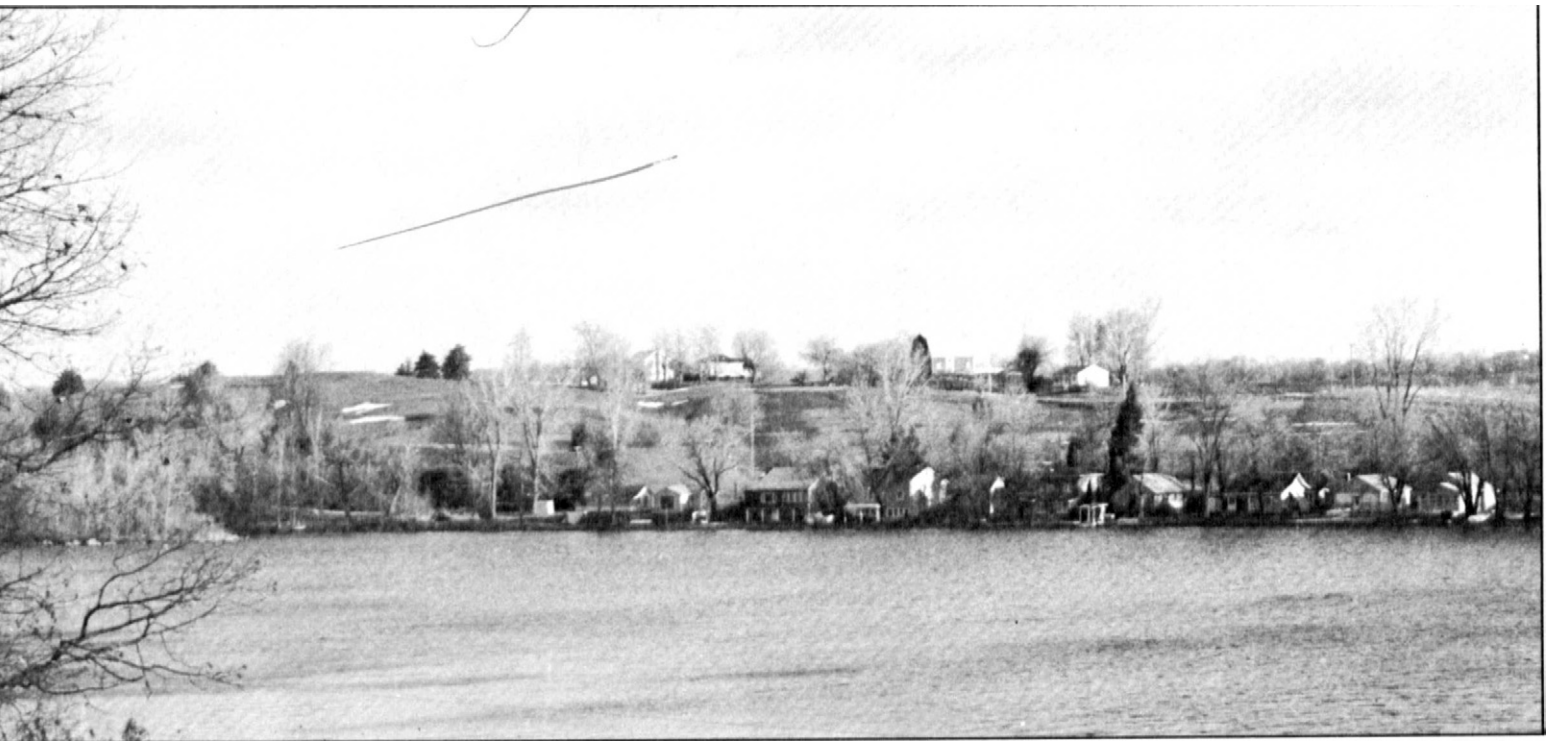
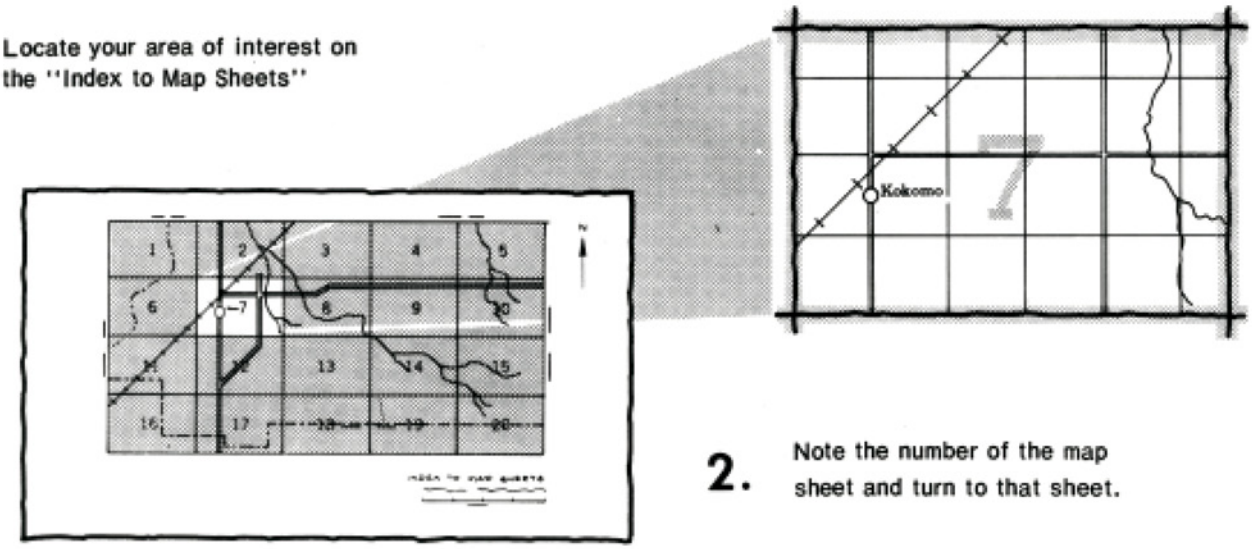
soil survey of
Steuben County
Indiana

United States Department of Agriculture, Soil Conservation Service
in cooperation with
Purdue University Agricultural Experiment Station and
Indiana Department of Natural Resources, Soil and Water Conservation Committee



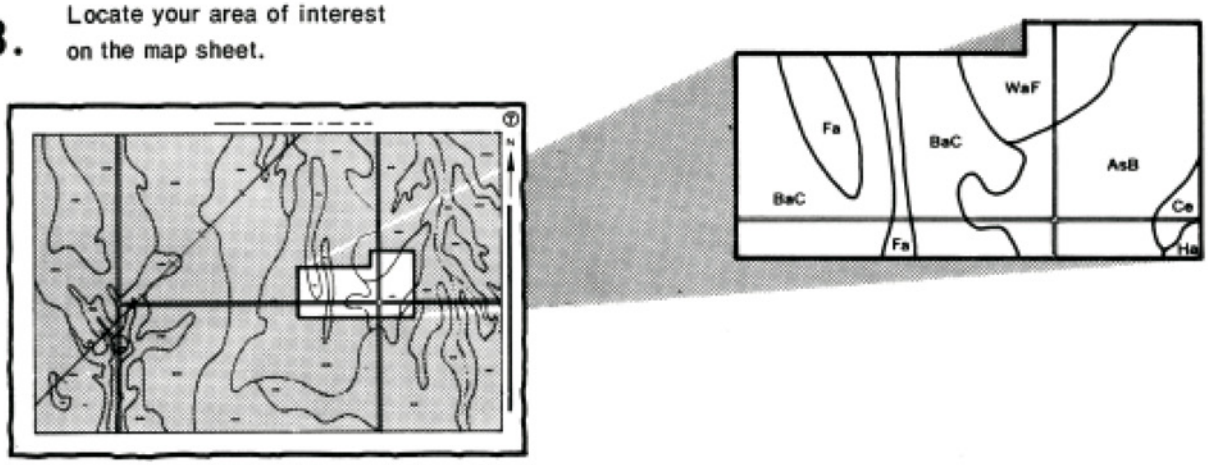
HOW TO USE

1. Locate your area of interest on the "Index to Map Sheets"

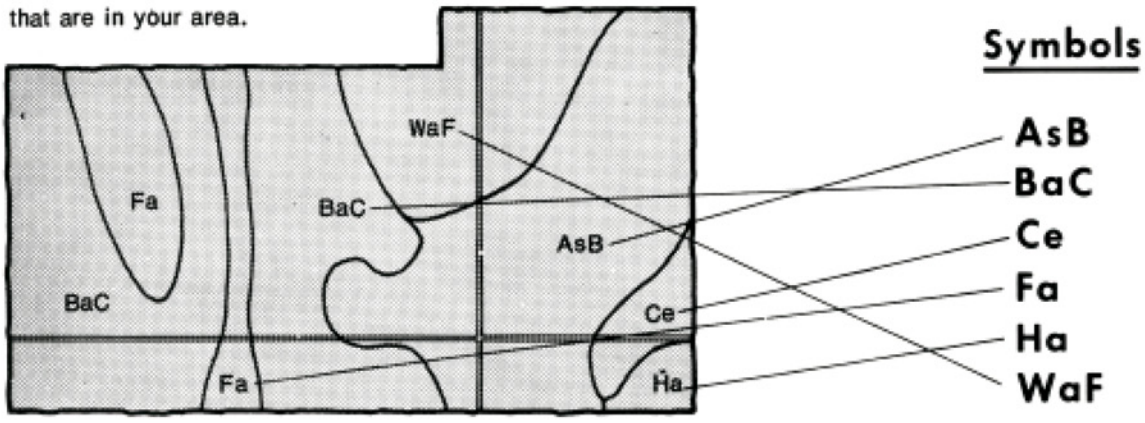


2. Note the number of the map sheet and turn to that sheet.

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

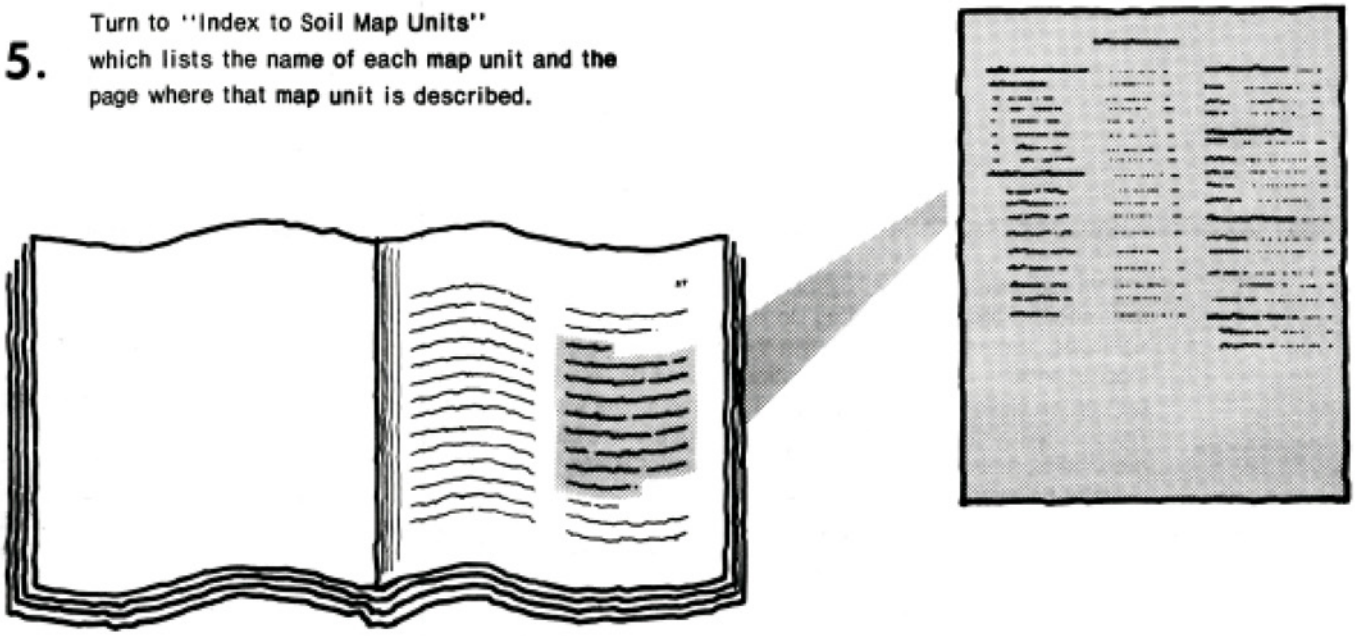


4. List the map unit symbols that are in your area.

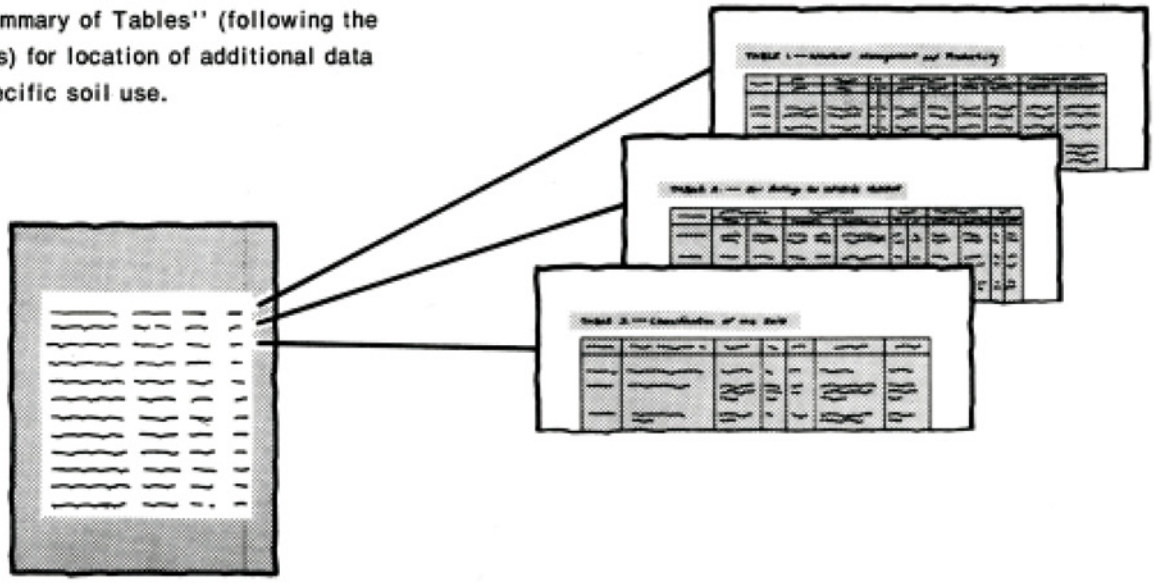


THIS SOIL SURVEY

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



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



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

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

This survey was made cooperatively by the Soil Conservation Service, the Purdue University Agricultural Experiment Station, and the Indiana Department of Natural Resources, Soil and Water Conservation Committee. It is part of the technical assistance furnished to the Steuben County Soil and Water Conservation District. Financial assistance was made available by the Steuben County Board of County Commissioners. Major fieldwork was performed in the period 1972-77. Soil names and descriptions were approved in 1979. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1979.

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

Cover: Building site development in an area of Boyer-Ormas loamy sands, 6 to 12 percent slopes, and Boyer-Ormas loamy sands, 12 to 18 percent slopes.

contents

soil series

Issued September 1981

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summary of tables

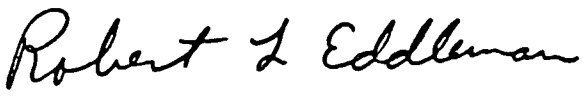
foreword

This soil survey contains information that can be used in land-planning programs in Steuben County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations inherent in the soil or hazards that adversely affect the soil, improvements needed to overcome the limitations or reduce the hazards, 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 insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

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

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



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soil survey of
Steuben County, Indiana

By Denver L. Farmer, Soil Conservation Service

Fieldwork by Denver L. Farmer, John H. Hillis,
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United States Department of Agriculture, Soil Conservation Service,
in cooperation with Purdue University Agricultural Experiment Station
and Indiana Department of Natural Resources,
Soil and Water Conservation Committee

STEUBEN COUNTY is in the northeast corner of Indiana (fig. 1). It has a total area of 207,360 acres. It is a rectangle that extends about 20 miles from east to west and about 16 miles from north to south. Angola, the county seat, is the largest town. It is about 135 miles east of Chicago and 145 miles northeast of Indianapolis, the state capital.

The population of Steuben County is about 20,000 during most of the year but swells to about five times this number in summer. It increased 17.3 percent between 1960 and 1970 and is likely to be 23,100 by 1985. The population density is 65 people per square mile.

The built-up areas around lakes are developed for urban uses at a faster pace than the areas in and around other community centers. They are virtually towns. Those around Clear Lake are incorporated.

The work force of the county is larger than can be employed by local businesses. Many residents are employed elsewhere.

Most of the county is farmed. Corn, soybeans, and wheat are the principal crops. Mint and vegetable crops are grown to a lesser extent. A few areas support orchards.

This soil survey updates the soil survey of Steuben County published in 1940 (*4*). It provides additional information and larger maps, which show the soils in greater detail.

general nature of the county

This section gives information about the general features that affect soil use in Steuben County.

relief

Steuben County is generally a high rolling plain. Hilly areas are near the lakes. Marshy areas are throughout the county.

The elevation is about 1,100 feet above sea level in the northeastern part of the county and 900 feet above sea level along the southern border. The highest point is about 1,205 feet above sea level in the northeastern part. The lowest point is about 876 feet above sea level, at the intersection of Fish Creek and the De Kalb County line.

water

The 101 lakes in Steuben County are of varying size and depth. Lake James, the largest, is 1,034 acres in size. Clear Lake, the deepest, is 107 feet deep. These lakes are an excellent source of recreation. They attract many tourists and part-time residents to the county. Other water areas include more than 250 ponds, which have been constructed in the past 25 years.

Most of the county is drained by Crooked Creek, Fawn

Figure 1.—Location of Steuben County in Indiana.

River, and Pigeon Creek. Each of these streams flows from east to west in a glacial channel and, along with its tributaries, connects a nearly continuous chain of lakes. These streams empty into Pigeon River, which flows into the part of the St. Joseph River in Michigan. This part of the St. Joseph River discharges into Lake Michigan. Fish Creek, in the eastern part of the county, flows from north to south in a narrow troughlike valley. It includes Lake Hamilton in its drainage basin and flows into the part of the St. Joseph River in Indiana and Ohio. This part of the St. Joseph River flows into the Maumee River, which discharges into Lake Erie.

climate

Prepared by the National Climatic Center, Asheville, North Carolina.

Steuben County is cold in winter and hot in summer. Winter precipitation, frequently snow, results in a good accumulation of soil moisture by spring and minimizes drought during summer on most soils. The normal annual precipitation is adequate for all of the crops that are suited to the temperature and length of growing season in the area.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Angola, Indiana, in the period 1951 to 1972. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 25 degrees F, and the average daily minimum temperature is 17 degrees. The lowest temperature on record, which occurred at Angola on January 24, 1963, is minus 18 degrees. In summer the average temperature is 70 degrees, and the average daily maximum temperature is 81 degrees. The highest recorded temperature, which occurred on June 29, 1971, is 99 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 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 34 inches. Of this, 20 inches, or 60 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 18 inches. The heaviest 1-day rainfall during the period of record was 5 inches at Angola on July 9, 1951. Thunderstorms occur on about 40 days each year, and most occur in summer.

Average seasonal snowfall is 33 inches. The greatest snow depth at any one time during the period of record was 17 inches. On an average of 27 days, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 70 percent of the time possible in summer and 40 percent in winter. The prevailing wind is from the southwest. Average windspeed is highest, 12 miles per hour, in spring.

transportation facilities

A four-lane toll road runs east and west through the northern part of Steuben County. Another four-lane road, Interstate I-69, runs south and north through the middle of the county. About 63 miles of other Federal highways, 84 miles of state roads, and 630.7 miles of county roads provide transportation routes throughout the county. Most roads are paved, and a few are graveled.

A railroad crosses the southern part of the county. It serves Helmer, Hudson, Ashley, Steubenville, and Hamilton. Another railroad, in the northeastern part of

the county, serves Ray, Fremont, and Angola. A recreational railroad runs between Angola and Pleasant Lake.

One small airport with a runway 2,740 feet long accommodates small- and medium-sized planes. There is no scheduled air service from this airport.

how this survey was made

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

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

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

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

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

general soil map units

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

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

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

The soils in the survey area vary widely in their potential for major land uses. Table 4 shows the extent of the map units shown on the general soil map. It lists the potential of each, in relation to that of the other map units, for major land uses and shows soil properties that limit use. Soil potential ratings are based on the practices commonly used in the survey area to overcome soil limitations. These ratings reflect the ease of overcoming the limitations. They also reflect the problems that will persist even if such practices are used.

Each map unit is rated for *cultivated crops, specialty crops, woodland, urban uses,* and *recreation areas.* Cultivated crops are those grown extensively in the survey area. Specialty crops are the vegetables and fruits that generally require intensive management. Woodland refers to areas of native or introduced trees. Urban uses include residential, commercial, and industrial developments. Intensive recreation areas are campsites, picnic areas, ballfields, and other areas that are subject to heavy foot traffic. Extensive recreation areas are those used for nature study and as wilderness.

soil descriptions

1. Kosciusko-Ormas-Boyer

Nearly level to strongly sloping, well drained, loamy and sandy soils that are moderately deep or deep over sand and gravel; on outwash plains and moraines

This map unit is on moraines and broad outwash plains. Slope ranges from 0 to 18 percent.

This map unit makes up about 22 percent of the county. It is about 35 percent Kosciusko soils, 15 percent Ormas soils, 14 percent Boyer soils, and 36 percent minor soils.

The Kosciusko soils generally are in nearly level to moderately sloping areas where sinkholes are common. Typically, the surface layer is dark brown sandy loam. The subsoil is strong brown gravelly sandy clay loam and gravelly sandy loam over yellowish red gravelly loamy sand.

The Ormas soils generally are in nearly level to moderately sloping areas. Typically, the surface layer is dark brown loamy sand. The subsurface layer is strong brown loamy sand. The subsoil is brown and dark brown sandy loam and sandy clay loam over dark brown gravelly loamy sand.

The Boyer soils generally are in the steeper areas. Typically, the surface layer is dark grayish brown loamy sand. The subsurface layer is light yellowish brown loamy sand. The subsoil is reddish brown sandy loam.

Of minor extent in this map unit are the somewhat poorly drained Riverdale soils in low lying areas; the very poorly drained Cohoctah and Millgrove soils in depressions; very poorly drained muck soils in depressions; marshy areas in the lowest part of depressions; and filled-in areas, mostly along lakeshores. Also of minor extent are Carmi, Casco, and Oshtemo soils, which are similar to the Kosciusko and Boyer soils.

This map unit is used mainly for cultivated crops. Some areas are used for hay or pasture, and some are wooded. Some of the low-lying depressional areas which have not been drained are used for wildlife habitat. Most of the areas adjacent to lakes are used as sites for houses.

Most of the soils in this map unit have only fair potential for cultivated crops because the available water capacity is only moderate or is low. They have good potential for residential and other urban uses. Establishing lawns is difficult in most areas.

2. Plainfield-Chelsea-Granby Variant

Deep, nearly level to moderately sloping, excessively drained and very poorly drained, sandy soils on outwash plains and bottom land

This map unit is on knolls and ridges and in depressional areas on loamy and sandy outwash plains. Slope ranges from 0 to 12 percent.

This map unit makes up about 4 percent of the county. It is about 30 percent Plainfield soils, 20 percent Chelsea soils, 20 percent Granby Variant soils, and 30 percent minor soils.

The nearly level to moderately sloping Plainfield soils are on knolls, ridges, and side slopes. Typically, the surface layer is dark brown fine sand. The subsoil is strong brown sand.

The gently sloping and moderately sloping Chelsea soils are on knolls, ridges, and side slopes. Typically, the surface layer is brown fine sand. The subsurface layer is yellowish brown and light yellowish brown fine sand. The subsoil is very pale brown fine sand that has bands of dark yellowish brown loamy fine sand.

The nearly level Granby Variant soils are in depressions. Typically, the surface layer is very dark grayish brown loamy sand. The subsoil is grayish brown, mottled loamy sand over light brownish gray, mottled sand.

Of minor extent in this map unit are the nearly level, moderately well drained Brems soils at a slightly lower elevation than the Plainfield soils, the somewhat poorly drained Morocco soils at a slightly lower elevation than the Brems soils, the well drained Oshtemo and Boyer soils in positions on the landscape similar to those of the Chelsea soils, very poorly drained muck soils in deep depressions, and areas of marsh in the deepest depressions.

This map unit is used mainly for cultivated crops or wildlife habitat. Some of the lower lying areas are drained and used for cultivated crops. Some of the depressional areas which have not been drained are used for wildlife habitat.

The excessively drained Plainfield and Chelsea soils have poor potential for cultivated crops because they are droughty. The very poorly drained Granby Variant soils have a better potential. The Plainfield and Chelsea soils have good potential for residential and other urban uses, but the very poorly drained Granby Variant soils have poor potential because they are wet.

3. Riddles-Miami-Brookston

Deep, nearly level to moderately steep, well drained and very poorly drained, loamy soils on till plains

This map unit is on till plains that are characterized by abrupt changes in topography. Slope ranges from 0 to 25 percent.

This map unit makes up about 30 percent of the county. It is about 30 percent Riddles soils, 15 percent Miami soils, 15 percent Brookston soils, and 40 percent minor soils.

The nearly level to strongly sloping Riddles soils generally are on ridges, knolls, and side slopes. Typically, the surface layer is dark brown sandy loam. The subsoil is dark yellowish brown and yellowish brown loam and clay loam.

The gently sloping to moderately steep Miami soils generally are on ridges, knolls, and side slopes. Typically, the surface layer is dark grayish brown loam. The subsurface layer is brown loam. The subsoil is dark yellowish brown and yellowish brown clay loam over yellowish brown loam.

The nearly level Brookston soils are in depressions. Typically, the surface layer is black loam. The subsurface layer is black clay loam. The subsoil is gray, mottled sandy clay loam over gray, mottled clay loam.

Of minor extent in this map unit are the somewhat poorly drained Crosier soils on flats and along drainageways, the well drained Wawasee soils and the well drained, sandy Metea soils in positions on the landscape similar to those of the Miami and Riddles soils, very poorly drained muck soils in depressions, and areas of marsh in the deepest depressions.

This map unit is used mainly for cultivated crops. Most of the areas which can be drained economically are adequately drained. Some areas are used for hay or pasture, and some are wooded. Some of the low-lying depressional areas which have not been drained are used for wildlife habitat.

Most of the soils in this map unit have good potential for cultivated crops. The Riddles and Miami soils have fair potential for residential and other urban uses, but the Brookston soils have poor potential because they are wet.

4. Glynwood-Morley-Blount

Deep, nearly level to moderately steep, well drained to somewhat poorly drained, silty soils on till plains and moraines

This map unit is on till plains and moraines. In some areas the landscape is rolling. Slope ranges from 0 to 25 percent.

This map unit makes up about 39 percent of the county. It is about 30 percent Glynwood soils, 20 percent Morley soils, 15 percent Blount soils, and 35 percent minor soils (fig. 2).

The gently sloping Glynwood soils generally are on broad ridges. Typically, the surface layer is brown silt loam. The subsoil is yellowish brown clay loam and clay.

The moderately sloping to moderately steep Morley soils are on ridges, knolls, and side slopes. Typically, the surface layer is brown silt loam. The subsoil is yellowish brown clay loam and clay.

The nearly level Blount soils are in areas adjacent to depressions. Typically, the surface layer is dark grayish brown silt loam. The subsoil is brown, mottled silty clay loam over grayish brown and brown, mottled silty clay.

Of minor extent in this map unit are the very poorly

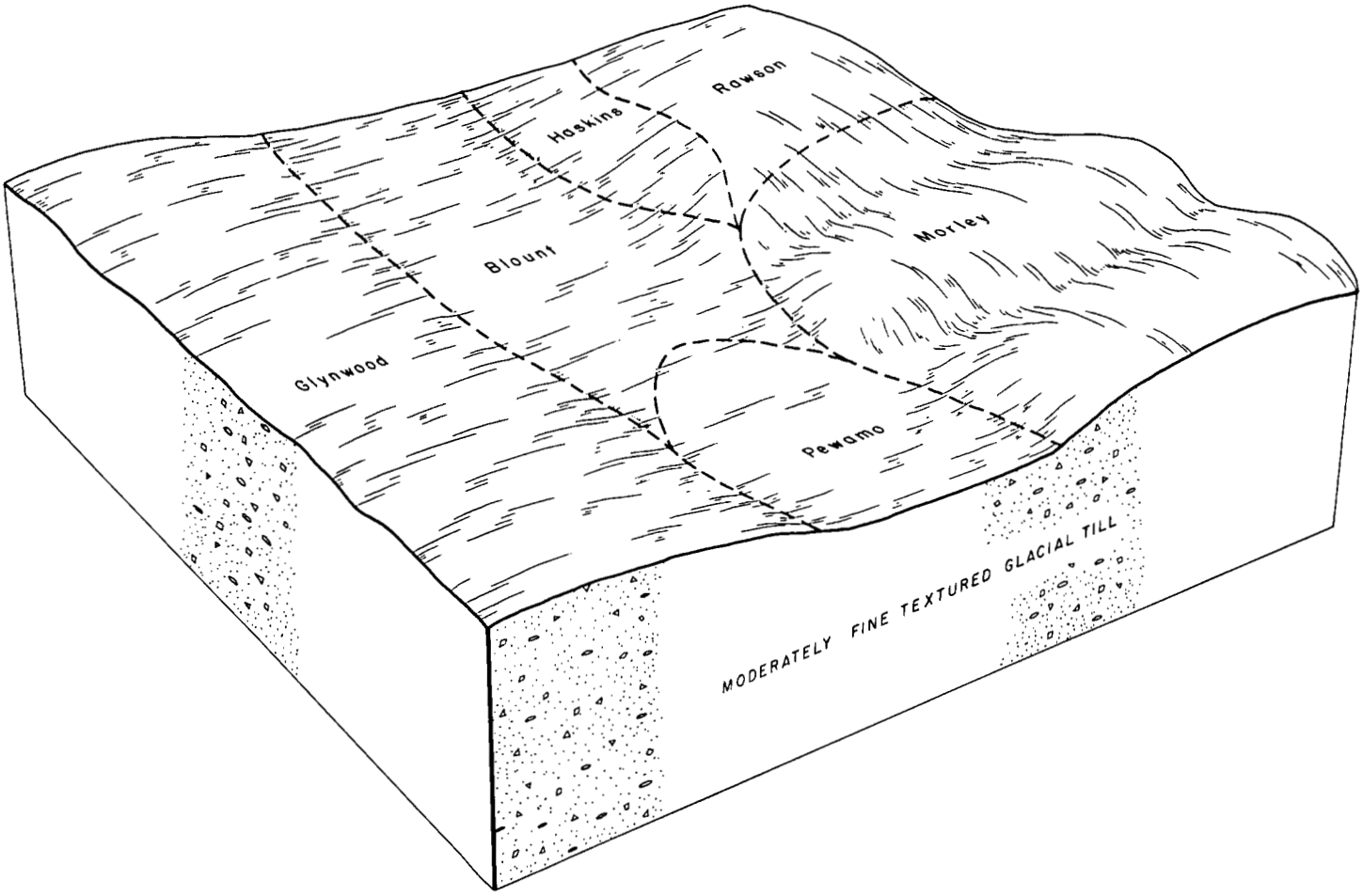

Figure 2.—Pattern of soils in the Glynwood-Morley-Blount map unit.

drained Milford and Pewamo soils and muck soils, all of which are in depressions; the somewhat poorly drained Shoals soils along drainageways; and areas of marsh in the deepest part of some depressions. Also of minor extent are Rawson soils, which are similar to the Glynwood soils, and Haskins soils, which are similar to the Blount soils.

This map unit is used mainly for cultivated crops. Most of the areas which can be drained economically are adequately drained. Some areas are used for hay or pasture, and some are wooded. Some of the low-lying depressional areas which have not been drained are used for wildlife habitat. Wetness is the main limitation affecting most uses in the areas that are nearly level or depressional.

Most of the soils in this map unit have good potential for cultivated crops. They have poor potential for residential and other urban uses because they are slowly permeable and have a moderate shrink-swell potential.

5. Houghton-Rensselaer-Milford

Deep, nearly level, very poorly drained, mucky, loamy, and silty soils in depressions on outwash plains and lake plains

This map unit makes up about 5 percent of the county. It is about 30 percent Houghton soils, 15 percent Rensselaer soils, 10 percent Milford soils, and 45 percent minor soils.

The Houghton soils are in the low-lying depressions. Typically, the surface layer is black muck. The underlying layers also are black muck.

The Rensselaer soils are in the low-lying areas on the glacial outwash plains. Typically, the surface layer is very dark gray loam. The subsurface layer is dark gray, mottled loam. The subsoil is dark gray, mottled clay loam over gray and light brownish gray, mottled sandy clay loam.

The Milford soils are in the low-lying areas on lake

plains. Typically, the surface layer is very dark gray silty clay loam. The subsurface layer is dark gray, mottled silty clay loam. The subsoil is dark gray, mottled silty clay loam and clay loam.

Of minor extent in this map unit are the somewhat poorly drained Haskins, Del Rey, and Whitaker soils at the slightly higher elevations and the well drained Martinsville soils at the highest elevations. Also of minor extent are Adrian, Edwards, Muskego, and Palms soils, which are similar to Houghton soils.

This map unit is used mainly for cultivated crops. Most areas have been drained. A few undrained swampy areas are wooded or used for wildlife habitat. Wetness is the main limitation affecting the areas used for farming or other purposes. Ponding or flooding is common in spring.

The soils in this map unit have good potential for cultivated crops. They have poor potential for residential and other urban uses because they are wet. Also, low strength is a limitation in the Houghton soils.

detailed soil map units

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

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

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

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

Soils of one series can differ in texture of the surface layer or of the substratum. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Miami loam, 2 to 6 percent slopes, is one of several phases in the Miami 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 that occur as areas so intricately mixed or so small that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Boyer-Ormas loamy sands, 0 to 6 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. These dissimiliar soils are described in each map unit. Also, some of the more unusual or strongly contrasting soils are identified by a special symbol on the soil maps.

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

Table 5 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

Ad—Adrian muck, drained. This nearly level, deep, very poorly drained soil is in depressions and former drainageways or along streams and lakeshores. It is frequently ponded by runoff from higher lying adjacent soils. Areas generally are long and narrow or oval. They range from 2 to 70 acres in size.

In a typical profile, the surface layer is black muck about 9 inches thick. The next 19 inches is black and dark reddish brown muck in which some of the plant material has not decomposed. The substratum to a depth of 60 inches is gray sand. In a few small areas, the muck is less than 16 inches thick or the sand is below a depth of 60 inches. In a few places the substratum is till or marl.

Included with this soil in mapping are a few small areas of mineral soils. These soils make up 4 to 6 percent of the unit.

Available water capacity is very high in the Adrian soil. Permeability is moderately slow to moderately rapid in the organic layers and rapid in the underlying sand. Runoff is very slow. The water table is near or above the surface for much of the year. Organic matter content is very high. The surface layer is friable and can be easily tilled throughout a wide range in moisture content.

About half of the areas are used for cultivated crops, but half are not drained well enough for crop production. Some areas are wooded or support a scrubby stand of timber.

This soil is subject to frost, which can severely damage many cultivated crops early and late in the growing season. It is best suited to special crops, such as mint or vegetables that are not easily damaged by frost. Crops for silage can be successfully grown.

Wetness is the major limitation if crops are grown. An adequate drainage system is needed. If drained, however, the soil is subject to severe wind erosion. Planting nurse crops, such as rye or wheat, beside the rows helps to control wind erosion.

If adequately drained, this soil is suited to grasses and legumes. Deep rooted legumes, such as alfalfa, are not so well suited as shallow rooted legumes. Wetness is the major concern in managing pasture. If the pasture is grazed during wet periods, stools of grass and soil form. These stools hinder the use of farm machinery. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is poorly suited to commercial tree production. It cannot support tall trees. Equipment limitations, seedling mortality, and the windthrow hazard are management concerns. Equipment can be used only during very dry periods or during periods when the ground is frozen. Many seedlings do not survive or grow well. Many trees are blown down.

This soil generally is unsuitable as a site for dwellings and septic tank absorption fields because of the ponding. Also, the low strength of the organic material is a limitation on sites for dwellings without basements. Low strength, ponding, and frost action are severe limitations on sites for local roads and streets. Building the roads and streets on raised, well compacted fill material helps to prevent the damage caused by ponding and frost action. Providing coarser grained subgrade or base material helps to prevent the damage caused by low strength and frost action.

The capability subclass is IVw; woodland suitability subclass 4w.

Be—Beaches. This map unit consists of sandy deposits adjacent to lakes. Sand has been washed ashore by wave action and has been reworked by the wind. Areas range from 2 to 65 acres in size.

In most areas fine sand or sand is throughout the profile. In some areas silt or very fine sand is at a depth of about 30 inches. A seasonal high water table is at a depth of 1 to 4 feet.

Beaches support little vegetation and are unsuitable for farming. They are suited to some kinds of wildlife habitat and some recreational uses.

No capability class or subclass or woodland suitability subclass is assigned.

BnA—Blount silt loam, 0 to 3 percent slopes. This nearly level, deep, somewhat poorly drained soil is on broad upland flats. Areas are irregular in shape and range from 2 to 200 acres in size.

In a typical profile, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsoil is about 22 inches thick. The upper part is brown, mottled, firm or very firm silty clay loam; the next part is grayish brown, mottled, very firm silty clay; and the lower part is brown, mottled, very firm silty clay. The substratum to a depth of 60 inches is brown, mottled clay loam. In some places calcareous clay loam till is at a depth of about 20 inches. In other places, the surface layer contains more sand or the upper part of the subsoil contains less clay.

Included with this soil in mapping are a few small areas of the well drained Morley soils on the higher parts of the landscape and small areas of the very poorly drained Pewamo soils in depressions. These soils make up 7 to 11 percent of the unit.

Available water capacity is high in the Blount soil. Permeability is slow. Runoff also is slow. The water table is at a depth of 1 to 3 feet for much of the year. Organic matter content is moderate. The surface layer is friable and can be easily tilled, but it crusts after some rains. As a result of the crusting, seedlings of plants, especially soybeans, cannot emerge easily.

Nearly all areas are used for cultivated crops. A few support grasses or legumes for hay or pasture. A few are wooded.

If adequately drained, this soil is well suited to corn, soybeans, and small grain. Wetness is the major limitation if crops are grown. A conservation cropping system that is dominated by row crops is suitable if subsurface drains are installed to control the wetness. Cover crops and a conservation tillage system that leaves crop residue on the surface increase the organic matter content and improve tilth.

If adequately drained, this soil is well suited to grasses and legumes for hay or pasture. Deep rooted legumes, such as alfalfa, are not so well suited as shallow rooted legumes. The major concerns of management are overgrazing and grazing when the soil is wet. Grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suited to water tolerant trees. Seedling mortality and the windthrow hazard are the main management concerns. Plant competition is moderate. Seedlings survive and grow well only if competing vegetation is controlled. The competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling.

Wetness is a severe limitation if this soil is used as a site for dwellings. Installing an adequate drainage system that lowers the water table helps to overcome the wetness. Frost action and low strength are severe limitations on sites for local roads and streets. Drainage ditches remove excess water and thus help to prevent the damage caused by frost action. Providing coarser grained subgrade or base material helps to prevent the damage caused by low strength and frost action.

The wetness and the slow permeability are severe limitations if this soil is used as a septic tank absorption field. Overcoming these limitations is very difficult. A better suited soil should be selected, or a public sewer system should be used if one is available.

The capablity subclass is IIw; woodland suitability subclass 3c.

BoB—Boyer-Ormas loamy sands, 0 to 6 percent slopes. These nearly level and gently sloping, deep, well drained soils are on outwash plains (fig. 3). Areas are somewhat elongated or oval and range from 2 to 300 acres in size. They are about 50 percent Boyer soil and 40 percent Ormas soil. The two soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

In a typical profile of the Boyer soil, the surface layer is dark grayish brown loamy sand about 8 inches thick. The subsurface layer is light yellowish brown loamy sand about 9 inches thick. The subsoil is reddish brown, firm and friable sandy loam about 10 inches thick. The substratum to a depth of 60 inches is yellowish brown very gravelly coarse sand.

In a typical profile of the Ormas soil, the surface layer is dark brown loamy sand about 8 inches thick. The subsurface layer is about 22 inches of strong brown and brown loamy sand and gravelly loamy sand. The subsoil is about 20 inches of strong brown, friable gravelly sandy clay loam. The substratum to a depth of 60 inches is pale brown very gravelly coarse sand.

Included with these soils in mapping are a few small areas of the somewhat poorly drained Riverdale soils in drainageways and small areas of steeper soils adjacent to small depressions. Also included are areas where stones are on the surface. Using farm machinery is difficult in the stony areas. Included areas make up 8 to 10 percent of the unit.

Available water capacity is moderate in the Boyer and Ormas soils. Permeability is moderately rapid in the upper part and very rapid in the substratum. Runoff is slow. Organic matter content is low. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content.

Most areas are used for hay or pasture. Some are used for row crops. A few are used for orchards or woodland.

These soils are suited to cultivated crops, but they are droughty during extended dry periods in summer. Measures that conserve moisture, control wind erosion, and increase the organic matter content are needed. Examples are cover crops, crop rotation, and a conservation tillage system that leaves crop residue on the surface.

Growing grasses and legumes for hay or pasture is effective in controlling wind erosion. Because these soils are droughty, however, overgrazing easily reduces the vigor of the pasture plants and the extent of the plant cover and thus increases the susceptibility to wind erosion. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during long dry perlods help to keep the pasture and the soil in good condition.

These soils are suited to trees. Seedling mortality is the main management concern. Seedlings should be planted as early in the spring as possible. Some do not survive or grow well.

These soils are suitable as sites for dwellings and local roads and streets. They readily absorb but do not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity may result in the pollution of ground water supplies.

Figure 3.—An area of Boyer-Ormas loamy sands, 0 to 6 percent slopes.

The capability subclass is IIIs; woodland suitability subclass 3s.

BoC—Boyer-Ormas loamy sands, 6 to 12 percent slopes. These moderately sloping, deep, well drained soils are on outwash plains. Areas are somewhat elongated and range from 2 to 160 acres in size. They are about 50 percent Boyer soil and 40 percent Ormas soil. The two soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

In a typical profile of the Boyer soil, the surface layer is brown loamy sand about 7 inches thick. The subsurface layer is brown, very friable loamy sand about 9 inches thick. The subsoil is about 10 inches thick. The upper part is reddish brown, firm sandy clay loam, and the lower part is reddish brown, friable gravelly sandy loam. The substratum to a depth of 60 inches is yellowish brown very gravelly coarse sand. In places the surface soil and subsoil contain more clay and less sand.

In a typical profile of the Ormas soil, the surface layer is dark brown loamy sand about 7 inches thick. The subsurface layer is about 21 inches thick. The upper part is strong brown, very friable loamy sand, and the lower part is brown, loose gravelly loamy sand. The subsoil is about 18 inches of strong brown, friable gravelly sandy clay loam. The substratum to a depth of 60 inches is pale brown very gravelly coarse sand.

Included with these soils in mapping are a few small areas of steeper soils adjacent to small depressions. Also included are areas where stones are on the surface. Using farm machinery is difficult in the stony areas. Included areas make up 8 to 10 percent of the unit.

Available water capacity is moderate in the Boyer and Ormas soils. Permeability is moderately rapid in the upper part and very rapid in the substratum. Runoff is medium. Organic matter content is low. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content.

Most areas are used for hay or pasture. Some are used for row crops. A few are wooded.

These soils are suited to cultivated crops grown in rotation with grasses and legumes. They tend to be droughty, however, if rainfall is poorly distributed during the growing season. Measures that conserve moisture, control wind erosion, and increase the organic matter content are needed. Examples are cover crops, crop rotation, and a conservation tillage system that leaves a protective amount of crop residue on the surface.

These soils are best suited to pasture or to deep rooted legumes for hay because the available water capacity is only moderate. A cover of pasture plants or hay helps to control wind erosion. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

These soils are suited to trees. Seedling mortality is the main management concern. Seedlings should be planted as early in the spring as possible. Some do not survive or grow well.

Slope is a moderate limitation if these soils are used as sites for dwellings or local roads and streets. Dwellings should be designed to conform to the natural slope of the land. Land shaping is needed in some areas. Local roads and streets should be built on the contour. The soils readily absorb but do not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity may result in the pollution of ground water supplies.

The capability subclass is IIIe; woodland suitability subclass 3s.

BoD—Boyer-Ormas loamy sands, 12 to 18 percent slopes. These strongly sloping, deep, well drained soils are on outwash plains. Areas are somewhat elongated and range from 2 to 80 acres in size. They are about 50 percent Boyer soil and 40 percent Ormas soil. The two soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

In a typical profile of the Boyer soil, the surface layer is brown loamy sand about 6 inches thick. The subsurface layer is light yellowish brown, very friable loamy sand about 9 inches thick. The subsoil is about 10 inches thick. The upper part is strong brown, firm gravelly sandy clay loam, and the lower part is strong brown, friable gravelly sandy loam. The substratum to a depth of 60 inches is yellowish brown very gravelly coarse sand. In places the surface soil and subsoil contain more clay and less sand.

In a typical profile of the Ormas soil, the surface layer is brown loamy sand about 7 inches thick. The subsurface layer is about 20 inches thick. The upper part is strong brown, very friable loamy sand, and the lower part is brown, loose gravelly loamy sand. The subsoil is about 16 inches of strong brown, friable gravelly sandy clay loam. The substratum to a depth of 60 inches is pale brown very gravelly coarse sand.

Included with these soils in mapping are a few small areas of steeper soils adjacent to small depressions. Also included are areas where stones are on the surface. Using farm machinery is difficult in the stony areas. Included areas make up 8 to 10 percent of the unit.

Available water capacity is moderate in the Boyer and Ormas soils. Permeability is moderately rapid in the upper part and very rapid in the substratum. Runoff is medium. Organic matter content is moderate. The surface layer is very friable.

Some areas are used for row crops. Some are used for hay or pasture. Some are wooded.

These soils are poorly suited to cultivated crops because they are strongly sloping and tend to be droughty. They are better suited to pasture or to deep rooted legumes for hay. A cover of pasture plants or hay helps to control wind erosion. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

These soils are best suited to trees. Seedling mortality, erosion, and equipment limitations are the main management concerns. Seedlings should be planted as early in the spring as possible. Some do not survive or grow well. Planting on the contour helps to control erosion.

Slope is a severe limitation if these soils are used as sites for dwellings, local roads and streets, or septic tank absorption fields. Dwellings should be designed to conform to the natural slope of the land, and roads and streets should be built on the contour. Constructing trenches for septic tank absorption fields is difficult because of the slope. Also, the soils readily absorb but do not adequately filter the effluent. The poor filtering capacity may result in the pollution of underground water supplies.

The capability subclass is IVe; woodland suitability subclass 3s.

BtA—Brems loamy sand, 0 to 2 percent slopes. This nearly level, deep, moderately well drained soil is on outwash plains. Areas are elongated and range from 2 to 85 acres in size.

In a typical profile, the surface layer is dark brown loamy sand about 8 inches thick. The subsoil is very friable sand about 37 inches thick. The upper part is yellowish brown, the next part is pale brown and mottled, and the lower part is light brownish gray and mottled. The substratum to a depth of 60 inches is brownish yellow sand. In places thin layers of finer textured material are between depths of 40 and 60 inches.

Included with this soil in mapping are a few small areas of the somewhat poorly drained Morocco soils on the lower lying parts of the landscape and the excessively drained Plainfield soils on the higher rises. These soils make up 8 to 12 percent of the unit.

Available water capacity is low in the Brems soil. Permeability is rapid. Runoff is very slow. The water table is at a depth of 2 to 3 feet during the winter and early in spring. Organic matter content is low. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content.

Most areas are used for pasture. Some areas are used for cultivated crops. They are adjacent to lower lying cultivated areas. Some areas are wooded.

This soil is poorly suited to row crops because it is droughty. A conservation tillage system that leaves a protective amount of crop residue on the surface conserves moisture, helps to control water and wind erosion, and increases the organic matter content.

Growing grasses and legumes for hay or pasture is effective in controlling erosion. Because these soils are droughty, however, overgrazing easily reduces the vigor of the pasture plants and the extent of the plant cover and thus increases the susceptibility to wind erosion. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during long dry periods help to keep the pasture and the soil in good condition.

This soil is suited to trees. Seedling mortality is a management concern. Plant competition is moderate. Seedlings survive and grow well only if competing vegetation is controlled. They should be planted as early in the spring as possible. Some do not survive or grow well.

Wetness is a moderate limitation if this soil is used as a site for dwellings without basements or for local roads and streets. It is a severe limitation on sites for dwellings with basements or for septic tank absorption fields. Installing an adequate drainage system helps to overcome the wetness. The soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity may result in the pollution of ground water supplies.

The capability subclass is IVs; woodland suitability subclass 3s.

Bz—Brookston loam. This nearly level, deep, very poorly drained soil is in depressions in till plains. It is frequently ponded by runoff from higher lying adjacent soils. Areas range from 2 to 125 acres in size.

In a typical profile, the surface layer is black loam about 10 inches thick. The subsurface layer is black clay loam about 7 inches thick. The subsoil is about 27 inches thick. The upper part is gray, mottled, friable sandy clay loam, and the lower part is gray, mottled, firm clay loam. The substratum to a depth of 60 inches is gray, mottled loam. In a few small areas the lower part of the subsoil is stratified sandy loam and sandy clay loam.

Included with this soil in mapping are a few small convex areas of the somewhat poorly drained Crosier soils. These soils are slightly higher on the landscape than the Brookston soil. Also included are undrained wet soils in small depressions. Included soils make up 6 to 10 percent of the unit.

Available water capacity is high in the Brookston soil. Permeability is moderate in the subsoil and moderately slow in the substratum. Runoff is very slow. A seasonal high water table is near or above the surface early in spring. Organic matter content is moderate. The surface layer is friable and can be easily tilled throughout a fairly wide range in moisture content.

Most areas are used for cultivated crops. A few are used for hay or pasture. A few are wooded.

If adequately drained, this soil is well suited to corn, soybeans, and small grain. If drained and otherwise well managed, it is suited to intensive row cropping. Excess water can be removed by open ditches, subsurface drains, surface drains, or pumps or by a combination of these. A conservation tillage system that leaves crop residue on the surface improves tilth and increases the organic matter content.

This soil is suited to grasses and legumes for hay or pasture. A drainage system is needed. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Overgrazing also reduces the

vigor and density of the plants. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to prevent surface compaction and maintain good tilth and plant density.

This soil is suited to water tolerant trees. Plant competition, the windthrow hazard, equipment limitations, and seedling mortality are management concerns. Seasonal wetness can delay planting and harvesting. Most seedlings survive and grow well if competing vegetation is controlled by spraying, cutting, or girdling.

Ponding is a severe limitation if this soil is used as a site for dwellings. Draining this soil is difficult because it commonly is on the lowest lying part of the landscape and receives runoff from higher lying adjacent areas. Ponding, frost action, and low strength are severe limitations on sites for local roads and streets. Building the roads and streets on raised, well compacted fill material and constructing drainage ditches help to prevent the damage caused by ponding and frost action. Providing coarser grained subgrade or base material helps to prevent the damage caused by low strength and frost action.

This soil generally is unsuited to septic tank absorption fields because the ponding and the moderately slow permeability are severe limitations. Overcoming these limitations is very difficult. A better suited soil should be selected.

The capability subclass is IIw; woodland suitability subclass 2w.

CaC—Casco gravelly sandy loam, 6 to 12 percent slopes. This moderately sloping, somewhat excessively drained soil is on outwash plains. It is shallow over very gravelly coarse sand. Areas are irregular in shape and range from 2 to 100 acres in size.

In a typical profile, the surface layer is brown gravelly sandy loam about 7 inches thick. The subsoil is brown, firm gravelly clay loam about 9 inches thick. The substratum to a depth of 60 inches is yellowish brown very gravelly coarse sand. In a few small areas calcareous very gravelly coarse sand is throughout the profile. In some places the very gravelly coarse sand is below a depth of 60 inches. In other places the surface layer and subsoil contain less clay.

Included with this soil in mapping are a few small areas of steeper soils adjacent to small depressions and a few severely eroded areas. Included areas make up 4 to 8 percent of the unit.

Available water capacity is low in the Casco soil. Permeability is moderate in the upper part and very rapid in the substratum. Runoff is medium. Organic matter content is low. The surface layer is very friable.

Most areas are used for hay or pasture. Some are used for cultivated crops. A few are wooded.

This soil is poorly suited to cultivated crops because it is subject to erosion and is droughty. Measures that control erosion and runoff and conserve moisture are needed if cultivated crops are grown. Examples are cover crops, crop rotation, terraces, diversions, contour farming, grassed waterways, grade stabilization structures, and a conservation tillage system that leaves a protective amount of crop residue on the surface. Planting cover crops and leaving crop residue on the surface also improve tilth and increase the organic matter content.

This soil is best suited to pasture or to deep rooted legumes for hay because the available water capacity is low. A cover of pasture plants or hay helps to control water and wind erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suited to trees. Seedling mortality and the windthrow hazard are moderate. Seedlings should be planted as early in the spring as possible, when an adequate amount of moisture is available. Some do not survive or grow well.

Slope is a moderate limitation if this soil is used as a site for dwellings or local roads and streets. Dwellings should be designed to conform to the natural slope of the land. Land shaping is needed in some areas. Local roads and streets should be built on the contour. The soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity may result in the pollution of ground water supplies.

The capability subclass is IVe; woodland suitability subclass 3s.

CaD2—Casco gravelly sandy loam, 12 to 18 percent slopes, eroded. This strongly sloping, somewhat excessively drained soil is on outwash plains. It is shallow over very gravelly coarse sand. Areas are irregular in shape and range from 2 to 100 acres in size.

In a typical profile, the surface layer is brown gravelly sandy loam about 5 inches thick. The subsoil is firm gravelly clay loam about 9 inches thick. The upper part is brown, and the lower part is reddish brown. The substratum to a depth of 60 inches is light yellowish brown very gravelly coarse sand. In a few small areas calcareous very gravelly coarse sand is throughout the profile. In some places the surface layer and subsoil contain less clay and more sand. In other places the very gravelly coarse sand is below a depth of 60 inches.

Included with this soil in mapping are a few small areas of steeper soils adjacent to small depressions. These soils make up 4 to 8 percent of the unit.

Available water capacity is low in the Casco soil. Permeability is moderate in the upper part and very rapid in the substratum. Runoff is rapid. Organic matter content is low. The surface layer is friable.

Some areas are used for cultivated crops. Some are used for hay or pasture. A few are wooded.

This soil generally is unsuited to cultivated crops because of slope and droughtiness. It is better suited to

pasture or to deep rooted legumes for hay because the available water capacity is low. A cover of pasture plants or hay helps to control erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is best suited to trees. Seedling mortality is moderate because of the droughtiness. Seedlings should be planted as early in the spring as possible. Some do not survive or grow well. Competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling.

Slope is a severe limitation if this soil is used as a site for dwellings, local roads and streets, or septic tank absorption fields. Land shaping is needed in some areas. Local roads and streets should be built on the contour. Dwellings should be designed to conform to the natural slope of the land, or a better suited soil should be selected. The distribution lines in septic tank absorption fields should be installed across the slope. The soil readily absorbs but does not adequately filter the effluent in these absorption fields. The poor filtering capacity may result in the pollution of ground water supplies.

The capability subclass is VIe; woodland suitability subclass 3s.

CcA—Carmi sandy loam, 0 to 2 percent slopes. This nearly level, well drained soil is on outwash plains. It is moderately deep over very gravelly coarse sand. Areas are broad and irregular in shape. They range from 5 to 540 acres in size.

In a typical profile, the surface layer is very dark brown sandy loam about 6 inches thick. The subsurface layer also is very dark brown sandy loam about 6 inches thick. The subsoil is about 24 inches thick. The upper part is dark yellowish brown, friable and firm sandy loam; the next part is dark brown, firm gravelly sandy clay loam; and the lower part is dark brown, friable gravelly sandy loam. The substratum to a depth of 60 inches is light yellowish brown and yellow very gravelly coarse sand. In some areas the lower part of the subsoil contains more sand. Small eroded areas are on the steeper slopes.

Included with this soil in mapping are a few small areas of the well drained Kosciusko and somewhat excessively drained Casco soils. The Casco soils are in the steeper areas. Included soils make up 7 to 10 percent of the unit.

Available water capacity is moderate in the Carmi soil. Permeability is moderately rapid in the upper part and very rapid in the substratum. Runoff is slow. Organic matter content is moderate. The surface layer is friable and can be easily tilled throughout a wide range in moisture content.

Most areas are used for cultivated crops. A few are used for hay or pasture.

This soil is suited to corn, soybeans, and small grain. It tends to be droughty, however, if rainfall is poorly distributed during the growing season. Measures that conserve moisture, control wind erosion, and increase the organic matter content are needed. Examples are cover crops and a conservation tillage system that leaves a protective amount of crop residue on the surface.

Growing grasses and legumes for hay or pasture is effective in controlling erosion. Overgrazing damages the sod, reduces plant density, and causes surface compaction. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

This soil is suitable as a site for dwellings. Frost action is a moderate limitation on sites for local roads and streets. Drainage ditches help to keep water from seeping under the road surface and thus help to prevent the damage caused by frost action. The soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity may result in the pollution of ground water supplies.

The capability subclass is IIs; no woodland suitability subclass is assigned.

ChB—Chelsea fine sand, 1 to 6 percent slopes. This gently sloping, deep, excessively drained soil is on outwash plains. Areas generally are elongated and range from 2 to 120 acres in size.

In a typical profile, the surface layer is brown fine sand about 8 inches thick. The subsurface layer is yellowish brown and light yellowish brown fine sand about 24 inches thick. The subsoil to a depth of 80 inches is very pale brown fine sand that has bands of dark brown loamy fine sand. The bands are 1/4 inch to 2 inches thick. In a few small areas stratified gravelly coarse sand is at a depth of 40 to 80 inches. In places the sand is coarser textured below the surface soil and has no bands.

Included with this soil in mapping are a few small areas of the well drained Metea soils in similar positions on the landscape. These soils make up 8 to 10 percent of the unit.

Available water capacity is low in the Chelsea soil. Permeability is rapid. Runoff is slow. Organic matter content is low. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content.

Most areas are used for pasture. Some areas are used for cultivated crops. They are adjacent to lower lying cultivated areas of the Morocco and Brems soils. Some areas are wooded.

This soil is poorly suited to row crops because it is droughty. If row crops are grown, a conservation tillage system that leaves a protective amount of crop residue on the surface conserves moisture, helps to control wind erosion, and increases the organic matter content.

Growing grasses and legumes for hay or pasture is effective in controlling erosion. Because this soil is droughty, however, overgrazing easily reduces the vigor

of the pasture plants and the extent of the plant cover and thus increases the susceptibility to wind erosion. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during long dry periods help to keep the pasture and the soil in good condition.

This soil is suited to trees. Seedling mortality is moderate because of the droughtiness. Seedlings should be planted as early in the spring as possible, when an adequate amount of moisture is available. Some do not survive or grow well. Competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling.

This soil is suitable as a site for dwellings and local roads and streets. It readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity may result in the pollution of ground water supplies.

The capability subclass is IVs; woodland suitability subclass 3s.

ChC—Chelsea fine sand, 6 to 12 percent slopes. This moderately sloping, deep, excessively drained soil is on outwash plains. Areas generally are elongated and range from 2 to 60 acres in size.

In a typical profile, the surface layer is brown fine sand about 6 inches thick. The subsurface layer is yellowish brown and strong brown fine sand about 24 inches thick. The subsoil to a depth of 60 inches is yellowish brown fine sand that has bands of brown loamy fine sand. The bands are 1/4 inch to 2 inches thick. In a few small areas stratified gravelly coarse sand is at a depth of 40 to 60 inches. In places the sand is coarser textured below the surface soil and has no bands.

Included with this soil in mapping are a few small areas of the well drained Metea soils and a few small areas of steeper soils. Included soils make up 8 to 10 percent of the unit.

Available water capacity is low in the Chelsea soil. Permeability is rapid. Runoff is medium. Organic matter content is low. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content.

Most areas are used for pasture or wildlife habitat. Some areas are used for cultivated crops. They are adjacent to lower lying cultivated areas. Some areas are wooded.

This soil is poorly suited to row crops because it is droughty. If row crops are grown, a conservation tillage system that leaves a protective amount of crop residue on the surface conserves moisture, helps to control wind erosion, and increases the organic matter content.

Growing grasses and legumes for hay or pasture is effective in controlling erosion. Because this soil is droughty, however, overgrazing easily reduces the vigor of the pasture plants and the extent of the plant cover and thus increases the susceptibility to wind erosion. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during long dry periods help to keep the pasture and the soil in good condition.

This soil is best suited to trees. Seedling mortality is a moderate limitation because of the droughtiness. Seedlings should be planted as early in the spring as possible, when an adequate amount of moisture is available. Some do not survive or grow well. Competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling.

Slope is a moderate limitation if this soil is used as a site for dwellings or local roads and streets. Land shaping is needed in some areas. Dwellings should be designed to conform to the natural slope of the land. Local roads and streets should be built on the contour. The soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity may result in the pollution of ground water supplies.

The capability subclass is IVs; woodland suitability subclass 3s.

Co—Cohoctah sandy loam. This nearly level, deep, very poorly drained soil is in depressions on bottom land. The depressions are along drainageways and lakeshores. The soil is frequently flooded. Areas are irregular in shape and range from 2 to 70 acres in size.

In a typical profile, the surface layer is black sandy loam about 11 inches thick. The subsoil is about 24 inches thick. The upper part is dark gray and grayish brown, mottled, very friable loamy sand, and the lower part is dark gray, mottled, friable sandy clay loam and sandy loam. The substratum to a depth of 60 inches is gray, dark gray, and grayish brown loamy sand. In a few areas the surface layer is mucky.

Included with this soil in mapping are a few small areas of the somewhat poorly drained Riverdale soils on the slightly higher rises and the sandier Granby Variant soils in positions on the landscape similar to those of the Cohoctah soil. These soils make up 8 to 12 percent of the unit.

Available water capacity is moderate in the Cohoctah soil. Permeability is moderately rapid. Runoff is very slow. The water table is at or near the surface for much of the year. Organic matter content is high. The surface layer is friable and can be easily tilled throughout a wide range in moisture content.

Most areas are used for cultivated crops. A few are used for hay or pasture. A few are wooded.

If adequately drained, this soil is well suited to corn, soybeans, and small grain. If drained and otherwise well managed, it is suited to intensive row cropping. Excess water can be removed by open ditches, subsurface drains, surface drains, or pumps or by a combination of these. A conservation tillage system that leaves crop residue on the surface improves tilth and increases the organic matter content.

This soil is suited to grasses and legumes for hay or pasture. A drainage system is needed. Overgrazing reduces the vigor and density of the plants. Proper stocking rates, rotation grazing, timely deferment of

grazing, and restricted use during wet periods help to prevent surface compaction and maintain good tilth and plant density.

This soil is suited to water tolerant trees. Plant competition, equipment limitations, seedling mortality, and the windthrow hazard are the main concerns of management. Seasonal wetness can delay planting and harvesting. Most seedlings survive and grow well once they are established if competing vegetation is controlled by spraying, cutting, or girdling.

This soil generally is unsuitable as a site for dwellings or septic tank absorption fields because the wetness and the flooding are severe limitations.

Wetness, flooding, and frost action are severe limitations on sites for local roads and streets. Building the roads and streets on raised, well compacted fill material, constructing adequate side ditches, and providing coarser grained subgrade or base material help to overcome these limitations.

The capability subclass is IIIw; woodland suitability subclass 2w.

CrA—Crosier loam, 0 to 3 percent slopes. This nearly level, deep, somewhat poorly drained soil is on moraines and till plains. Areas are irregular in shape and range from 2 to 200 acres in size.

In a typical profile, the surface layer is dark grayish brown loam about 8 inches thick. The subsoil is about 24 inches thick. The upper part is yellowish brown, mottled, firm clay loam, and the lower part is brown, mottled, firm clay loam and loam. The substratum to a depth of 60 inches is yellowish brown loam. In a few areas the surface layer is darker.

Included with this soil in mapping are a few small areas of the well drained Miami and Riddles soils on the higher rises and the very poorly drained Brookston soils in depressions. These soils make up 7 to 11 percent of the unit.

Available water capacity is high in the Crosier soil. Permeability is moderately slow. Runoff is slow. The water table is at a depth of 1 to 3 feet for much of the year. The surface layer generally is neutral because of local liming practices. It is friable and can be easily tilled throughout a wide range in moisture content.

Nearly all areas are used for cultivated crops. A few support grasses or legumes for hay or pasture. A few are wooded.

If adequately drained, this soil is well suited to corn, soybeans, and small grain. Wetness is the major limitation if crops are grown. A conservation cropping system that is dominated by row crops is suitable if subsurface drains are installed to control the wetness. Cover crops and a conservation tillage system that leaves crop residue on the surface increase the organic matter content and improve tilth.

If adequately drained, this soil is well suited to grasses and legumes for hay or pasture. Deep rooted legumes, such as alfalfa, are not so well suited as shallow rooted legumes. The major concerns of management are overgrazing and grazing when the soil is wet. Grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suited to trees. Plant competition is moderate. Seedlings survive and grow well only if competing vegetation is controlled. The competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling.

Wetness is a severe limitation if this soil is used as a site for dwellings. Installing an adequate drainage system that lowers the water table helps to overcome this limitation. Frost action and low strength are severe limitations on sites for local roads and streets. Drainage ditches help to lower the water table and thus help to prevent the damage caused by frost action. Providing coarser grained subgrade or base material helps to prevent the damage caused by low strength and frost action.

Wetness and the moderately slow permeability are severe limitations if this soil is used as a septic tank absorption field. Installing an adequate drainage system that lowers the water table helps to overcome the wetness. Enlarging the absorption field helps to overcome the slow absorption of liquid waste.

The capability subclass is IIw; woodland suitability subclass 3o.

Dr—Del Rey silt loam. This nearly level, deep, somewhat poorly drained soil is on lake plains. Areas range from 2 to 80 acres in size.

In a typical profile, the surface layer is brown silt loam about 8 inches thick. The subsoil is about 32 inches thick. The upper part is brown, mottled, very firm silty clay loam, and the lower part is grayish brown, mottled, very firm silty clay. The substratum to a depth of 60 inches is grayish brown silty clay loam. In places the soil is calcareous at a depth of about 17 inches.

Included with this soil in mapping are a few small areas of Whitaker soils on outwash plains and small areas of the very poorly drained Milford soils in depressions. The subsoil of Whitaker soils is less clayey than that of the Del Rey soil. Included soils make up 8 to 10 percent of the unit.

Available water capacity is high in the Del Rey soil. Permeability is slow. Runoff also is slow. The water table is at a depth of 1 to 3 feet much of the year. Organic matter content is moderate. The surface layer generally is neutral. It is friable, but it can be easily tilled only within a narrow range in moisture content.

Nearly all areas are used for cultivated crops. A few support grasses or legumes for hay or pasture. A few are wooded.

If adequately drained, this soil is suited to corn, soybeans, and small grain. Wetness is the major

limitation if crops are grown. A conservation cropping system that is dominated by row crops is suitable if subsurface drains are installed to control the wetness. Leaving a protective amount of crop residue on the surface helps to control erosion and improves soil structure and tilth.

If adequately drained, this soil is well suited to grasses and legumes for hay or pasture. Deep rooted legumes, such as alfalfa, are not so well suited as shallow rooted legumes. The major concerns of management are overgrazing and grazing when the soil is wet. Grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suited to water tolerant trees. Seedling mortality and the windthrow hazard are the main concerns of management. Some seedlings do not survive or grow well. Competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling.

Wetness is a severe limitation if this soil is used as a site for dwellings. Installing an adequate drainage system that lowers the water table helps to overcome the wetness. Frost action and low strength are severe limitations on sites for local roads and streets. Drainage ditches remove excess water and thus help to prevent the damage caused by frost action. Providing coarser grained subgrade or base material helps to prevent the damage caused by low strength and frost action.

Wetness and the slow permeability are severe limitations if this soil is used as a septic tank absorption field. Enlarging the field helps to overcome the slow absorption of liquid waste, and installing an adequate drainage system helps to overcome the wetness. A better suited soil generally should be selected, however, or a public sewer system should be used if one is available.

The capability subclass is IIw; woodland suitability subclass 3c.

Ed—Edwards muck, drained. This nearly level, deep, very poorly drained soil is in depressions and former drainageways or along streams and lakeshores. It is frequently ponded by runoff from higher lying adjacent soils. Areas generally are oval or crescent shaped. They range from 2 to 160 acres in size.

In a typical profile, the surface layer is black muck about 10 inches thick. The next 22 inches is black muck in which some of the plant material has not decomposed. The substratum to a depth of 60 inches is light gray marl. In a few small areas it is sand or loam till. In places, the organic layer is more than 50 inches thick or the underlying marl is closer to the surface.

Included with this soil in mapping are a few small areas of mineral soils. These soils make up 4 to 8 percent of the unit.

Available water capacity is very high in the Edwards soil. Permeability is moderately slow to moderately rapid in the organic layers and is slow in the underlying marl. Runoff is very slow. The water table is near or above the surface for much of the year. Organic matter content is very high. The surface layer is neutral to moderately alkaline. It is friable and can be easily tilled throughout a wide range in moisture content.

Some areas are used for row crops. Some are used for pasture. Some are idle and support grass or a scrubby stand of timber.

This soil is subject to frost, which can severely damage many cultivated crops early and late in the growing season. It is best suited to special crops, such as mint or vegetables that are not easily damaged by frost. Crops for silage can be successfully grown. Wetness is the major limitation if crops are grown. An adequate drainage system is needed. Planting nurse crops, such as rye or wheat, beside the rows helps to control wind erosion.

If adequately drained, this soil is suited to grasses and legumes. Deep rooted legumes, such as alfalfa, are not so well suited as shallow rooted legumes. Wetness is the major concern in managing pasture. If the pasture is grazed during wet periods, stools of grass and soil form. These stools hinder the movement of livestock and the use of farm machinery. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is poorly suited to commercial tree production. It cannot support tall trees. Equipment limitations, seedling mortality, and the windthrow hazard are management concerns. Equipment can be used only during very dry periods or during periods when the ground is frozen. Many seedlings do not survive or grow well. Many trees are blown down.

This soil generally is unsuitable as a site for dwellings and septic tank absorption fields because of the ponding. Also, the low strength of the organic material is a limitation on sites for dwellings. Low strength, ponding, and frost action are severe limitations on sites for local roads and streets. Building the roads and streets on raised, well compacted fill material helps to prevent the damage caused by ponding and frost action. Providing coarser grained subgrade or base material helps to prevent the damage caused by low strength and frost action.

The capability subclass is IVw; woodland suitability subclass 4w.

GnB—Glynwood silt loam, 2 to 6 percent slopes. This gently sloping, deep, moderately well drained soil is on ridges and knolls on till plains. Areas are irregular in shape and range from 2 to 400 acres in size.

In a typical profile, the surface layer is brown silt loam about 6 inches thick. The subsoil is about 27 inches thick. The upper part is yellowish brown, firm clay loam;

the next part is yellowish brown, very firm clay; and the lower part is yellowish brown, firm clay loam. The substratum to a depth of 60 inches is brown clay loam. In places the subsoil contains less clay.

Included with this soil in mapping are a few small areas of the somewhat poorly drained Blount soils on the lower lying parts of the landscape, severely eroded areas of steeper soils, and small areas of marsh in deep depressions. Also included are areas where stones and boulders are on the surface. Included areas make up 9 to 12 percent of the unit.

Available water capacity is high in the Glynwood soil. Permeability is slow. Runoff is medium. The water table is at a depth of 2.0 to 3.5 feet for much of the year. The surface layer is friable and can be easily tilled unless it is too wet. If tilled when too wet, the soil becomes massive and cloddy. The shrink-swell potential is moderate.

Most areas are used for cultivated crops. Some are used for hay or pasture. A few are wooded.

This soil is suited to corn, soybeans, and small grain. Measures that control erosion and runoff are needed if cultivated crops are grown. Examples are cover crops, crop rotation, terraces, diversions, contour farming, grassed waterways, grade stabilization structures, and a conservation tillage system that leaves crop residue on the surface. Planting cover crops and leaving crop residue on the surface also improve tilth and increase the organic matter content. In the seepy parts of some drainageways and swales, subsurface drains are needed.

Growing grasses and legumes for hay or pasture is effective in controlling erosion (fig. 4). Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition and seedling mortality are moderate. Seedlings survive and grow well only if competing vegetation is controlled. The competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling. Some seedlings do not survive or grow well.

The shrink-swell potential and the wetness are moderate limitations if this soil is used as a site for dwellings without basements. The wetness is a severe limitation on sites for dwellings with basements. Reinforcing foundations, footings, and basement walls and backfilling with sandy material help to prevent the structural damage caused by shrinking and swelling. Providing foundation drain tile reduces the wetness. Frost action and low strength are severe limitations on sites for local roads and streets. Providing coarser grained subgrade or base material helps to overcome these limitations.

This soil is poorly suited to septic tank absorption fields because the wetness and the slow permeability are severe limitations. Installing an adequate drainage system that lowers the water table helps to overcome the wetness, and enlarging the field helps to overcome the slow absorption of liquid waste. Overcoming these limitations, however, generally is not feasible. A better suited soil should be selected, or a public sewer system should be used if one is available.

Figure 4.—Pasture on Glynwood silt loam, 2 to 6 percent slopes.

The capability subclass is IIe; woodland suitability subclass 2c.

Gs—Granby Variant loamy sand. This nearly level, deep, very poorly drained soil is on bottom land. It is frequently flooded. Also, it receives runoff from higher lying adjacent soils. Areas generally are elongated. They range from 2 to 160 acres in size.

In a typical profile, the surface layer is very dark grayish brown loamy sand about 12 inches thick. The subsoil is about 18 inches thick. The upper part is grayish brown, mottled, very friable loamy sand, and the lower part is light brownish gray, mottled, loose sand. The substratum to a depth of 60 inches is light gray sand. In some places very coarse sand is throughout the profile. In other places the surface layer is thicker and darker. In some areas the soil is more acid. In a few areas the subsoil contains more clay.

Included with this soil in mapping are a few small areas of the somewhat poorly drained Morocco soils on the slightly higher parts of the landscape. These soils make up 4 to 8 percent of the unit.

Available water capacity is low in the Granby Variant soil. Permeability is rapid. Organic matter content is high. Runoff is very slow. The water table is at or near the surface for much of the year. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content.

Most areas are used for cultivated crops. A few are used for hay and pasture. A few are wooded.

If adequately drained, this soil is suited to corn, soybeans, and small grain. If drained and otherwise well managed, it is suited to intensive row cropping. Excess water can be removed by open ditches, subsurface drains, surface drains, or pumps or by a combination of these. The drainage system should be carefully controlled because the soil tends to become droughty if it is drained. Leaving a protective amount of crop residue on the surface helps to control erosion, improves tilth, and increases the organic matter content.

This soil is suited to grasses and legumes for hay or pasture. A drainage system is needed. Overgrazing reduces the vigor and density of the plants. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to prevent surface compaction and maintain good tilth and plant density.

This soil is poorly suited to trees. Equipment limitations, seedling mortality, and the windthrow hazard are management concerns. Seasonal wetness can delay planting and harvesting. Some seedlings do not survive or grow well.

This soil generally is unsuitable as a site for dwellings because the wetness and the flooding are severe limitations. Overcoming these limitations generally is not feasible, and a better suited soil should be selected. The wetness and the flooding are severe limitations on sites for local roads and streets. Providing drainage ditches that lower the water table and building the roads and streets on raised, well compacted fill material help to overcome the wetness.

This soil generally is unsuitable as a septic tank absorption field. The wetness and the flooding are severe limitations. Also, the soil readily absorbs but does not adequately filter the effluent in these fields. The poor filtering capacity may result in the pollution of ground water supplies.

The capability subclass is IIIw; woodland suitability subclass 4w.

HaA—Haskins loam, 0 to 3 percent slopes. This nearly level, deep, somewhat poorly drained soil is on till plains and former lakebeds. Areas are irregular in shape and range from 2 to 70 acres in size.

In a typical profile, the surface layer is dark grayish brown loam about 9 inches thick. The subsoil is about 41 inches thick. The upper part is grayish brown and yellowish brown, mottled, friable sandy loam; the next part is light brownish gray, mottled, firm clay loam; and the lower part is gray, mottled, firm clay loam and silty clay loam. The substratum to a depth of 60 inches is dark gray silty clay loam. In some areas, the surface layer contains more sand or the subsoil contains more clay.

Included with this soil in mapping are a few small areas of the very poorly drained Pewamo soils in depressions and the moderately well drained Rawson soils on the higher parts of the landscape. These soils make up 8 to 11 percent of the unit.

Available water capacity is high in the Haskins soil. Permeability is moderate in the upper part and slow in the substratum. Runoff is slow. The water table is at a depth of 1.0 to 2.5 feet for much of the year. Organic matter content is moderate. The surface layer is friable and can be easily tilled throughout a wide range in moisture content.

Nearly all areas are used for cultivated crops. A few support grasses or legumes for hay or pasture. A few are wooded.

If adequately drained, this soil is suited to corn, soybeans, and small grain. Wetness is the major limitation if crops are grown. A conservation cropping system that is dominated by row crops is suitable if subsurface drains are installed to control the wetness. Leaving a protective amount of crop residue on the surface helps to control erosion and improves soil structure and tilth.

If adequately drained, this soil is well suited to grasses and legumes for hay or pasture. Deep rooted legumes, such as alfalfa, are not so well suited as shallow rooted legumes. The major concerns of management are overgrazing and grazing when the soil is wet. Grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well only if competing vegetation is controlled by spraying, cutting, or girdling.

Wetness is a severe limitation if this soil is used as a site for dwellings. Installing an adequate drainage system that lowers the water table helps to overcome this limitation. Frost action is a severe limitation on sites for local roads and streets. Drainage ditches remove excess water and thus help to prevent the damage caused by frost action.

This soil is poorly suited to septic tank absorption fields because the wetness and the slow permeability are severe limitations. Installing an adequate drainage system that lowers the water table helps to overcome the wetness, and enlarging the absorption field helps to overcome the slow absorption of liquid waste. Overcoming these limitations, however, generally is not feasible. A better suited soil should be selected, or a public sewer system should be used if one is available.

The capability subclass is IIw; woodland suitability subclass 2o.

Hn—Histosols, ponded. These soils occur as areas of partly decomposed organic material in depressions in the uplands. The areas generally are long and narrow or oval. They generally are about 30 acres in size but range from 2 to 300 acres.

Typically, the surface layer is black muck and the next layer is dark reddish brown muck. The lower layer generally is dark reddish brown muck, but in some areas it is loamy or sandy mineral soil material.

Available water capacity is very high in the Histosols. Permeability is moderately slow to moderately rapid. Water is ponded on these soils for most of the year. Organic matter content is very high.

Most areas are used as wildlife habitat (fig. 5). They support water tolerant shrubs, reeds, and grasses.

Figure 5.—Wetland wildlife habitat in an area of Histosols, ponded.

These soils are not suitable for crops because they are ponded. They are so low on the landscape that suitable outlets generally are not available. Pumping the ponded water onto the higher lying soils that are underlain by gravelly coarse sand is not effective because the pumped water returns.

These soils are too wet to support domestic grasses and legumes or trees. A few areas are used for pasture. They are adjacent to better drained pastured areas.

These soils generally are unsuitable as sites for dwellings because the ponding and low strength are severe limitations. A better suited soil should be selected. Low strength, wetness, and ponding are severe limitations on sites for local roads and streets. Building the roads and streets on raised, well compacted fill material and providing coarser grained subgrade or base material help to overcome these limitations. These soils generally are unsuitable as septic tank absorption fields because the ponding is a severe hazard.

The capability subclass is VIIIw; no woodland suitability subclass is assigned.

Ht—Houghton muck, undrained. This nearly level, deep, very poorly drained soil is in depressions and former drainageways or along streams and lakeshores. It is frequently ponded by runoff from higher lying adjacent soils. Areas generally are long and narrow or oval. They generally are about 20 acres in size but range from 2 to 250 acres.

In a typical profile, the surface layer is black muck about 12 inches thick. The next 20 inches is dark reddish brown muck in which some of the plant material has not decomposed. The lower layer to a depth of 60 inches is dark reddish brown muck. In places sand, marl, or loamy mineral material is at a depth of 30 to 50 inches.

Included with this soil in mapping are a few small areas of mineral soils. These soils make up 4 to 6 percent of the unit.

Available water capacity is very high in the Houghton soil. Permeability is moderately slow to moderately rapid. Runoff is very slow. The water table is near or above the surface for most of the year. Organic matter content is very high.

Most areas are idle and support water tolerant reeds and grasses. Some are used as pasture.

This soil is not suitable for crops because it generally cannot be drained. It is so low on the landscape that suitable drainage outlets generally are not available. Pumping the ponded water onto the higher lying adjacent soils that are underlain by gravelly coarse sand is not effective because the pumped water returns.

This soil generally is too wet to support domestic grasses and legumes. Native species are of little value for grazing.

This soil is not suited to trees. Because the muck provides little support for the roots, trees are easily blown over.

This soil generally is unsuitable as a site for buildings, local roads and streets, or septic tank absorption fields. The ponding is the main limitation. Also, low strength is a limitation on sites for dwellings and local roads and streets, frost action is a limitation on sites for local roads and streets, and the moderately slow permeability is a limitation in septic tank absorption fields. Overcoming these severe limitations is so difficult that a better suited soil should be selected.

The capability subclass is Vw; woodland suitability subclass 4w.

Hw—Houghton muck, drained. This nearly level, deep, very poorly drained soil is in depressions and former drainageways or along streams and lakeshores. It is frequently ponded by runoff from higher lying adjacent soils. Areas generally are long and narrow or oval. They generally are about 20 acres in size but range from 2 to 300 acres.

In a typical profile, the surface layer is black muck about 16 inches thick. The next layer is black muck about 34 inches thick. The lower layer to a depth of 60 inches is also black muck. In places sand, marl, or loamy material is at a depth of 30 to 50 inches.

Included with this soil in mapping are a few small areas of mineral soils. These soils make up 4 to 6 percent of the unit.

Available water capacity is very high in the Houghton soil. Permeability is moderately slow to moderately rapid. Runoff is very slow. The water table is near or above the surface most of the year. Organic matter content is very high. The surface layer is friable and can be easily tilled throughout a wide range in moisture content.

Most areas are used for row crops or mint. Some are used for pasture. A few are idle.

This soil is subject to frost, which can severely damage many crops early and late in the growing season. It is best suited to special crops, such as mint or vegetables that are not easily damaged by frost (fig 6). Crops for silage can be successfully grown. Wetness is the major limitation if crops are grown. An adequate drainage system is needed. If drained, however, the soil is subject to severe wind erosion. Planting nurse crops, such as rye or wheat, beside the rows helps to control wind erosion.

If adequately drained, this soil is suited to grasses and legumes. Deep rooted legumes, such as alfalfa, are not so well suited as shallow rooted legumes. Wetness is the major concern in managing pasture. If the pasture is grazed during wet periods, stools of grass and soil form. These stools hinder the movement of livestock and the use of farm machinery. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use

Figure 6.—Potatoes harvested in an area of Houghton muck, drained.

during wet periods help to keep the pasture and the soil in good condition.

This soil is poorly suited to commercial tree production. It cannot support tall trees. Equipment limitations, seedling mortality, and the windthrow hazard are management concerns. Equipment can be used only during very dry periods or during periods when the ground is frozen. Many seedlings do not survive or grow well. Many trees are blown down.

This soil generally is unsuitable as a site for dwellings and septic tank absorption fields because of the ponding. Also, the low strength of the organic material is a limitation on sites for dwellings. Low strength, ponding, and frost action are severe limitations on sites for local roads and streets. Building the roads and streets on raised, well compacted fill material helps to prevent the damage caused by ponding and frost action. Providing coarser grained subgrade or base material helps to prevent the damage caused by low strength and frost action.

The capability subclass is IVw; woodland suitability subclass 4w.

KoA—Kosciusko sandy loam, 0 to 2 percent slopes. This nearly level, well drained soil is on outwash plains and moraines. It is moderately deep over very gravelly coarse sand. Areas are irregular in shape and range from 5 to 400 acres in size.

In a typical profile, the surface layer is dark brown sandy loam about 8 inches thick. The subsoil is about 26 inches thick. The upper part is strong brown, firm and friable gravelly sandy clay loam and gravelly sandy loam, and the lower part is yellowish red, very friable gravelly loamy sand. The substratum to a depth of 60 inches is light yellowish brown very gravelly coarse sand. Some small eroded areas are on the steeper slopes. In some small areas, the subsoil contains less clay or the very gravelly coarse sand is closer to the surface.

Included with this soil in mapping are a few small areas of the well drained Miami soils. These soils are in the slightly higher positions at the edge of the mapped areas. Also included are areas where stones are on the surface. Included areas make up 4 to 6 percent of the unit.

Available water capacity is low in the Kosciusko soil. Permeability is moderate in the subsoil and very rapid in the substratum. Runoff is slow. Organic matter content is low. The surface layer is friable and can be easily tilled throughout a fairly wide range in moisture content. The shrink-swell potential is moderate.

Most areas are used for cultivated crops. Some are used for hay or pasture. A few are wooded.

This soil is suited to cultivated crops, but it is somewhat droughty during extended dry periods in the growing season. Measures that conserve moisture and control erosion and runoff are needed if cultivated crops are grown. Examples are cover crops, crop rotation, terraces, and a conservation tillage system that leaves a protective amount of crop residue on the surface. Planting cover crops and leaving crop residue on the surface also improve tilth and increase the organic matter content.

This soil is suited to pasture, deep rooted legumes for hay, and small grain. A cover of pasture plants or hay helps to control water and wind erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well only if competing vegetation is controlled. The competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling.

This soil is suitable as a site for dwellings with basements. The shrink-swell potential is a moderate limitation on sites for dwellings without basements. Reinforcing foundations helps to prevent the structural damage caused by the shrinking and swelling. Frost action and the shrink-swell potential are moderate limitations on sites for local roads and streets. Providing coarse grained subgrade or base material helps to overcome these limitations. The soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity may result in the pollution of ground water supplies.

The capability subclass is IIIs; woodland suitability subclass 2o.

KoB—Kosciusko sandy loam, 2 to 6 percent slopes. This gently sloping, well drained soil is on outwash plains and moraines. It is moderately deep over very gravelly coarse sand. Areas are irregular in shape. They generally are about 15 acres in size but range from 2 to 500 acres.

In a typical profile, the surface layer is dark brown sandy loam about 8 inches thick. The subsoil is about 24 inches thick. The upper part is brown, firm sandy clay loam; the next part is strong brown, firm gravelly sandy clay loam; and the lower part is strong brown, very friable gravelly sandy loam. The substratum to a depth of 60 inches is light yellowish brown, loose very gravelly coarse sand. In places, the subsoil contains less clay or the very gravelly coarse sand is closer to the surface. Some small eroded areas are on the steeper slopes.

Included with this soil in mapping are a few small areas of the well drained Miami soils. These soils are in the slightly higher positions near the edge of the mapped areas. Also included are areas where stones are on the surface. Included areas make up 4 to 6 percent of the unit.

Available water capacity is low in the Kosciusko soil. Permeability is moderate in the subsoil and very rapid in the substratum. Runoff is medium. Organic matter content is low. The surface layer is friable and can be easily tilled throughout a fairly wide range in moisture content. The shrink-swell potential is moderate.

Most areas are used for cultivated crops. Some are used for hay or pasture. A few are wooded.

This soil is suited to cultivated crops, but it is subject to erosion and is somewhat droughty during extended dry periods in the growing season. Measures that control erosion and runoff and conserve moisture are needed if cultivated crops are grown. Examples are cover crops, crop rotation, terraces, diversions, contour farming, grassed waterways, grade stabilization structures, and a conservation tillage system that leaves a protective amount of crop residue on the surface. Planting cover crops and leaving crop residue on the surface also improve tilth and increase the organic matter content.

This soil is suited to pasture, deep rooted legumes for hay, and small grain. A cover of pasture plants or hay helps to control erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well only if competing vegetation is controlled. The competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling.

This soil is suitable as a site for dwellings with basements. The shrink-swell potential is a moderate limitation on sites for dwellings without basements. Reinforcing foundations helps to prevent the structural damage caused by the shrinking and swelling. Frost action and the shrink-swell potential are moderate limitations on sites for local roads and streets. Providing coarse grained subgrade or base material helps to overcome these limitations. The soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity may result in the pollution of ground water supplies.

The capability subclass is IIIe; woodland suitability subclass 2o.

KsC—Kosciusko gravelly sandy loam, 6 to 12 percent slopes. This moderately sloping, well drained

soil is on outwash plains and moraines. It is moderately deep over very gravelly coarse sand. Areas are irregular in shape and range from 2 to 200 acres in size.

In a typical profile, the surface layer is dark brown gravelly sandy loam about 8 inches thick. The subsoil is about 22 inches thick. The upper part is brown, firm gravelly sandy clay loam, and the lower part is strong brown, friable gravelly sandy loam. The substratum to a depth of 60 inches is light yellowish brown, loose very gravelly coarse sand. In places, the very gravelly coarse sand is closer to the surface or the subsoil contains less clay. Some small eroded areas are on the steeper slopes.

Included with this soil in mapping are a few small areas of the well drained Miami soils. These soils are near the edge of some of the mapped areas. Also included are areas where stones are on the surface. Included areas make up 3 to 5 percent of the unit.

Available water capacity is low in the Kosciusko soil. Permeability is moderate in the subsoil and very rapid in the substratrum. Runoff is medium. Organic matter content is low. The surface layer is friable and can be easily tilled throughout a fairly wide range in moisture content. The shrink-swell potential is moderate.

Most areas are used for cultivated crops. Some are used for hay or pasture. A few are wooded.

This soil is suited to cultivated crops grown in rotation with grasses and legumes. It tends to be somewhat droughty, however, if rainfall is poorly distributed during the growing season. Measures that control erosion and runoff and conserve moisture are needed if cultivated crops are grown. Examples are cover crops, crop rotation, terraces, diversions, contour farming, and a conservation tillage system that leaves a protective amount of crop residue on the surface. Planting cover crops and leaving crop residue on the surface also improve tilth and increase the organic matter content.

This soil is best suited to pasture, deep rooted legumes for hay, and small grain because the available water capacity is low. A cover of pasture plants or hay helps to control erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well only if competing vegetation is controlled. The competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling.

The shrink-swell potential and the slope are moderate limitations if this soil is used as a site for dwellings without basements. The slope is a moderate limitation on sites for dwellings with basements. Dwellings should be designed to conform to the natural slope of the land. Land shaping is needed in some areas. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. Slope, frost action, and the shrink-swell potential are moderate limitations on sites for local roads and streets. Building the roads and streets on the contour helps to overcome the slope. Providing coarse grained subgrade or base material helps to prevent the damage caused by shrinking and swelling and by frost action. The soil readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity may result in the pollution of ground water supplies.

The capability subclass is IIIe; woodland suitability subclass 2o.

MbA—Martinsville loam, 0 to 2 percent slopes. This nearly level, deep, well drained soil is on outwash plains. Areas are irregular in shape and range from 3 to 80 acres in size.

In a typical profile, the surface layer is dark grayish brown loam about 10 inches thick. The subsurface layer is brown sandy loam about 5 inches thick. The subsoil is about 36 inches thick. The upper part is yellowish brown, firm clay loam; the next part is dark yellowish brown and brown, firm clay loam and silty clay loam; and the lower part is dark yellowish brown, friable sandy clay loam and sandy loam. The substratum to a depth of 60 inches is yellowish brown and very pale brown, friable stratified silt loam, fine sand, and silt. In some areas, the surface layer contains more sand or the slope is more than 2 percent. In other areas loam till is in the substratum.

Included with this soil in mapping are a few small areas of the Riddles soils on the slightly higher parts of the landscape and the somewhat poorly drained Whitaker soils on the lower lying flats and in slight depressions. Included soils make up 7 to 12 percent of the unit.

Available water capacity is high in the Martinsville soil. Permeabilty is moderate. Runoff is slow. Organic matter content is moderate. The surface layer is friable and can be easily tilled throughout a fairly wide range in moisture content. The shrink-swell potential is moderate.

Most areas are used for cultivated crops. Some are used for hay or pasture. A few are wooded.

This soil is suited to corn, soybeans, and small grain. Measures that control erosion and runoff are needed if cultivated crops are grown. Examples are cover crops, crop rotation, terraces, diversions, grassed waterways, and a conservation tillage system that leaves a protective amount of crop residue on the surface. Planting cover crops and leaving crop residue on the surface also improve tilth and increase the organic matter content.

Growing grasses and legumes for hay or pasture is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suited to trees. Plant competition is moderate. Seedlings survive and grow well only if competing vegetation is controlled. The competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling.

The shrink-swell potential is a moderate limitation if this soil is used as a site for dwellings. Reinforcing foundations and footings and backfilling with sandy material help to prevent the structural damage caused by shrinking and swelling. Low strength and frost action are moderate limitations on sites for local roads and streets. Providing coarser grained subgrade or base material helps to prevent the damage caused by low strength and frost action. Drainage ditches remove excess water and thus help to prevent the damage caused by frost action. This soil is suitable as a septic tank absorption field.

The capability class is I; woodland suitability subclass 1o.

MbB—Martinsville loam, 2 to 6 percent slopes. This gently sloping, deep, well drained soil is on outwash plains. Areas are irregular in shape and range from 2 to 100 acres in size.

In a typical profile, the surface layer is dark grayish brown loam about 9 inches thick. The subsurface layer is dark yellowish brown loam about 5 inches thick. The subsoil is firm clay loam about 24 inches thick. The upper part is dark yellowish brown, and the lower part is strong brown. The substratum to a depth of 60 inches is yellowish brown sandy loam that has thin strata of fine sand and silt. In some areas the surface layer is more sandy. In other areas the slope is more than 6 percent.

Included with this soil in mapping are a few small areas of the Riddles and Miami soils on the slightly higher rises and the somewhat poorly drained Whitaker soils on the lower parts of the landscape. These soils make up 7 to 12 percent of the unit.

Available water capacity is high in the Martinsville soil. Permeability is moderate. Runoff is medium. Organic matter content is moderate. The surface layer is friable and can be easily tilled throughout a fairly wide range in moisture content. The shrink-swell potential is moderate.

Most areas are used for cultivated crops. Some are used for hay or pasture. A few are wooded.

This soil is suited to corn, soybeans, and small grain. Measures that control erosion and runoff are needed if cultivated crops are grown. Examples are cover crops, crop rotation, terraces, diversions, contour farming, grassed waterways, grade stabilization structures, and a conservation tillage system that leaves a protective amount of crop residue on the surface. Planting cover crops and leaving crop residue on the surface also improve tilth and increase the organic matter content.

Growing grasses and legumes for hay or pasture is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suited to trees. Plant competition is moderate. Seedlings survive and grow well only if competing vegetation is controlled. The competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling.

The shrink-swell potential is a moderate limitation if this soil is used as a site for dwellings. Reinforcing foundations and footings and backfilling with sandy material help to prevent the structural damage caused by shrinking and swelling. Low strength and frost action are moderate limitations on sites for local roads and streets. Providing coarser grained subgrade or base material helps to prevent the damage caused by low strength and frost action. Drainage ditches remove excess water and thus help to prevent the damage caused by frost action. This soil is suitable as a septic tank absorption field.

The capability subclass is IIe; woodland suitability subclass 1o.

MbC—Martinsville loam, 6 to 12 percent slopes. This moderately sloping, deep, well drained soil is on outwash plains. Areas are irregular in shape and range from 3 to 50 acres in size.

In a typical profile, the surface layer is dark brown loam about 8 inches thick. The subsurface layer is brown sandy loam about 3 inches thick. The subsoil is about 24 inches thick. The upper part is dark brown, firm clay loam, and the lower part is dark yellowish brown, friable loam. The substratum to a depth of 60 inches is yellowish brown, friable stratified fine sand and silt. In some areas the surface layer contains more sand.

Included with this soil in mapping are a few small areas of the Riddles and Miami soils on the higher lying parts of the landscape. These soils make up 7 to 12 percent of the unit.

Available water capacity is high in the Martinsville soil. Permeability is moderate. Runoff is medium. Organic matter content is moderate. The surface layer is friable and can be easily tilled throughout a fairly wide range in moisture content. The shrink-swell potential is moderate.

Most areas are used for cultivated crops. Some are used for hay or pasture. A few are wooded.

This soil is suited to corn, soybeans, and small grain grown in rotation with grasses and legumes. Measures that control erosion and runoff are needed if cultivated crops are grown. Examples are cover crops, crop rotation, terraces, diversions, contour farming, grassed waterways, grade stabilization structures, and a conservation tillage system that leaves a protective amount of crop residue on the surface. Planting cover crops and leaving crop residue on the surface also improve tilth and increase the organic matter content.

Growing grasses and legumes for hay or pasture is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates,

pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suited to trees. Plant competition is moderate. Seedlings survive and grow well only if competing vegetation is controlled. The competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling.

The slope and the shrink-swell potential are moderate limitations if this soil is used as a site for dwellings. Reinforcing foundations and footings and backfilling with sandy material help to prevent the structural damage caused by shrinking and swelling. Dwellings should be designed to conform to the natural slope of the land. Land shaping is needed in some areas. In order to establish a protective plant cover that controls erosion, topsoil should be stockpiled during construction and used for topdressing after construction. Establishing the plant cover as soon as possible after construction helps to keep soil loss at a minimum.

Low strength, slope, and frost action are moderate limitations if this soil is used as a site for local roads and streets. Building the roads and streets on the contour helps to overcome the slope. Providing coarser grained subgrade or base material helps to prevent the damage caused by low strength and frost action. Drainage ditches remove excess water and thus help to prevent the damage caused by frost action.

Slope is a moderate limitation if this soil is used as a septic tank absorption field. Land shaping and installing the distribution lines across the slope help to overcome this limitation.

The capability subclass is IIIe; woodland suitability subclass 1o.

Mc—Martisco muck, undrained. This nearly level, very poorly drained soil is in depressions or along streams and lakeshores. It is shallow over marl. It is frequently ponded by runoff from higher lying adjacent soils. Areas generally are oval or crescent shaped. They generally are about 15 acres in size but range from 3 to 100 acres.

In a typical profile, the surface layer is black muck about 12 inches thick. The next 2 inches is black muck that contains flecks of marl. The underlying material to a depth of 60 inches is light gray marl. In some areas shells and other remnants of marine life are in the profile. In other areas the surface layer has limy deposits and shells. In a few small areas seams of fine sand are in the marl. In places, the organic material is more than 20 inches thick or the underlying material is sandy or loamy.

Included with this soil in mapping are a few small areas of mineral soils. These soils make up 4 to 6 percent of the unit.

Available water capacity is very high in the Martisco soil. Permeability is moderately slow to moderately rapid in the organic layers and slow in the underlying marl. Runoff is very slow. The water table is near or above the surface for much of the year. Organic matter content is very high. The surface layer is friable and can be easily tilled throughout a wide range in moisture content.

Some areas are used for pasture. Some are idle and support grass or a scrubby stand of timber. Very few are used for row crops.

This soil is subject to frost, which can severely damage many cultivated crops early and late in the growing season. It is best suited to special crops, such as mint or vegetables, that are not easily damaged by frost. Crops for silage can be successfully grown. Wetness is the major limitation if crops are grown. An adequate drainage system is needed. If drained, however, the soil is subject to severe wind erosion. Planting nurse crops, such as rye or wheat, beside the rows helps to control wind erosion.

If adequately drained, this soil is suited to grasses and legumes. Deep rooted legumes, such as alfalfa, are not so well suited as shallow rooted legumes. Wetness is the major concern in managing pasture. If the pasture is grazed during wet periods, stools of grass and soil form. These stools hinder the movement of livestock and the use of farm machinery. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is poorly suited to commercial tree production. It cannot support tall trees. Equipment limitations, seedling mortality, and the windthrow hazard are management concerns. Equipment can be used only during very dry periods or during periods when the ground is frozen. Many seedlings do not survive or grow well. Many trees are blown down.

This soil generally is unsuitable as a site for dwellings and septic tank absorption fields because of the ponding. Also, the low strength of the organic material is a severe limitation on sites for dwellings and the moderately slow permeability a severe limitation in septic tank absorption fields.

Low strength, ponding, and frost action are severe limitations on sites for local roads and streets. Building the roads and streets on raised, well compacted fill material helps to prevent the damage caused by ponding and frost action. Providing coarser grained subgrade or base material helps to prevent the damage caused by low strength and frost action.

The capability subclass is IVw; woodland suitability subclass 4w.

MfB—Metea loamy sand, 1 to 6 percent slopes. This gently sloping, deep, well drained soil is on knolls and low ridges on till plains. Areas are irregular in shape and range from 2 to 50 acres in size.

In a typical profile, the surface layer is brown loamy sand about 10 inches thick. The subsoil is about 50 inches thick. The upper part is yellowish brown, very friable loamy sand; the next part is yellowish brown, firm

sandy clay loam; and the lower part is yellowish brown, firm and friable clay loam. The substratum to a depth of 65 inches is brown loam. In places the surface layer and the upper part of the subsoil contain less sand. In a few small areas the surface layer is very dark gray.

Included with this soil in mapping are a few small areas of the excessively drained Plainfield soils. These soils make up 7 to 11 percent of the unit.

Available water capacity is moderate in the Metea soil. Permeability is very rapid in the surface layer and in the upper part of the subsoil and moderate in the lower part and in the substratum. Runoff is slow. Organic matter content is low. The surface layer is very friable and can be easily tilled throughout a fairly wide range in moisture content.

Most areas are used for cultivated crops. Some are used for hay or pasture. A few are wooded.

This soil is suited to corn, soybeans, and small grain. Measures that control erosion and increase the organic matter content are needed. Examples are cover crops, crop rotation, and a conservation tillage system that leaves crop residue on the surface.

Growing grasses and legumes for hay or pasture is effective in controlling erosion. Overgrazing, however, easily reduces the vigor of the pasture plants and the extent of the plant cover and thus increases the susceptibility to wind erosion. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during long dry periods help to keep the pasture and the soil in good condition.

This soil is suited to trees. Seedling mortality is the main concern of management. Seedlings should be planted as early in the spring as possible. Some seedlings do not survive or grow well. Competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling.

This soil is suitable as a site for dwellings. Frost action is a moderate limitation on sites for local roads and streets. Drainage ditches help to keep water from seeping under the road surface and thus help to prevent the damage caused by frost action. The moderate permeability is a moderate limitation if the soil is used as a septic tank absorption field. Enlarging the field helps to overcome the slow absorption of liquid waste.

The capability subclass is IIIe; woodland suitability subclass 2s.

MfC—Metea loamy sand, 6 to 12 percent slopes. This moderately sloping, deep, well drained soil is on knolls and low ridges on till plains. Areas are irregular in shape and range from 3 to 35 acres in size.

In a typical profile, the surface layer is dark grayish brown loamy sand about 9 inches thick. The subsoil is about 39 inches thick. The upper part is yellowish brown, very friable loamy sand; the next part is yellowish brown, firm sandy clay loam; and the lower part is yellowish brown, firm clay loam. The substratum to a depth of 60 inches is brown loam. In places the surface layer and the upper part of the subsoil contain less sand. In a few small areas the surface layer is very dark gray.

Included with this soil in mapping are a few small areas of the excessively drained Plainfield soils. Also included are a few areas where the slope is more than 12 percent. Included areas make up 7 to 11 percent of the unit.

Available water capacity is moderate in the Metea soil. Permeability is very rapid in the surface layer and the upper part of the subsoil and moderate in the lower part and the substratum. Runoff is medium. Organic matter content is low. The surface layer is very friable and can be easily tilled throughout a fairly wide range in moisture content.

Most areas are used for cultivated crops. Some are used for hay or pasture. A few are wooded.

This soil is suited to corn, soybeans, and small grain grown in rotation with grasses and legumes. Measures that control erosion and increase the organic matter content are needed if cultivated crops are grown. Examples are cover crops, crop rotation, and a conservation tillage system that leaves crop residue on the surface.

Growing grasses and legumes for hay or pasture is effective in controlling erosion. Overgrazing, however, easily reduces the vigor of the pasture plants and the extent of the plant cover and thus increases the susceptibility to wind erosion. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during long dry periods help to keep the pasture and the soil in good condition.

This soil is suited to trees. Seedling mortality is the main management concern. Seedlings should be planted as early in the spring as possible. Some do not survive or grow well. Competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling.

Slope is a moderate limitation if this soil is used as a site for dwellings. The dwellings should be designed to conform to the natural slope of the land. Land shaping is needed in some areas. In order to establish a protective plant cover that controls erosion, topsoil should be stockpiled during construction and used for topdressing after construction. Establishing the plant cover as soon as possible after construction helps to keep soil loss at a minimum. Slope and frost action are moderate limitations on sites for local roads and streets. Building the roads and streets on the contour helps to overcome the slope. Drainage ditches remove excess water and thus help to prevent the damage caused by frost action.

The slope and the moderate permeability are moderate limitations if this soil is used as a septic tank absorption field. Land shaping and installing the distribution lines across the slope help to overcome the slope. Enlarging the field helps to overcome the slow absorption of liquid waste.

The capability subclass is IIIe; woodland suitability subclass 2s.

MhB—Miami loam, 2 to 6 percent slopes. This gently sloping, deep, well drained soil is on ridges and knolls on till plains. Areas range from 2 to 200 acres in size.

In a typical profile, the surface layer is dark grayish brown loam about 7 inches thick. The subsurface layer is brown loam about 4 inches thick. The subsoil is about 21 inches thick. The upper part is dark yellowish brown, firm clay loam; the next part is yellowish brown, firm clay loam; and the lower part is yellowish brown, friable loam. The substratum to a depth of 60 inches is brown loam. In some places, the surface layer contains more sand and the depth to the substratum is greater. In other places the surface layer contains less sand.

Included with this soil in mapping are a few small areas of the somewhat poorly drained Crosier soils on the lower parts of the landscape. Also included are a few small, severely eroded areas where the slope is more than 6 percent. Included areas make up 9 to 12 percent of the unit.

Available water capacity is high in the Miami soil. Permeability is moderate in the subsoil and moderately slow in the substratum. Runoff is medium. Organic matter content is moderate. The surface layer generally is neutral as a result of local liming practices. It is friable and can be easily tilled throughout a fairly wide range in moisture content. The shrink-swell potential is moderate.

Most areas are used for row crops. Some are used for hay or pasture. Some are wooded.

This soil is suited to corn, soybeans, and small grain. Measures that control erosion and runoff are needed if cultivated crops are grown. Examples are cover crops, crop rotation, terraces, diversions, contour farming, grassed waterways, grade stabilization structures, and a conservation tillage system that leaves a protective amount of crop residue on the surface. Planting cover crops and leaving crop residue on the surface also improve tilth and increase the organic matter content. In the seepy parts of some drainageways and swales, subsurface drains are needed.

Growing grasses and legumes for hay or pasture is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well only if competing vegetation is controlled. The competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling.

The shrink-swell potential is a moderate limitation if this soil is used as a site for dwellings. Reinforcing foundations and footings and backfilling with sandy material help to prevent the structural damage caused by shrinking and swelling. Low strength and frost action are moderate limitations on sites for local roads and streets. Providing coarser grained subgrade or base material helps to prevent the damage caused by low strength and frost action. Drainage ditches remove excess water and thus help to prevent the damage caused by frost action. The moderately slow permeability is a severe limitation if this soil is used as a septic tank absorption field. Enlarging the field helps to overcome the slow absorption of liquid waste.

The capability subclass is IIe; woodland suitability subclass 1o.

MhC—Miami loam, 6 to 12 percent slopes. This moderately sloping, deep, well drained soil is on ridges and knolls on till plains. Areas range from 2 to 160 acres in size.

In a typical profile, the surface layer is dark grayish brown loam about 7 inches thick. The subsurface layer is brown loam about 3 inches thick. The subsoil is about 22 inches thick. The upper part is dark yellowish brown, firm clay loam; the next part is yellowish brown, firm clay loam; and the lower part is yellowish brown, friable loam. The substratum to a depth of 60 inches is brown loam. In some places, the surface layer contains more sand and the depth to the substratum is greater. In other places the surface layer contains less sand.

Included with this soil in mapping are a few small, severely eroded areas where the surface layer is clay loam, areas where stones are on the surface, and small areas where slopes are short and steep. Included areas make up 9 to 12 percent of the unit.

Available water capacity is high in the Miami soil. Permeability is moderate in the subsoil and moderately slow in the substratum. Runoff is medium. Organic matter content is moderate. The surface layer is friable and can be easily tilled throughout a fairly wide range in moisture content. The shrink-swell potential is moderate.

Some areas are used for row crops. Some are used for hay or pasture. Some are wooded.

This soil is suited to corn, soybeans, and small grain grown in rotation with grasses and legumes. Measures that control erosion and runoff are needed if cultivated crops are grown. Examples are cover crops, crop rotation, terraces, diversions, contour farming, grassed waterways, grade stabilization structures, and a conservation tillage system that leaves a protective amount of crop residue on the surface. Planting cover crops and leaving crop residue on the surface also improve tilth and increase the organic matter content.

Growing grasses and legumes for hay or pasture is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well only if competing vegetation is controlled. The competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling.

The slope and the shrink-swell potential are moderate limitations if this soil is used as a site for dwellings. The dwellings should be designed to conform to the natural slope of the land. Land shaping is needed in some areas. In order to establish a protective plant cover that controls erosion, topsoil should be stockpiled during construction and used for topdressing after construction. Establishing the plant cover as soon as possible after construction helps to keep soil loss at a minimum. Reinforcing foundations and footings and backfilling with sandy material help to prevent the structural damage caused by shrinking and swelling.

Slope, low strength, and frost action are moderate limitations if this soil is used as a site for local roads and streets. Building the roads and streets on the contour helps to overcome the slope. Providing coarser grained subgrade or base material helps to prevent the damage caused by low strength and frost action.

The moderately slow permeability is a severe limitation if this soil is used as a septic tank absorption field. Also, the slope is a moderate limitation. Land shaping and installing the distribution lines across the slope help to overcome the slope. Enlarging the field helps to overcome the slow absorption of liquid waste.

The capability subclass is IIIe; woodland suitability subclass 1o.

MhD—Miami loam, 12 to 18 percent slopes. This strongly sloping, deep, well drained soil is on ridges and knolls on till plains. Areas range from 2 to 70 acres in size.

In a typical profile, the surface layer is dark grayish brown loam about 7 inches thick. The subsurface layer is brown loam about 3 inches thick. The subsoil is about 20 inches thick. The upper part is yellowish brown, firm clay loam, and the lower part is yellowish brown, friable loam. The substratum to a depth of 60 inches is brown loam. In some places, the surface layer contains more sand and the depth to the substratum is greater. In other places the surface layer contains less sand.

Included with this soil in mapping are a few small, severely eroded areas where the surface layer is clay loam, areas where stones are on the surface, and a few small areas where slopes are short and steep. Included areas make up 9 to 12 percent of the unit.

Available water capacity is high in the Miami soil. Permeability is moderate in the subsoil and moderately slow in the substratum. Runoff is rapid. Organic matter content is moderate. The surface layer is friable and can be easily tilled throughout a fairly wide range in moisture content.

Some areas are used for row crops. Some are used for hay or pasture. Some are wooded.

This soil is suited to corn, soybeans, and small grain grown in rotation with grasses and legumes. Measures that control erosion and runoff are needed if cultivated crops are grown. Examples are cover crops, crop rotation, terraces, diversions, contour farming, grassed waterways, grade stabilization structures, and a conservation tillage system that leaves a protective amount of crop residue on the surface. Planting cover crops and leaving crop residue on the surface also improve tilth and increase the organic matter content.

Growing grasses and legumes for hay or pasture is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well only if competing vegetation is controlled. The competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling.

Slope is a severe limitation if this soil is used as a site for dwellings or local roads and streets. Dwellings should be designed to conform to the natural slope of the land. Land shaping is needed in some areas. In order to establish a protective plant cover that controls erosion, topsoil should be stockpiled during construction and used for topdressing after construction. Removing as little of the plant cover as possible and revegetating as soon as possible after construction help to control erosion. Roads and streets should be built on the contour if feasible.

The slope and the moderately slow permeability are severe limitations if this soil is used as a septic tank absorption field. Land shaping and installing the distribution lines across the slope help to overcome the slope. If these measures are not feasible, a less sloping soil should be selected. Enlarging the field helps to overcome the slow absorption of liquid waste.

The capability subclass is IVe; woodland suitability subclass 1o.

MhE—Miami loam, 18 to 25 percent slopes. This moderately steep, deep, well drained soil is on ridges and knolls on till plains. Areas range from 3 to 50 acres in size.

In a typical profile, the surface layer is dark grayish brown loam about 6 inches thick. The subsurface layer is brown loam about 4 inches thick. The subsoil is about 19 inches thick. The upper part is yellowish brown, firm clay loam, and the lower part is yellowish brown, friable loam. The substratum to a depth of 60 inches is brown loam. In some places, the surface layer contains more sand and the depth to the substratum is greater. In other places the surface layer contains less sand.

Included with this soil in mapping are a few small, severely eroded areas where the surface layer is clay loam, areas where stones are on the surface, and a few small areas where slopes are short and steep. Included areas make up 9 to 12 percent of the unit.

Available water capacity is high in the Miami soil. Permeability is moderate in the subsoil and moderately slow in the substratum. Runoff is rapid. Organic matter

content is moderate. The surface layer is friable and can be easily tilled throughout a fairly wide range in moisture content.

Some areas are used for hay or pasture. Some are wooded. Very few are used for row crops.

This soil is not suited to corn, soybeans, or small grain because it is moderately steep. It is better suited to grasses and legumes for hay or pasture. A cover of these plants is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

This soil is suited to trees. Plant competition, the erosion hazard, and equipment limitations are the main management concerns. Seedlings survive and grow well only if competing vegetation is controlled. The competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling.

This soil generally is unsuitable as a site for dwellings because the slope is a severe limitation. A better suited soil should be selected. The slope is a severe limitation on sites for local roads and streets. The roads and streets should be built on the contour or on the less sloping sites.

The slope and the moderately slow permeability are severe limitations if this soil is used as a septic tank absorption field. Land shaping and installing the distribution lines across the slope help to overcome the slope. If these measures are not feasible, a less sloping soil should be selected. Enlarging the field helps to overcome the slow absorption of liquid waste.

The capability subclass is VIe; woodland suitability subclass 1r.

MkC3—Miami clay loam, 6 to 12 percent slopes, severely eroded. This moderately sloping, deep, well drained soil is on ridges and knolls on till plains. Areas range from 2 to 50 acres in size.

In a typical profile, the surface layer is brown clay loam about 7 inches thick. The subsoil is about 18 inches thick. The upper part is dark yellowish brown and yellowish brown, firm clay loam, and the lower part is yellowish brown, friable loam. The substratum to a depth of 60 inches is brown loam. In places, the surface layer contains more sand and the depth to the substratum is greater.

Included with this soil in mapping are a few small areas where stones are on the surface and areas where slopes are short and steep. Included areas make up 8 to 12 percent of the unit.

Available water capacity is high in the Miami soil. Permeability is moderate in the subsoil and moderately slow in the substratum. Runoff is rapid. Organic matter content is low. The surface layer can be easily tilled only within a narrow range in moisture content. The shrink-swell potential is moderate.

Most areas are used for row crops. Some are used for hay or pasture. Some are wooded.

This soil is suited to corn, soybeans, and small grain grown in rotation with grasses and legumes, but obtaining a good stand of crops is somewhat difficult. Measures that control erosion and runoff are needed. Examples are cover crops, crop rotation, terraces, diversions, contour farming, grassed waterways, grade stabilization structures, and a conservation tillage system that leaves crop residue on the surface. Planting cover crops and leaving crop residue on the surface also improve tilth and increase the organic matter content.

Growing grasses and legumes for hay or pasture is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing improve the pasture.

This soil is suited to trees. Plant competition is moderate. Seedlings survive and grow well only if competing vegetation is controlled. The competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling.

The slope and the shrink-swell potential are moderate limitations if this soil is used as a site for dwellings. Dwellings should be designed to conform to the natural slope of the land. Land shaping is needed in some areas. Restricting building site development to small areas, removing as little of the plant cover as possible, and revegetating as soon as possible after construction help to control erosion. In order to establish a protective plant cover that controls erosion, topsoil should be stockpiled during construction and used for topdressing after construction. Reinforcing foundations and footings and backfilling with sandy material help to prevent the structural damage caused by shrinking and swelling.

Slope, low strength, and frost action are moderate limitations if this soil is used as a site for local roads and streets. Building the roads and streets on the contour helps to overcome the slope. Providing coarser grained subgrade or base material helps to prevent the damage caused by low strength and frost action.

The moderately slow permeability is a severe limitation if this soil is used as a septic tank absorption field. Also, the slope is a moderate limitation. Land shaping and installing the distribution lines across the slope help to overcome the slope. Enlarging the field helps to overcome the slow absorption of liquid waste.

The capability subclass is IVe; woodland suitability subclass 1o.

MkD3—Miami clay loam, 12 to 18 percent slopes, severely eroded. This strongly sloping, deep, well drained soil is on ridges and knolls on till plains. Areas range from 2 to 40 acres in size.

In a typical profile, the surface layer is brown clay loam about 7 inches thick. The subsoil is about 18 inches thick. The upper part is yellowish brown, firm clay

loam, and the lower part is yellowish brown, friable loam. The substratum to a depth of 60 inches is brown loam. In places, the surface layer contains more sand and the depth to the substratum is greater.

Included with this soil in mapping are a few small areas where slopes are short and steep and areas where stones are on the surface. Included areas make up 8 to 12 percent of the unit.

Available water capacity is high in the Miami soil. Permeability is moderate in the subsoil and moderately slow in the substratum. Runoff is very rapid. Organic matter content is low. The surface layer can be easily tilled only within a narrow range in moisture content.

Some areas are used for row crops. Some are used for hay or pasture. Some are wooded.

This soil generally is unsuited to corn, soybeans, and small grain because of the slope and the severe erosion. Crops should be grown only to reestablish grasses.

Growing grasses and legumes for hay or pasture is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing improve the pasture.

This soil is suited to trees. Seedlings survive and grow well if competing vegetation is controlled. The competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling.

The slope is a severe limitation if this soil is used as a site for dwellings or local roads and streets. Land shaping is needed in some areas. Dwellings should be designed to conform to the natural slope of the land. Restricting building site development to small areas and removing as little of the plant cover as possible help to control erosion. Roads and streets should be built on the contour.

The slope and the moderately slow permeability are severe limitations if this soil is used as a septic tank absorption field. Land shaping and installing the distribution lines across the slope help to overcome the slope. If these measures are not feasible, a less sloping soil should be selected. Enlarging the field helps to overcome the slow absorption of liquid waste.

The capability subclass is VIe; woodland suitability subclass 1o.

Mm—Millgrove loam. This nearly level, deep, very poorly drained soil is in depressions or along drainageways on outwash plains. It is frequently ponded by runoff from higher lying adjacent soils. Areas are elongated, oval, or round and range from 2 to 175 acres in size.

In a typical profile, the surface layer is black loam about 11 inches thick. The subsurface layer is very dark gray loam about 2 inches thick. The subsoil is about 22 inches thick. The upper part is dark gray, friable loam; the next part is grayish brown, mottled, firm clay loam and sandy clay loam; and the lower part is pale brown, mottled, friable gravelly sandy clay loam. The substratum to a depth of 60 inches is grayish brown gravelly sandy loam. In a few small areas the surface layer is lighter colored. In some areas a thin layer of muck is at the surface. In other areas the substratum is loamy and is stratified.

Included with this soil in mapping are a few small areas of Adrian and Cohoctah soils. Adrian soils are organic. Cohoctah soils contain less clay in the subsoil than the Millgrove soil. Included soils make up 9 to 12 percent of the unit.

Available water capacity is moderate in the Millgrove soil. Permeability also is moderate. Runoff is very slow. The water table is near or above the surface for much of the year. Organic matter content is high. The surface layer is friable and can be easily tilled throughout a wide range in moisture content.

Some areas are used for cultivated crops. A few are used for hay and pasture. A few are wooded.

If adequately drained, this soil is well suited to corn, soybeans, and small grain. If drained and otherwise well managed, it is suited to intensive row cropping. Excess water can be removed by open ditches, subsurface drains, surface drains, or pumps or by a combination of these. A conservation tillage system that leaves crop residue on the surface improves tilth and increases the organic matter content.

This soil is suited to grasses and legumes for hay and pasture. A drainage system is needed. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Overgrazing also reduces the vigor and density of the plants. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to prevent surface compaction and maintain good tilth and plant density.

This soil is suited to water tolerant trees, which should be favored in timber stands. Equipment limitations, seedling mortality, and the windthrow hazard are management concerns. Harvesting equipment can be used only during the drier periods or during periods wher the ground is frozen.

This soil generally is unsuitable as a site for dwellings and septic tank absorption fields because the ponding is a severe hazard. Ponding and frost action are severe hazards on sites for local roads and streets. Constructing drainage ditches that help to remove excess water and building the roads and streets on raised, well compacted fill material help to prevent the damage caused by ponding and frost action.

The capability subclass is IIw; woodland suitability subclass 2w.

Mn—Milford silty clay loam. This nearly level, deep, very poorly drained soil is in depressions in former glacial lakebeds. It is frequently ponded by runoff from higher lying adjacent soils. Areas are elongated or oval and range from 2 to 400 acres in size.

In a typical profile, the surface layer is very dark gray silty clay loam about 12 inches thick. The subsurface

layer is dark gray, mottled silty clay loam about 8 inches thick. The subsoil is dark gray, mottled, firm silty clay loam and clay loam about 35 inches thick. The substratum to a depth of 60 inches is dark gray, mottled clay loam that has thin strata of sandy loam, silty clay loam, and silty clay. In a few small areas it is sandy or is glacial till. In places the subsoil contains less clay and more sand.

Included with this soil in mapping are a few small areas of the somewhat poorly drained Del Rey soils on the slightly higher parts of the landscape. These soils make up 7 to 11 percent of the unit.

Available water capacity is high in the Milford soil. Permeability is slow. Runoff is very slow. The water table is near or above the surface for much of the year. Organic matter content is high. The surface layer is friable and can be easily tilled only within a narrow range in moisture content.

Most areas are used for cultivated crops. A few are used for hay and pasture. A few are wooded.

If adequately drained, this soil is well suited to corn, soybeans, and small grain. If drained and otherwise well managed, it is suited to intensive row cropping. Excess water can be removed by open ditches, subsurface drains, surface drains, or pumps or by a combination of these. A conservation tillage system that leaves crop residue on the surface improves tilth and increases the organic matter content.

This soil is suited to grasses and legumes for hay or pasture. A drainage system is needed. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Overgrazing also reduces the vigor and density of the plants. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to prevent surface compaction and maintain good tilth and plant density.

This soil is poorly suited to building site development because the ponding is a severe hazard. Installing an adequate drainage system that lowers the water table helps to prevent the damage caused by ponding. If overcoming this hazard is too difficult, a better suited soil should be selected. Ponding, frost action, and low strength are severe limitations on sites for local roads and streets. Building the roads and streets on raised, well compacted fill material and constructing drainage ditches help to prevent the damage caused by ponding and frost action. Providing coarser grained subgrade or base material helps to prevent the damage caused by low strength and frost action.

The ponding and the slow permeability are severe limitations if this soil is used as a septic tank absorption field. Overcoming these limitations is difficult. A better suited soil should be selected.

The capability subclass is IIw; no woodland suitability subclass is assigned.

MoC2—Morley silt loam, 6 to 12 percent slopes, eroded. This moderately sloping, deep, well drained soil is on ridges and knolls on till plains. Areas are irregular in shape and range from 2 to 400 acres in size.

In a typical profile, the surface layer is brown silt loam about 7 inches thick. The subsoil is about 22 inches thick. The upper part is yellowish brown, firm clay loam; the next part is yellowish brown, very firm clay; and the lower part is yellowish brown, firm clay loam. The substratum to a depth of 60 inches is brown clay loam. In a few small areas, the surface layer is sandier or the subsoil contains less clay.

Included with this soil in mapping are a few small areas of the moderately well drained Glynwood soils on the less sloping parts of the landscape. Also included are small, severely eroded areas where the slope is more than 12 percent, areas where stones and boulders are on the surface, and, in deep depressions, small areas of marsh or the very poorly drained Pewamo soils. Included areas make up 7 to 10 percent of the unit.

Available water capacity is high in the Morley soil. Permeability is slow. Runoff is medium. Organic matter content is moderate. The surface layer is friable and can be easily tilled throughout a fairly wide range in moisture content. If tilled when it is too wet, however, this soil becomes cloddy. The shrink-swell potential is moderate.

Most areas are used for cultivated crops. Some are used for hay or pasture. A few are wooded.

This soil is suited to corn, soybeans, and small grain grown in rotation with grasses and legumes. Measures that control erosion and runoff are needed if cultivated crops are grown. Examples are cover crops, crop rotation, terraces, diversions, contour farming, grassed waterways, grade stabilization structures, and a conservation tillage system that leaves a protective amount of crop residue on the surface. Planting cover crops and leaving crop residue on the surface also improve tilth and increase the organic matter content.

Growing grasses and legumes for hay or pasture is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well only if competing vegetation is controlled. The competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling.

The shrink-swell potential and the slope are moderate limitations if this soil is used as a site for dwellings. Reinforcing foundations, footings, and basement walls and backfilling with sandy material help to prevent the structural damage caused by shrinking and swelling. Dwellings should be designed to conform to the natural slope of the land. Land shaping is needed in some areas. Low strength is a severe limitation on sites for local roads and streets. Providing coarser grained subgrade or base material helps to prevent the damage caused by low strength.

This soil is poorly suited to septic tank absorption fields because the slow permeability is a severe limitation. Overcoming this limitation generally is not feasible. A better suited soil should be selected.

The capability subclass is IIIe; woodland suitability subclass 2o.

MoD2—Morley silt loam, 12 to 18 percent slopes, eroded. This strongly sloping, deep, well drained soil is on ridges and knolls on till plains. Areas are irregular in shape and range from 2 to 40 acres in size.

In a typical profile, the surface layer is dark brown silt loam about 6 inches thick. The subsoil is about 22 inches thick. The upper part is yellowish brown, firm clay loam, and the lower part is yellowish brown, very firm clay. The substratum to a depth of 60 inches is brown clay loam. In a few small areas, the surface layer is sandier or the subsoil contains less clay.

Included with this soil in mapping are a few small, severely eroded areas where the slope is more than 18 percent and areas where stones and boulders are on the surface. Included areas make up 4 to 6 percent of the unit.

Available water capacity is high in the Morley soil. Permeability is slow. Runoff is rapid. Organic matter content is moderate. The surface layer can be easily tilled throughout a fairly wide range in moisture content. If tilled when it is too wet, however, this soil becomes cloddy. The shrink-swell potential is moderate.

Some areas are used for cultivated crops. Some are used for hay or pasture. A few are wooded.

This soil is suited to corn, soybeans, and small grain grown in rotation with grasses and legumes. Measures that control erosion and runoff are needed if cultivated crops are grown. Examples are cover crops, crop rotation, terraces, diversions, contour farming, grassed waterways, grade stabilization structures, and a conservation tillage system that leaves a protective amount of crop residue on the surface. Planting cover crops and leaving crop residue on the surface also improve tilth and increase the organic matter content.

Growing grasses and legumes for hay or pasture is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

This soil is suited to trees. Plant competition is moderate. The competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling.

Slope is a severe limitation if this soil is used as a site for dwellings. Also, the shrink-swell potential is a moderate limitation. Dwellings should be designed to conform to the natural slope of the land. Land shaping is needed in some areas. Reinforcing foundations, footings, and basement walls, backfilling with sandy material, and providing foundation drain tile help to prevent the structural damage caused by shrinking and swelling.

Slope and low strength are severe limitations if this soil is used as a site for local roads and streets. Providing coarser grained subgrade or base material helps to prevent the damage caused by low strength. Building the roads and streets on the contour helps to overcome the slope.

This soil is poorly suited to septic tank absorption fields because the slope and the slow permeability are severe limitations. Overcoming these limitations generally is not feasible. A better suited soil should be selected.

The capability subclass is IVe; woodland suitability subclass 2o.

MoE2—Morley silt loam, 18 to 25 percent slopes, eroded. This moderately steep, deep, well drained soil is on ridges and knolls on till plains. Areas are irregular in shape and range from 3 to 30 acres in size.

In a typical profile, the surface layer is dark brown silt loam about 5 inches thick. The subsoil is about 21 inches thick. The upper part is yellowish brown, firm clay loam, and the lower part is yellowish brown, very firm silty clay. The substratum to a depth of 60 inches is brown clay loam. In a few small areas the surface layer is sandier. In places the subsoil contains less clay.

Included with this soil in mapping are small, severely eroded areas and areas where stones and boulders are on the surface. Included areas make up 6 to 8 percent of the unit.

Available water capacity is high in the Morley soil. Permeability is slow. Runoff is rapid. Organic matter content is moderate. The surface layer can be easily tilled throughout a fairly wide range in moisture content. If tilled when it is too wet, however, this soil becomes cloddy.

Some areas are used for cultivated crops. Some are used for hay or pasture. Some are wooded.

This soil generally is unsuited to corn, soybeans, and small grain because of the slope. It is better suited to grasses and legumes for hay and pasture. A cover of these plants is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

This soil is suited to trees. Erosion, equipment limitations, and the windthrow hazard are management concerns. The competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling.

This soil generally is unsuitable as a site for dwellings because the slope is a severe limitation. A better suited soil should be selected. Low strength and slope are severe limitations on sites for local roads and streets. Providing coarser grained subgrade or base material helps to prevent the damage caused by low strength. The roads and streets should be built on the contour or on the less sloping sites.

This soil is generally unsuitable as a septic tank absorption field because the slope and the slow permeability are severe limitations. Overcoming these limitations generally is not feasible. A better suited soil should be selected.

The capability subclass is VIe; woodland suitability subclass 2r.

MrC3—Morley silty clay loam, 6 to 12 percent slopes, severely eroded. This moderately sloping, deep, well drained soil is on ridges and knolls on till plains. Areas are irregular in shape and range from 5 to 100 acres in size.

In a typical profile, the surface layer is brown silty clay loam about 6 inches thick. The subsoil is about 20 inches thick. The upper part is yellowish brown, firm clay loam, and the lower part is yellowish brown, very firm clay. The substratum to a depth of 60 inches is brown clay loam. In places less clay is throughout the profile.

Included with this soil in mapping are small areas that are only slightly eroded, areas where stones and boulders are on the surface, and small areas of marsh in depressions. Included areas make up 5 to 7 percent of the unit.

Available water capacity is high in the Morley soil. Permeability is slow. Runoff is rapid. Organic matter content is low. Tilling the surface layer is difficult. If tilled when it is too wet, this soil becomes very cloddy. The shrink-swell potential is moderate.

Most areas are used for cultivated crops. Some are used for hay or pasture. A few are wooded.

This soil is suited to corn, soybeans, and small grain grown in rotation with grasses and legumes. Measures that control erosion and runoff are needed if cultivated crops are grown. Examples are cover crops, crop rotation, terraces, diversions, contour farming, grassed waterways, grade stabilization structures, and a conservation tillage system that leaves a protective amount of crop residue on the surface. Planting cover crops and leaving crop residue on the surface also improve tilth and increase the organic matter content.

Growing grasses and legumes for hay or pasture is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

This soil is suited to trees. Seedlings survive and grow well if competing vegetation is controlled. The competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling.

The shrink-swell potential and the slope are moderate limitations if this soil is used as a site for dwellings. Reinforcing foundations, footings, and basement walls and backfilling with sandy material help to prevent the structural damage caused by shrinking and swelling. Dwellings should be designed to conform to the natural slope of the land. Land shaping is needed in some areas. Low strength is a severe limitation on sites for local roads and streets. Providing coarser grained subgrade or base material helps to prevent the damage caused by low strength.

This soil is poorly suited to septic tank absorption fields because the slow permeability is a severe limitation. Overcoming this limitation generally is not feasible. A better suited soil should be selected.

The capability subclass is IVe; woodland suitability subclass 2o.

MrD3—Morley silty clay loam, 12 to 18 percent slopes, severely eroded. This strongly sloping, deep, well drained soil is on ridges and knolls on till plains. Areas are irregular in shape and range from 5 to 50 acres in size.

In a typical profile, the surface layer is brown silty clay loam about 6 inches thick. The subsoil is yellowish brown, very firm clay about 18 inches thick. The substratum to a depth of 60 inches is yellowish brown clay loam. In places, the subsoil contains less clay and the substratum is loam till.

Included with this soil in mapping are a few areas that are only slightly eroded and areas where stones and boulders are on the surface. Included areas make up 4 to 6 percent of the unit.

Available water capacity is high in the Morley soil. Permeability is slow. Runoff is very rapid. Organic matter content is low. Tilling the surface layer is difficult. If tilled when it is too wet, this soil becomes very cloddy. The shrink-swell potential is moderate.

Most areas are used for cultivated crops. Some are used for hay or pasture. A few are wooded.

This soil generally is unsuited to corn, soybeans, and small grain because of the slope and the erosion. It is better suited to grasses and legumes for hay or pasture. A cover of these plants is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

This soil is suited to trees. Plant competition is moderate. The competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling.

Slope is a severe limitation if this soil is used as a site for dwellings. Also, the shrink-swell potential is a moderate limitation. Dwellings should be designed to conform to the natural slope of the land. Land shaping is needed in some areas. Reinforcing foundations, footings, and basement walls and backfilling with sandy material help to prevent the structural damage caused by shrinking and swelling. Slope and low strength are severe limitations on sites for local roads and streets. Providing coarser grained subgrade or base material helps to prevent the damage caused by low strength. Building the roads and streets on the contour helps to overcome the slope.

This soil is poorly suited to septic tank absorption fields because the slope and the slow permeability are severe limitations. Overcoming these limitations generally is not feasible. A better suited soil should be selected.

The capability subclass is VIe; woodland suitability subclass 2o.

Mx—Morocco loamy sand. This nearly level, deep, somewhat poorly drained soil is on outwash plains bordering depressions or is in drainageways between steeper sandy soils. Areas are irregular in shape and range from 2 to 50 acres in size.

In a typical profile, the surface layer is very dark grayish brown loamy sand about 6 inches thick. The subsurface layer is yellowish brown loamy sand about 8 inches thick. The subsoil is mottled, loose sand about 18 inches thick. The upper part is light yellowish brown, the next part is brownish yellow, and the lower part is light yellowish brown. The substratum to a depth of 60 inches is pale brown and light yellowish brown sand. In a few areas the lower part of the subsoil and the substratum are less acid.

Included with this soil in mapping are a few small areas of the moderately well drained Brems soils on the slightly higher rises and the very poorly drained Granby Variant soils in slight depressions. Also included are small areas, in depressions, where water ponds most of the year. Included areas make up 8 to 12 percent of the unit.

Available water capacity is low in the Morocco soil. Permeability is rapid. Runoff is very slow. The water table is at a depth of 1 to 2 feet early in spring. Organic matter content is low. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content.

About half of the areas are used for cultivated crops. Some areas support grasses or legumes for hay or pasture. A few are wooded.

This soil is poorly suited to corn and soybeans because it can become droughty if it is drained. Both droughtiness and wetness are major limitations if cultivated crops are grown. Because the soil tends to be droughty after it is drained, the drainage system should be designed to prevent droughtiness. A conservation cropping system that includes row crops can be used if subsurface drains are installed to control the wetness. Covering subsurface drains with a permanent filter helps to keep sand from clogging the drains. Cover crops and a conservation tillage system that leaves crop residue on the surface increase the organic matter content and improve tilth.

If adequately drained, this soil is suited to grasses and legumes for hay or pasture. Deep rooted legumes, such as alfalfa, are not so well suited as shallow rooted legumes. The major concern of management is overgrazing or grazing when the soil is too wet. Overgrazing reduces the vigor and density of the plants. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suited to trees. Plant competition is the main management concern. The competing plants can be controlled by cutting, spraying, or girdling.

Wetness is a severe limitation if this soil is used as a site for dwellings. Installing an adequate drainage system that lowers the water table helps to overcome the wetness. Frost action and wetness are moderate limitations on sites for local roads and streets. Drainage ditches remove excess water and thus help to prevent the damage caused by frost action and wetness.

The wetness and a poor filtering capacity are severe limitations if this soil is used as a septic tank absorption field. The soil readily absorbs but does not adequately filter the effluent. The poor filtering capacity may result in the pollution of ground water supplies.

The capability subclass is IVs; woodland suitability subclass 3o.

Mz—Muskego muck, drained. This nearly level, deep, very poorly drained soil is in depressions and former drainageways or along streams and lakeshores. It is frequently ponded by runoff from higher lying adjacent soils. Areas generally are oval or crescent shaped. They generally are about 20 acres in size but range from 2 to 400 acres.

In a typical profile, the surface layer is black muck about 8 inches thick. The next 21 inches is very dark brown, black, and dark brown muck. The substratum to a depth of 60 inches is very dark grayish brown, very dark gray, and dark gray coprogenous earth. In a few places, the substratum is sandy or loamy material or marl or the muck is more than 50 inches thick.

Included with this soil in mapping are a few areas of mineral soils. These soils are around the edge of some of the mapped areas. They make up 6 to 8 percent of the unit.

Available water capacity is very high in the Muskego soil. Permeability is moderately slow to moderately rapid in the organic layers and slow in the underlying coprogenous earth. Runoff is very slow. The water table is near or above the surface for most of the year. Organic matter content is very high. The surface layer is friable and can be easily tilled throughout a wide range in moisture content.

Some areas are used for row crops. Some are used for pasture. Some are idle and support grass or a scrubby stand of timber.

This soil is subject to frost, which can severely damage many cultivated crops early and late in the growing season. It is best suited to special crops, such as mint or vegetables that are not easily damaged by frost. Crops for silage can be successfully grown. Wetness is the major limitation if crops are grown. An adequate drainage system is needed. Subsurface drains should be installed above the coprogenous earth; otherwise, they do not function properly. In areas where

the organic layer is too thin, they cannot be installed at the proper depth. The soil is subject to severe wind erosion if drained. Planting nurse crops, such as rye or wheat, beside the rows helps to control wind erosion.

If adequately drained, this soil is suited to grasses and legumes. Deep rooted legumes, such as alfalfa, are not so well suited as shallow rooted legumes. Wetness is the major concern in managing pasture. If the pasture is grazed during wet periods, stools of grass and soil form. These stools hinder the movement of livestock and the use of farm machinery. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is poorly suited to commercial tree production. It cannot support tall trees. Equipment limitations, seedling mortality, and the windthrow hazard are management concerns. Equipment can be used only during very dry periods or during periods when the ground is frozen. Many seedlings do not survive or grow well. Many trees are blown down.

This soil generally is unsuitable as a site for dwellings and septic tank absorption fields because of the ponding. Also, the low strength of the organic material is a limitation on sites for dwellings and the moderately slow permeability a severe limitation in septic tank absorption fields.

Low strength, ponding, and frost action are severe limitations on sites for local roads and streets. Building the roads and streets on raised, well compacted fill material helps to prevent the damage caused by ponding and frost action. Providing coarser grained subgrade or base material helps to prevent the damage caused by low strength and frost action.

The capability subclass is IVw; woodland suitability subclass 4w.

OhA—Oshtemo-Ormas loamy sands, 0 to 2 percent slopes. These nearly level, deep, well drained soils are on outwash plains. Areas are somewhat elongated or oval and range from 3 to 200 acres in size. They are about 55 percent Oshtemo soil and 35 percent Ormas soil. The two soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

In a typical profile of the Oshtemo soil, the surface layer is dark brown loamy sand about 9 inches thick. The subsoil is about 37 inches thick. The upper part is reddish brown, friable sandy loam; the next part is yellowish red, friable sandy clay loam and sandy loam; and the lower part is reddish brown and dark reddish brown, friable and firm sandy loam and gravelly sandy clay loam. The substratum to a depth of 60 inches is brown gravelly coarse sand. In some places the depth to the substratum is less than 40 inches. In other places the surface layer and subsoil contain more clay.

In a typical profile of the Ormas soil, the surface layer is dark brown loamy sand about 9 inches thick. The subsurface layer is strong brown, very friable or loose loamy sand about 30 inches thick. The subsoil is about 21 inches thick. It is brown and dark brown, friable sandy loam and sandy clay loam in the upper part and dark brown, loose loamy sand in the lower part. The substratum to a depth of 80 inches is brown gravelly coarse sand.

Included with these soils in mapping are a few small areas where stones are on the surface, some areas where the slope is more than 2 percent, and small areas of marsh in deep depressions. Included areas make up 6 to 10 percent of the unit.

Available water capacity is moderate in the Oshtemo and Ormas soils. Permeability is moderately rapid in the upper part and very rapid in the substratum. Runoff is slow. Organic matter content is low. The surface layer is very friable.

Most areas are used for cultivated crops. Some are used for hay or pasture. A few are wooded.

These soils are suited to corn, soybeans, and small grain grown in rotation with grasses and legumes. If irrigated and otherwise well managed, they are suited to intensive row cropping. The droughtiness resulting from the moderate available water capacity is the main limitation. Also, wind erosion is a hazard. Leaving a protective amount of crop residue on the surface and planting cover crops conserve moisture, help to control wind erosion, improve tilth, and increase the organic matter content.

Growing grasses and legumes for hay or pasture is effective in controlling erosion. Because these soils are droughty, however, overgrazing easily reduces the vigor of the pasture plants and the extent of the plant cover and thus increases the susceptibility to wind erosion. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during long dry periods help to keep the pasture and the soil in good condition.

These soils are suited to trees. Seedling mortality is the main management concern. Seedlings should be planted as early in the spring as possible. Some do not survive or grow well because of the droughtiness.

These soils are suitable as sites for dwellings and septic tank absorption fields. Frost action is a moderate limitation on sites for local roads and streets. Providing coarser grained subgrade or base material helps to prevent the damage caused by frost action.

The capability subclass is IIIs; woodland suitability subclass 3s.

OhB—Oshtemo-Ormas loamy sands, 2 to 6 percent slopes. These gently sloping, deep, well drained soils are on outwash plains. Areas are somewhat elongated or oval and range from 3 to 70 acres in size. They are about 55 percent Oshtemo soil and 35 percent Ormas soil. The two soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

In a typical profile of the Oshtemo soil, the surface layer is dark brown loamy sand about 8 inches thick. The subsurface layer is brown sandy loam about 3 inches

thick. The subsoil is about 34 inches thick. The upper part is yellowish brown, friable sandy loam; the next part is strong brown, firm sandy clay loam; and the lower part is strong brown and brown, friable gravelly sandy loam and gravelly loamy sand. The substratum to a depth of 60 inches is brown gravelly coarse sand. In some places the depth to the substratum is less than 40 inches. In other places the surface soil and subsoil contain more clay.

In a typical profile of the Ormas soil, the surface layer is dark brown loamy sand about 9 inches thick. The subsurface layer is strong brown, very friable or loose loamy sand about 30 inches thick. The subsoil is about 21 inches thick. It is brown and dark brown, friable sandy loam and sandy clay loam in the upper part and dark brown, loose gravelly loamy sand in the lower part. The substratum to a depth of 80 inches is brown gravelly coarse sand.

Included with these soils in mapping are a few small areas where stones are on the surface and small areas around small depressions where the slope is more than 6 percent. Included areas make up 6 to 10 percent of the unit.

Available water capacity is moderate in the Oshtemo and Ormas soils. Permeability is moderately rapid in the upper part and very rapid in the substratum. Runoff is slow. Organic matter content is low. The surface layer is very friable.

Most areas are used for cultivated crops. Some are used for hay or pasture. A few are wooded.

These soils are suited to corn, soybeans, and small grain grown in rotation with grasses and legumes. If irrigated and otherwise well managed, they are suited to intensive row cropping. The droughtiness resulting from the moderate available water capacity is the main limitation. Also, wind erosion is a hazard. Measures that conserve moisture and control erosion and runoff are needed. Examples are cover crops, crop rotation, contour farming, and a conservation tillage system that leaves a protective amount of crop residue on the surface. Planting cover crops and leaving crop residue on the surface also improve tilth and increase the organic matter content.

Growing grasses and legumes for hay or pasture is effective in controlling wind erosion. Because these soils are droughty, however, overgrazing easily reduces the vigor of the pasture plants and the extent of the plant cover and thus increases the susceptibility to wind erosion. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during long dry periods help to keep the pasture and the soil in good condition.

These soils are suited to trees. Seedling mortality is the main management concern. Seedlings should be planted as early in the spring as possible. Some do not survive or grow well because of the droughtiness.

These soils are suitable as sites for dwellings and septic tank absorption fields. Frost action is a moderate limitation on sites for local roads and streets. Providing coarser grained subgrade or base material helps to prevent the damage caused by frost action.

The capability subclass is IIIs; woodland suitability subclass 3s.

OhC—Oshtemo-Ormas loamy sands, 6 to 12 percent slopes. These moderately sloping, deep, well drained soils are on outwash plains. Areas are somewhat elongated or oval and range from 3 to 65 acres in size. They are about 55 percent Oshtemo soil and 35 percent Ormas soil. The two soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

In a typical profile of the Oshtemo soil, the surface layer is dark brown loamy sand about 7 inches thick. The subsoil is about 36 inches thick. The upper part is reddish brown and yellowish red, friable sandy loam; the next part is yellowish red, firm gravelly sandy clay loam; and the lower part is reddish brown, friable gravelly sandy loam. The substratum to a depth of 60 inches is brown gravelly coarse sand. In some places the depth to the substratum is less than 40 inches. In other places the surface layer and subsoil contain more clay.

In a typical profile of the Ormas soil, the surface layer is brown loamy sand about 8 inches thick. The subsurface layer is strong brown, very friable or loose loamy sand about 28 inches thick. The subsoil is about 22 inches thick. It is brown and dark brown, friable sandy loam and sandy clay loam in the upper part and dark brown, loose loamy sand in the lower part. The substratum to a depth of 80 inches is brown gravelly coarse sand.

Included with these soils in mapping are a few small areas where the slope is more than 12 percent and areas where stones are on the surface. Using farm machinery is difficult in the stony areas. Included areas make up 6 to 10 percent of the unit.

Available water capacity is moderate in the Oshtemo and Ormas soils. Permeability is moderately rapid in the upper part and very rapid in the substratum. Runoff is medium. Organic matter content is low. The surface layer is very friable.

Most areas are used for cultivated crops. Some are used for hay or pasture. A few are wooded.

These soils are suited to corn, soybeans, and small grain grown in rotation with grasses and legumes. Measures that control erosion and runoff are needed if cultivated crops are grown. Examples are cover crops, crop rotation, terraces, diversions, contour farming, grassed waterways, grade stabilization structures, and a conservation tillage system that leaves a protective amount of crop residue on the surface. Planting cover crops and leaving crop residue on the surface also improve tilth and increase the organic matter content.

Growing grasses and legumes for hay or pasture is effective in controlling erosion. Overgrazing, however, easily reduces the vigor of the pasture plants and the

extent of the plant cover and thus increases the susceptibility to wind erosion. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during long dry periods help to keep the pasture and the soil in good condition.

These soils are well suited to trees. Seedling mortality is the main management concern. Seedlings should be planted as early in the spring as possible. Some do not survive or grow well.

The slope is a moderate limitation if these soils are used as sites for dwellings, local roads and streets, or septic tank absorption fields. Also, frost action is a moderate hazard on sites for local roads and streets. Land shaping and grading help to overcome the slope. Designing the dwellings so that they conform to the natural slope of the land, building the roads and streets on the contour, and installing the distribution lines in septic tank absorption fields across the slope also help to overcome this limitation. Providing coarser grained subgrade or base material helps to prevent the road damage caused by frost action.

The capability subclass is IIIe; woodland suitability subclass 3s.

OsC—Oshtemo-Kosciusko-Riddles complex, 4 to 12 percent slopes. These soils are on uplands and in outwash areas. The Oshtemo and Riddles soils are gently sloping, deep, and well drained. The Kosciusko soil is moderately sloping and well drained. It is moderately deep over very gravelly coarse sand. Areas are irregular in shape. They generally are about 30 acres in size but range from 5 to 120 acres. They are about 35 percent Oshtemo soil, 25 percent Kosciusko soil, and 20 percent Riddles soil. The three soils occur as areas so intricately mixed or so small that mapping them separately is not practical.

In a typical profile of the Oshtemo soil, the surface layer is dark brown loamy sand about 7 inches thick. The subsoil is about 36 inches thick. The upper part is reddish brown and yellowish red, friable sandy loam; the next part is yellowish red, firm gravelly sandy clay loam; and the lower part is reddish brown, friable gravelly sandy loam. The substratum to a depth of 60 inches is brown gravelly coarse sand.

In a typical profile of the Kosciusko soil, the surface layer is dark brown sandy loam about 8 inches thick. The subsurface layer is yellowish brown sandy loam about 3 inches thick. The subsoil is about 19 inches thick. The upper part is brown, firm sandy clay loam and gravelly sandy clay loam, and the lower part is strong brown, friable gravelly sandy loam. The substratum to a depth of 60 inches is light yellowish brown very gravelly coarse sand.

In a typical profile of the Riddles soil, the surface layer is dark brown sandy loam about 7 inches thick. The subsurface layer is brown loam about 3 inches thick. The subsoil is yellowish brown, firm clay loam about 35 inches thick. The substratum to a depth of 60 inches is brown loam. In places the surface layer is sandier.

Included with these soils in mapping are the somewhat excessively drained Casco soils and the excessively drained Plainfield and Chelsea soils. Casco soils generally are below the Kosciusko soil at the base of slopes. Plainfield and Chelsea soils are on ridges and knolls adjacent to the Oshtemo soil. Casco soils make up about 10 percent of the unit, Plainfield soils 5 percent, and Chelsea soils 3 percent. Also included are small areas where the slope is more than 12 percent and areas where stones are on the surface. Using farm machinery is difficult in the stony areas.

Available water capacity is moderate in the Oshtemo and Kosciusko soils and high in the Riddles soil. Permeability is moderately rapid in the subsoil of the Oshtemo soil and very rapid in the substratum. It is moderate in the subsoil of the Kosciusko soil and very rapid in the Riddles soil. Runoff is medium on all three soils. Organic matter content generally is low. The surface layer is friable or very friable. The shrink-swell potential is moderate in the Kosciusko and Riddles soils.

Most areas are near the lakes and are used as sites for houses, recreational development, or wildlife refuge. Some are used for pasture or hay. Some are wooded.

These soils are suited to corn, soybeans, and small grain grown in rotation with grasses and legumes. Measures that control erosion and runoff are needed if cultivated crops are grown. Examples are cover crops, crop rotation, terraces, diversions, contour farming, grassed waterways, grade stabilization structures, and a conservation tillage system that leaves a protective amount of crop residue on the surface. Planting cover crops and leaving crop residue on the surface also improve tilth and increase the organic matter content.

Growing grasses and legumes for hay or pasture is effective in controlling erosion. Overgrazing, however, easily reduces the vigor of the pasture plants and the extent of the plant cover and thus increases the susceptibility to wind erosion. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during long dry periods help to keep the pasture and the soil in good condition.

These soils are well suited to trees. Seedling mortality is a management concern on the Oshtemo soil. Seedlings should be planted as early in the spring as possible. Some do not survive or grow well.

Slope is a moderate limitation if these soils are used as sites for dwellings. Also, the shrink-swell potential of the Kosciusko and Riddles soils is a moderate limitation. Dwellings should be designed to conform to the natural slope of the land. Land shaping is needed in some areas. Reinforcing footings and foundations and backfilling with sandy material help to prevent the structural damage caused by shrinking and swelling.

The slope and frost action are moderate limitations if these soils are used as sites for local roads and streets. Also, the shrink-swell potential of the Kosciusko soil and the low strength of the Riddles soil are moderate limitations. Building the roads and streets on the contour

helps to overcome the slope. Providing coarser grained subgrade or base material helps to prevent the damage caused by low strength, frost action, and shrinking and swelling.

The Kosciusko soil is not so well suited to septic tank absorption fields as the Oshtemo and Riddles soils. It readily absorbs but does not adequately filter the effluent. The poor filtering capacity may result in the pollution of ground water supplies. The slope of the Oshtemo and Riddles soils and the moderate permeability of the Riddles soil are moderate limitations. Land shaping and installing the distribution lines across the slope help to overcome the slope. Enlarging the field helps to overcome the slow absorption of liquid waste.

The capability subclass is IIIe; the Oshtemo soil is assigned to woodland suitability subclass 3s, the Kosciusko soil to 2o, and the Riddles soil to 1o.

Pa—Palms muck, drained. This nearly level, deep, very poorly drained soil is in depressions and former drainageways or along streams and lakeshores. It is frequently ponded by runoff from higher lying adjacent soils. Areas generally are oval or crescent shaped and range from 2 to 60 acres in size.

In a typical profile, the surface layer is black muck about 12 inches thick. The next 13 inches also is black muck. The substratum to a depth of 60 inches is grayish brown sandy loam. In a few small areas the muck is less than 16 or more than 50 inches thick. In places the substratum is sand or marl.

Included with this soil in mapping are a few small areas of mineral soils. These soils make up 4 to 6 percent of the unit.

Available water capacity is very high in the Palms soil. Permeability is moderately slow to moderately rapid in the organic layers and moderately slow in the substratum. Runoff is very slow. The water table is near or above the surface for much of the year. Organic matter content is very high. The surface layer is friable and can be easily tilled throughout a wide range in moisture content.

Some areas are used for row crops. Some are used for pasture. Some are idle and support grass or a scrubby stand of timber.

This soil is subject to frost, which can severely damage many crops early and late in the growing season. It is best suited to special crops, such as mint or vegetables that are not easily damaged by frost. Crops for silage can be successfully grown. Wetness is the major limitation if crops are grown. An adequate drainage system is needed. If drained, however, the soil is subject to severe wind erosion. Planting nurse crops, such as rye or wheat, beside the rows helps to control wind erosion.

If adequately drained, this soil is suited to grasses and legumes. Deep rooted legumes, such as alfalfa, are not so well suited as shallow rooted legumes. Wetness is the major concern in managing pasture. If the pasture is grazed during wet periods, stools of grass and soil form. These stools hinder the movement of livestock and the use of farm machinery. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is poorly suited to commercial tree production. It cannot support tall trees. Equipment limitations, seedling mortality, and the windthrow hazard are management concerns. Equipment can be used only during very dry periods or during periods when the ground is frozen. Many seedlings do not survive or grow well. Many trees are blown down.

This soil generally is unsuitable as a site for dwellings and septic tank absorption fields because of the ponding. Also, the low strength of the organic material is a severe limitation on sites for dwellings. Low strength, ponding, and frost action are severe limitations on sites for local roads and streets. Building the roads and streets on raised, well compacted fill material helps to prevent the damage caused by ponding and frost action. Providing coarser grained subgrade or base material helps to prevent the damage caused by low strength and frost action.

The capability subclass is IIIw; woodland suitability subclass 4w.

Pe—Pewamo silty clay loam. This nearly level, deep, very poorly drained soil is in depressions in till plains. It is frequently ponded by runoff from higher lying adjacent soils. Areas are irregular in shape and range from 2 to 180 acres in size.

In a typical profile, the surface layer is very dark gray silty clay loam about 11 inches thick. The subsoil is about 28 inches thick. The upper part is dark gray, firm silty clay loam and silty clay, and the lower part is gray, mottled, firm silty clay loam. The substratum to a depth of 60 inches is gray and grayish brown, mottled clay loam. In places it is stratified lacustrine deposits.

Included with this soil in mapping are a few small areas of Blount and Washtenaw soils. The somewhat poorly drained Blount soils are on the slightly higher rises. Washtenaw soils formed in local alluvium over a buried soil. Also included are small areas, in deep depressions, where water ponds most of the year. Included areas make up 7 to 11 percent of the unit.

Available water capacity is high in the Pewamo soil. Permeability is moderately slow. Runoff is very slow. The water table is near or above the surface during winter and spring. Organic matter content is high. This soil becomes cloddy if tilled when it is too wet.

Most areas are used for cultivated crops. A few are used for hay and pasture. A few are wooded.

If adequately drained, this soil is well suited to corn, soybeans, and small grain. If drained and otherwise well managed, it is suited to intensive row cropping. Excess water can be removed by open ditches, subsurface drains, surface drains, or pumps or by a combination of

these. A conservation tillage system that leaves crop residue on the surface improves tilth and increases the organic matter content.

This soil is well suited to grasses and legumes for hay or pasture. A drainage system is needed. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Overgrazing also reduces the vigor and density of the plants. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to prevent surface compaction and maintain good tilth and plant density.

This soil is suited to water tolerant trees. Equipment limitations, seedling mortality, the windthrow hazard, and plant competition are management concerns. Seedlings survive and grow well only if competing vegetation is controlled by spraying, cutting, or girdling.

This soil is poorly suited to building site development because the ponding is a severe limitation. Overcoming this limitation is difficult. A better suited soil should be selected. Ponding, frost action, and low strength are severe limitations on sites for local roads and streets. Building the roads and streets on raised, well compacted fill material and constructing drainage ditches that remove excess water help to prevent the damage caused by ponding and frost action. Providing coarser grained subgrade or base material helps to prevent the damage caused by low strength and frost action.

The ponding and the moderately slow permeability are severe limitations if this soil is used as a septic tank absorption field. Overcoming these limitations is very difficult. A better suited soil should be selected.

The capability subclass is IIw; woodland suitability subclass 2w.

Pg—Pits, gravel. Gravel pits are open excavations from which sand and gravel is removed for private or commercial use. They range from 2 to 100 acres in size. Some are only shallow excavations, and others are as much as 50 feet deep. Some contain water.

Gravel pits are typically adjacent to Boyer, Casco, Kosciusko, and Oshtemo soils. In some areas they are adjacent to other soils which have small pockets of gravel.

Abandoned gravel pits have little value for farming. They are suited to wildlife habitat and recreational uses, especially if the water is deep enough for fish to survive. Some of the dry pits are used as sites for archery practice and shooting ranges.

No capability class or subclass or woodland suitability subclass is assigned.

PnA—Plainfield fine sand, 0 to 2 percent slopes. This nearly level, deep, excessively drained soil is on outwash plains. Areas are irregular in shape. They generally are about 40 acres in size but range from 3 to 175 acres.

In a typical profile, the surface layer is brown fine sand about 9 inches thick. The subsoil is strong brown and yellowish brown, very friable sand about 19 inches thick. The substratum to a depth of 60 inches is brownish yellow and light yellowish brown sand. In a few small areas loamy sand is at a depth of 50 to 60 inches. In places bands of loamy sand and sand are below a depth of 30 inches.

Included with this soil in mapping are a few small areas of Metea and Brems soils. Metea soils are well drained. Brems soils are moderately well drained and are in slight depressions. Also included are a few small areas where the slope is more than 2 percent. Included areas make up 6 to 10 percent of the unit.

Available water capacity is low in the Plainfield soil. Permeability is rapid. Runoff is slow. Organic matter content is low. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content.

Most areas are used as wildlife refuges. Some areas are used for cultivated crops. They are adjacent to lower lying cultivated areas. Some areas are wooded.

This soil is not suited to row crops because it is droughty. If crops are grown, a conservation tillage system that leaves a protective amount of crop residue on the surface helps to control wind erosion and maintains the organic matter content.

Growing grasses and legumes for hay or pasture is effective in controlling erosion. Because this soil is droughty, however, overgrazing easily reduces the vigor of the pasture plants and the extent of the plant cover and thus increases the susceptibility to wind erosion. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during long dry periods help to keep the pasture and the soil in good condition.

This soil is suited to trees. Seedling mortality is the main management concern. Seedlings should be planted as early in the spring as possible. Some do not survive or grow well because of the droughtiness.

This soil is suitable as a site for dwellings and local roads and streets. It readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity may result in the pollution of ground water supplies.

The capability subclass is VIs; woodland suitability subclass 3s.

PnB—Plainfield fine sand, 2 to 10 percent slopes. This gently sloping and moderately sloping, deep, excessively drained soil is on outwash plains. Areas are irregular in shape. They generally are about 30 acres in size but range from 3 to 220 acres.

In a typical profile, the surface layer is dark brown fine sand about 9 inches thick. The subsoil is strong brown, very friable sand about 12 inches thick. The substratum to a depth of 60 inches is brownish yellow and light yellowish brown sand. In a few small areas loamy sand is at a depth of 50 to 60 inches. In places the subsoil has bands of sandy loam or loamy sand.

Included with this soil in mapping are a few small areas of the well drained Metea soils. These soils make up 6 to 10 percent of the unit.

Available water capacity is low in the Plainfield soil. Permeability is rapid. Runoff is slow. Organic matter content is low. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content.

Most areas are used as wildlife refuges. Some areas are used for cultivated crops. They are adjacent to lower lying cultivated areas of Brems and other soils. Some areas are wooded.

This soil is not suited to row crops because it is droughty. If row crops are grown, a conservation tillage system that leaves a protective amount of crop residue on the surface helps to control wind erosion and maintains the organic matter content.

Growing grasses and legumes for hay or pasture is effective in controlling erosion. Because this soil is droughty, however, overgrazing easily reduces the vigor of the pasture plants and the extent of the plant cover and thus increases the susceptibility to wind erosion. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during long dry periods help to keep the pasture and the soil in good condition.

This soil is suited to trees. Seedling mortality is the main management concern. Seedlings should be planted as early in the spring as possible. Some do not survive or grow well because of the droughtiness.

This soil is suitable as a site for dwellings and local roads and streets. It readily absorbs but does not adequately filter the effluent in septic tank absorption fields. The poor filtering capacity may result in the pollution of ground water supplies.

The capability subclass is VIs; woodland suitability subclass 3s.

RaB—Rawson loam, 2 to 6 percent slopes. This gently sloping, deep, moderately well drained soil is on ridges and knolls on till plains. Areas are irregular in shape and range from 3 to 300 acres in size.

In a typical profile, the surface layer is dark brown loam about 7 inches thick. The subsurface layer is yellowish brown loam about 4 inches thick. The subsoil is about 26 inches thick. The upper part is dark brown, friable sandy clay loam, and the lower part is dark brown and yellowish brown, firm clay loam. The substratum to a depth of 60 inches is brown clay loam. In some areas, the surface layer contains more sand or the upper part of the subsoil contains more clay.

Included with this soil in mapping are a few small areas of the somewhat poorly drained Haskins soils on the lower lying flats and small areas of the well drained Metea soils on the slightly higher ridges. Also included are small, severely eroded areas where the slope is more than 6 percent and areas where stones are on the surface. Using farm machinery is difficult in the stony areas. Included areas make up 8 to 12 percent of the unit.

Available water capacity is high in the Rawson soil. Permeability is moderate in the subsoil and slow in the substratum. Runoff is medium. The seasonal high water table is at a depth of 2.5 to 4.0 feet. Organic matter content is moderate. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. The shrink-swell potential is high in the substratum.

Most areas are used for cultivated crops. Some are used for hay or pasture. A few are wooded.

This soil is suited to corn, soybeans, and small grain. Measures that control erosion and runoff are needed if cultivated crops are grown. Examples are cover crops, crop rotation, terraces, diversions, contour farming, grassed waterways, grade stabilization structures, and a conservation tillage system that leaves a protective amount of crop residue on the surface. Planting cover crops and leaving crop residue on the surface also improve tilth and increase the organic matter content. In the seepy parts of some drainageways and swales, subsurface drains are needed.

Growing grasses and legumes for hay or pasture is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well only if competing vegetation is controlled. The competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling.

This soil is suitable as a site for dwellings without basements. The shrink-swell potential is a severe limitation on sites for dwellings with basements. Reinforcing foundations, footings, and basement walls and backfilling with sandy material help to prevent the structural damage caused by shrinking and swelling. Frost action is a moderate limitation on sites for local roads and streets. Drainage ditches remove excess water and thus help to prevent the damage caused by frost action.

The wetness and the slow permeability are severe limitations if this soil is used as a septic tank absorption field. Enlarging the field helps to overcome the slow absorption of liquid waste. Overcoming the slow permeability is so difficult, however, that a better suited soil generally should be selected.

The capability subclass is IIe; woodland suitability subclass 2o.

Rb—Rensselaer loam. This nearly level, deep, very poorly drained soil is in depressions in outwash plains and lake plains. It is frequently ponded by runoff from higher lying adjacent soils. Areas are elongated or oval and range from 2 to 100 acres in size.

In a typical profile, the surface layer is very dark gray loam about 11 inches thick. The subsurface layer is dark

gray, mottled loam about 3 inches thick. The subsoil is about 23 inches thick. The upper part is dark gray, mottled, firm clay loam; the next part is gray, mottled, firm sandy clay loam; and the lower part is light brownish gray, mottled, friable sandy clay loam. The substratum to a depth of 60 inches is gray, mottled, friable sandy clay loam that has thin strata of sandy loam. In a few small areas, the subsoil is clayey or the substratum is gravelly sandy loam.

Included with this soil in mapping are a few small areas of Cohoctah and Whitaker soils. Cohoctah soils are along streams. They have a silt loam surface layer. The somewhat poorly drained Whitaker soils are on the slightly higher rises. Included soils make up 8 to 12 percent of the unit.

Available water capacity is high in the Rensselaer soil. Permeability is slow. Runoff is very slow. The water table is near or above the surface during winter and spring. Organic matter content is high. The surface layer is friable and can be easily tilled throughout a wide range in moisture content.

Most areas are used for cultivated crops. A few are used for hay or pasture. A few are wooded.

If adequately drained, this soil is well suited to corn, soybeans, and small grain. If drained and otherwise well managed, it is suited to intensive row cropping. Excess water can be removed by open ditches, subsurface drains, surface drains, or pumps or by a combination of these. A conservation tillage system that leaves crop residue on the surface improves tilth and increases the organic matter content.

This soil is well suited to grasses and legumes for hay or pasture. A drainage system is needed. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Overgrazing also reduces the vigor and density of the plants. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to prevent surface compaction and maintain good tilth and plant density.

This soil is suited to water tolerant trees. Equipment limitations, seedling mortality, the windthrow hazard, and plant competition are management concerns. Seasonal wetness can delay planting and harvesting. Plant competition can be controlled by spraying, cutting, or girdling. Some seedlings do not survive or grow well.

Ponding is a severe limitation if this soil is used as a site for dwellings. Installing an adequate drainage system helps to overcome this limitation. Ponding, low strength, and frost action are severe limitations on sites for local roads and streets. Building the roads and streets on raised, well compacted fill material and constructing drainage ditches that remove excess water help to prevent the damage caused by ponding and frost action. Providing coarse grained subgrade or base material helps to prevent the damage caused by low strength and frost action.

The ponding and the slow permeability are severe limitations if this soil is used as a septic tank absorption field. Installing a drainage system around the absorption field helps to prevent saturation of the absorption field and comtamination of ground water. Increasing the length of the laterals helps to overcome the slow absorption of liquid waste. If these measures are not feasible, a better suited soil should be selected.

The capability subclass is IIw; woodland suitability subclass 2w.

RxA—Riddles sandy loam, 0 to 2 percent slopes. This nearly level, deep, well drained soil is on till plains. Areas are irregular in shape and range from 3 to 140 acres in size.

In a typical profile, the surface layer is dark brown sandy loam about 6 inches thick. The subsoil is about 41 inches thick. The upper part is dark yellowish brown, friable loam; the next part is yellowish brown, firm clay loam; and the lower part is dark yellowish brown, firm clay loam. The substratum to a depth of 60 inches is brown, friable loam. In places, the thickness of the surface layer combined with that of the subsoil is less than 47 inches and calcareous loam till is within a depth of 40 inches. On some rises the surface layer is loamy sand.

Included with this soil in mapping are a few small areas of the somewhat poorly drained Crosier soils on flats and in slight depressions. These soils make up 7 to 11 percent of the unit.

Available water capacity is high in the Riddles soil. Permeability is moderate. Runoff is slow. Organic matter content is moderate. The surface layer is friable and can be easily tilled throughout a wide range in moisture content. The shrink-swell potential is moderate.

Most areas are used for cultivated crops. Some are used for hay or pasture. A few are wooded.

This soil is well suited to corn, soybeans, and small grain. Measures that control erosion and runoff are needed if cultivated crops are grown. Examples are cover crops, crop rotation, terraces, diversions, contour farming, grassed waterways, grade stabilization structures, and a conservation tillage system that leaves a protective amount of crop residue on the surface. Planting cover crops and leaving crop residue on the surface also improve tilth and increase the organic matter content.

Growing grasses and legumes for hay or pasture is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well only if competing vegetation is controlled. The competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling.

The shrink-swell potential is a moderate limitation if this soil is used as a site for dwellings. Reinforcing

foundations and footings and backfilling with sandy material help to prevent the structural damage caused by shrinking and swelling. Low strength and frost action are moderate limitations on sites for local roads and streets. Providing coarser grained subgrade or base material helps to overcome these limitations. This soil is suitable as a septic tank absorption field.

The capability class is I; woodland suitability subclass 1o.

RxB—Riddles sandy loam, 2 to 6 percent slopes. This gently sloping, deep, well drained soil is on ridges and knolls on till plains. Areas generally are about 20 acres in size but range from 3 to 360 acres.

In a typical profile, the surface layer is dark grayish brown sandy loam about 7 inches thick. The subsurface layer is brown loam about 3 inches thick. The subsoil is firm clay loam about 36 inches thick. The upper part is yellowish brown, and the lower part is dark yellowish brown. The substratum to a depth of 60 inches is brown, friable loam. In some areas the surface layer contains more sand. In a few places, the thickness of the surface layer combined with that of the subsurface layer and the subsoil is less than 46 inches and calcareous loam till is within a depth of 40 inches. On some rises the surface layer is loamy sand.

Included with this soil in mapping are a few small areas of the somewhat poorly drained Crosier soils on the lower parts of the landscape. Also included are small, severely eroded areas and areas where stones are on the surface. Using farm machinery is difficult in the stony areas. Included areas make up 7 to 11 percent of the unit.

Available water capacity is high in the Riddles soil. Permeability is moderate. Runoff is medium. Organic matter content is moderate. The surface layer is friable and can be easily tilled throughout a fairly wide range in moisture content. The shrink-swell potential is moderate.

Most areas are used for cultivated crops. Some are used for hay or pasture. Some are wooded.

This soil is suited to corn, soybeans, and small grain. Measures that control erosion and runoff are needed if cultivated crops are grown. Examples are cover crops, crop rotation, terraces, diversions, contour farming, grassed waterways, grade stabilization structures, and a conservation tillage system that leaves a protective amount of crop residue on the surface. Planting cover crops and leaving crop residue on the surface also improve tilth and increase the organic matter content.

Growing grasses and legumes for hay or pasture is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well only if competing vegetation is controlled. The competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling.

The shrink-swell potential is a moderate limitation if this soil is used as a site for dwellings. Reinforcing foundations and footings and backfilling with sandy material help to prevent the structural damage caused by shrinking and swelling. Low strength and frost action are moderate limitations on sites for local roads and streets. Providing coarser grained subgrade or base material helps to overcome these limitations. This soil is suitable as a septic tank absorption field.

The capability subclass is IIe; woodland suitability subclass 1o.

RxC—Riddles sandy loam, 6 to 12 percent slopes. This moderately sloping, deep, well drained soil is on ridges and knolls on till plains. Areas range from 3 to 300 acres in size.

In a typical profile, the surface layer is dark brown sandy loam about 7 inches thick. The subsurface layer is brown loam about 3 inches thick. The subsoil is yellowish brown, firm clay loam about 35 inches thick. The substratum to a depth of 60 inches is brown, friable loam. In places, the surface layer contains more sand or calcareous loam till is within a depth of 40 inches. On some knolls the surface layer is loamy sand.

Included with this soil in mapping are a few small, severely eroded areas and areas where stones are on the surface. Using farm machinery is difficult in the stony areas. Included areas make up 7 to 11 percent of the unit.

Available water capacity is high in the Riddles soil. Permeability is moderate. Runoff is medium. Organic matter content is moderate. The surface layer is friable and can be easily tilled throughout a fairly wide range in moisture content. The shrink-swell potential is moderate.

Some areas are used for row crops. Some are used for hay or pasture. Some are wooded.

This soil is suited to corn, soybeans, and small grain grown in rotation with grasses and legumes. Measures that control erosion and runoff are needed if cultivated crops are grown. Examples are cover crops, crop rotation, terraces, diversions, contour farming, grassed waterways, grade stabilization structures, and a conservation tillage system that leaves a protective amount of crop residue on the surface. Planting cover crops and leaving crop residue on the surface also improve tilth and increase the organic matter content.

Growing grasses and legumes for hay or pasture is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well only if competing vegetation is controlled. The competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling.

Slope and the shrink-swell potential are moderate limitations if this soil is used as a site for dwellings. The dwellings should be designed to conform to the natural slope of the land. Land shaping is needed in some areas. In order to establish a protective plant cover that controls erosion, topsoil should be stockpiled during construction and used for topdressing after construction. Establishing the plant cover as soon as possible after construction helps to keep soil losses at a minimum. Reinforcing foundations and footings and backfilling with sandy material help to prevent the structural damage caused by shrinking and swelling.

Low strength, slope, and frost action are moderate limitations on sites for local roads and streets. Land shaping and building the roads and streets on the contour help to overcome the slope. Providing coarser grained subgrade or base material helps to prevent the damage caused by low strength and frost action.

Slope is a moderate limitation if this soil is used as a septic tank absorption field. Land shaping and installing the distribution lines across the slope help to overcome this limitation.

The capability subclass is IIIe; woodland suitability subclass 1o.

RxD—Riddles sandy loam, 12 to 18 percent slopes. This strongly sloping, deep, well drained soil is on ridges and knolls on till plains. Areas range from 3 to 70 acres in size.

In a typical profile, the surface layer is dark brown sandy loam about 7 inches thick. The subsurface layer is brown loam about 2 inches thick. The subsoil is yellowish brown, firm clay loam about 35 inches thick. The substratum to a depth of 60 inches is brown, friable loam. In places, the surface layer contains more sand or calcareous loam till is within a depth of 40 inches. In some areas the surface layer is loamy sand.

Included with this soil in mapping are a few small, severely eroded areas and areas where stones are on the surface. Using farm machinery is difficult in the stony areas. Included areas make up 7 to 11 percent of the unit.

Available water capacity is high in the Riddles soil. Permeability is moderate. Runoff is rapid. Organic matter content is moderate. The surface layer is friable and can be easily tilled throughout a fairly wide range in moisture content.

Some areas are used for row crops. Some are used for hay or pasture. Some are wooded.

This soil is suited to corn, soybeans, and small grain grown in rotation with grasses and legumes. Measures that control erosion and runoff are needed if cultivated crops are grown. Examples are cover crops, crop rotation, terraces, diversions, contour farming, grassed waterways, grade stabilization structures, and a conservation tillage system that leaves a protective amount of crop residue on the surface. Planting cover crops and leaving crop residue on the surface also improve tilth and increase the organic matter content.

Growing grasses and legumes for hay or pasture is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well only if competing vegetation is controlled. The competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling.

Slope is a severe limitation if this soil is used as a site for dwellings. The dwellings should be designed to conform to the natural slope of the land. Land shaping is needed in some areas. Removing as little of the plant cover as possible and revegetating as soon as possible after construction help to control erosion. In order to establish a protective plant cover that controls erosion, topsoil should be stockpiled during construction and used for topdressing after construction.

The slope is a severe limitation if this soil is used as a site for local roads and streets. Also, frost action and low strength are moderate limitations. Land shaping and building the roads and streets on the contour help to overcome the slope. Drainage ditches help to keep water from seeping under the road surface and thus help to prevent the damage caused by frost action. Providing coarser grained subgrade or base material helps to prevent the damage caused by low strength and frost action.

Slope is a severe limitation if this soil is used as a septic tank absorption field. Land shaping and installing the distribution lines across the slope help to overcome this limitation. If these measures are not feasible, a better suited soil should be selected.

The capability subclass is IVe; woodland suitability subclass 1o.

Ry—Riverdale loamy sand. This nearly level, deep, somewhat poorly drained soil is on outwash plains bordering deep depressions. Areas are irregular in shape and range from 2 to 35 acres in size.

In a typical profile, the surface layer is very dark grayish brown loamy sand about 7 inches thick. The subsurface layer is brown and yellowish brown loamy sand about 26 inches thick. The subsoil is about 12 inches thick. The upper part is brown, friable sandy loam; the next part is brown, firm loam; and the lower part is yellowish brown, friable sandy loam. The substratum to a depth of 60 inches is pale brown sand that has strata of silt and clay loam. In a few areas the surface layer is lighter colored.

Included with this soil in mapping are a few small areas of the very poorly drained Cohoctah soils on the lower lying parts of the landscape near streams and the moderately well drained Brems soils on the higher parts of the landscape. These soils make up 8 to 12 percent of the unit.

Available water capacity is moderate in the Riverdale soil. Permeability is moderately rapid in the subsoil and very rapid in the substratum. Runoff is slow. The seasonal high water table is at a depth of 1 to 2 feet. Organic matter content is moderate.

Nearly all areas are used for cultivated crops. A few support grasses or legumes for hay or pasture. A few are wooded.

If adequately drained, this soil is suited to corn, soybeans, and small grain. Wetness is the major limitation if crops are grown. A conservation cropping system that is dominated by row crops is suitable if subsurface drains are installed to control the wetness. The drainage system should be carefully controlled because the soil tends to become droughty if it is drained. Cover crops and a conservation tillage system that leaves crop residue on the surface increase the organic matter content and improve tilth.

If adequately drained, this soil is well suited to grasses and legumes for hay or pasture. Deep rooted legumes, such as alfalfa, are not so well suited as shallow rooted legumes. The major concern of management is overgrazing. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

This soil is suited to water tolerant trees. Seedling mortality and plant competition are the main management concerns. Seedlings should be planted as early in the spring as possible. Some do not survive or grow well because of the droughtiness. The competing vegetation can be controlled by cutting, spraying, or girdling.

Wetness is a severe limitation if this soil is used as a site for dwellings or septic tank absorption fields. Installing an adequate drainage system lowers the water table and thus helps to overcome the wetness. Frost action and the wetness are moderate limitations on sites for local roads and streets. Drainage ditches that lower the water table help to overcome these limitations.

The capability subclass is IIIw; woodland suitability subclass 3s.

Sh—Shoals loam. This deep, nearly level, somewhat poorly drained soil is on bottom land. It is frequently flooded by stream overflow. Areas generally are elongated and range from 3 to 390 acres in size.

In a typical profile, the surface layer is dark grayish brown loam about 7 inches thick. The upper part of the substratum, to a depth of about 37 inches, is brown, mottled, friable loam over dark gray, mottled, friable silt loam. The lower part to a depth of 60 inches is grayish brown, friable loam that has thin strata of silt loam and sandy loam.

Included with this soil in mapping are a few small areas of darker soils in small depressions and the well drained Martinsville and Morley soils on the higher parts of the landscape. Included soils make up 9 to 12 percent of the unit.

Available water capacity is high in the Shoals soil. Permeability is moderate. Runoff is very slow. The water table is at a depth of 1 to 3 feet during much of the year. Organic matter content is moderate. The surface layer is friable and can be easily tilled throughout a wide range in moisture content.

Nearly all areas are used for cultivated crops. A few support grasses or legumes for hay or pasture. A few are wooded.

This soil is suited to corn, soybeans, and small grain. Wetness is the major limitation if crops are grown. A conservation cropping system that is dominated by row crops is suitable if subsurface drains are installed to control the wetness. Cover crops and a conservation tillage system that leaves crop residue on the surface increase the organic matter content and improve tilth.

This soil is well suited to grasses and legumes for hay or pasture. Deep rooted legumes, such as alfalfa, are not so well suited as shallow rooted legumes. The major concerns of management are overgrazing and grazing when the soil is wet. Grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suited to trees. Plant competition is severe. Seedlings survive and grow well only if competing vegetation is controlled by spraying, cutting, and girdling.

This soil generally is unsuitable as a site for dwellings and septic tank absorption fields because the wetness and the flooding are severe limitations. A better suited soil should be selected. Frost action and the flooding are severe limitations on sites for local roads and streets. Building on raised, well compacted fill material and constructing adequate drainage ditches help to prevent the damage caused by flooding. By increasing the depth to the water table and keeping water from seeping under the road surface, they also help to prevent the damage caused by frost action.

The capability subclass is IIw; woodland suitability subclass 2o.

Ud—Udorthents, loamy. These deep, well drained to somewhat poorly drained soils occur as areas so altered by urban development that the soil series can no longer be identified. Most areas are filled with 3 or 4 feet of soil material on which buildings have been constructed. Most are around lakes. Most are nearly level, but some are gently sloping or moderately sloping. The areas generally are long and narrow and range from 3 to 280 acres in size.

A typical area is one that has been leveled or filled with sandy loam, loam, or sand and gravel. The soil material is dominantly sand and gravel around the lakes. In a few areas, it is dominantly marl or it is slowly permeable clay loam and silty clay loam.

Included with these soils in mapping are a few areas where the original soil is unaltered. Included areas make up 6 to 12 percent of the unit.

The available water capacity and the permeability of Udorthents vary. Generally, available water capacity is low and permeability moderately rapid. Runoff generally is slow, but in some areas it is rapid. The seasonal high water table is at a depth of 3 to 6 feet in most areas near the lakes. In most areas organic matter content is low. In places, topsoil has been spread on the surface in order to establish grass on homesites.

Most areas are used as sites for dwellings, lawns, and gardens. Some, especially along the Indiana Toll Road and Interstate 69, are used for pasture or are idle. Very few are used for crops or woodland.

These soils generally are unsuited to corn or soybeans. In some areas they are suited to small grain or to grasses and legumes for hay and pasture. In some areas where a large amount of sand and gravel was used as fill material, droughtiness is a problem. If trees and shrubs are planted, seedling mortality generally is a problem because of the droughtiness or the high alkalinity of the soils.

Before these soils are used as sites for dwellings or local roads and streets, onsite investigation is needed. Low strength is a limitation in many areas around the lakes where the underlying material is muck or marl, and a seasonal high water table late in winter and early in spring is a limitation in most areas. Road ditches that lower the water table are needed. Providing coarse grained subgrade or base material helps to prevent the road damage caused by low strength. Also, pilings commonly are used to prevent the damage to buildings.

Septic tank absorption fields generally function properly in these soils if the fill material is deep enough. The soils are not suitable as sites for other kinds of sanitary facilities.

No capability class or subclass or woodland suitability subclass is assigned.

Wa—Wallkill silt loam. This nearly level, deep, very poorly drained soil is in depressions in outwash plains and till plains. It is frequently ponded by runoff from higher lying adjacent soils. Areas are oval or crescent shaped and range from 2 to 30 acres in size.

In a typical profile, the surface layer is very dark gray silt loam about 8 inches thick. The subsurface layer is dark gray, friable silt loam about 6 inches thick. The subsoil is very dark gray, mottled, firm silty clay loam about 8 inches thick. The underlying material to a depth of 60 inches is black muck. In a few small areas the mineral soil is less than 20 inches thick over muck. In places the underlying material is a buried mineral soil or other mineral material.

Included with this soil in mapping are a few small areas of Houghton soils. These soils are in the center of some of the large mapped areas. They formed in deep organic material. They make up 9 to 12 percent of the unit.

Available water capacity is high in the Wallkill soil. Permeability is moderate in the subsoil and moderately slow to moderately rapid in the underlying organic material. Runoff is very slow. The water table is near or above the surface for much of the year. Organic matter content is very high. The surface layer is friable and can be easily tilled throughout a wide range in moisture content.

Some areas are used for cultivated crops. A few are used for hay and pasture. A few are wooded.

If adequately drained, this soil is suited to corn, soybeans, and small grain. If drained and otherwise well managed, it is suited to intensive row cropping. Excess water can be removed by open ditches, subsurface drains, surface drains, or pumps or by a combination of these. A conservation tillage system that leaves crop residue on the surface improves tilth and increases the organic matter content.

This soil is well suited to grasses and legumes for hay or pasture. A drainage system is needed. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Overgrazing also reduces the vigor and density of the plants. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to prevent surface compaction and maintain good tilth and plant density.

This soil is suited to water tolerant trees. Seedling mortality, equipment limitations, and the windthrow hazard are management concerns. In some areas a drainage system is needed to prevent ponding.

This soil generally is unsuitable as a site for dwellings because low strength and ponding are severe limitations. Ponding and frost action are severe hazards on sites for local roads and streets. Building on raised, well compacted fill material and constructing drainage ditches that remove excess water help to prevent the damage caused by ponding and frost action. This soil generally is unsuitable as a septic tank absorption field because the ponding is a severe hazard.

The capability subclass is IIIw; woodland suitability subclass 4w.

Wh—Washtenaw silt loam. This nearly level, deep, poorly drained soil is in depressions in till plains, moraines, and outwash plains. It is frequently ponded by runoff from higher lying adjacent soils. Areas are round or oval and range from 2 to 15 acres in size.

In a typical profile, the surface layer is dark grayish brown silt loam about 9 inches thick. The subsurface layer is dark grayish brown, mottled silt loam about 9 inches thick. The substratum, to a depth of about 28 inches, is dark grayish brown, mottled silt loam. Below this is a buried soil. The surface layer of this buried soil is about 23 inches thick. It is very dark gray, mottled, firm silty clay loam in the upper part and black, firm clay loam in the lower part. The subsoil to a depth of 80 inches is grayish brown, firm silty clay loam that has thin strata of sandy loam. In a few small areas less than 20 inches to a little more than 40 inches of local alluvium overlies the buried soil.

Included with this soil in mapping are a few small areas of the very poorly drained Wallkill, Palms, Pewamo, and Brookston soils. These soils make up 7 to 11 percent of the unit.

Available water capacity is high in the Washtenaw soil. Permeability is slow. Runoff is very slow. The water table is near or above the surface for much of the year. Organic matter content is moderate. The surface layer is friable and can be easily tilled unless it is too wet.

Most areas are used for cultivated crops. A few areas are used for hay and pasture. A few are wooded.

If adequately drained, this soil is well suited to corn, soybeans, and small grain. If drained and otherwise well managed, it is suited to intensive row cropping. Excess water can be removed by open ditches, subsurface drains, surface drains, or pumps or by a combination of these. A conservation tillage system that leaves crop residue on the surface improves tilth and increases the organic matter content.

This soil is suited to grasses and legumes for hay or pasture. A drainage system is needed. Overgrazing or grazing when the soil is too wet damages sod, reduces plant density, and causes surface compaction and poor tilth. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to prevent surface compaction and maintain good tilth and plant density.

This soil is suited to water tolerant trees. Seedling mortality, equipment limitations, and the windthrow hazard are management concerns. In some areas a drainage system is needed to prevent ponding.

This soil is poorly suited to building site development because the ponding is a severe hazard. An adequate drainage system that lowers the water table helps to overcome this hazard. Ponding and frost action are hazards on sites for local roads and streets. Building on raised, well compacted fill material and constructing drainage ditches that remove excess water help to prevent the damage caused by ponding and frost action. This soil is poorly suited to septic tank absorption fields because the ponding and the slow permeability are severe limitations.

The capability subclass is IIw; woodland suitability subclass 2w.

WsB—Wawasee loam, 2 to 6 percent slopes. This gently sloping, deep, well drained soil is on ridges and knolls on till plains. Areas range from 2 to 200 acres in size.

In a typical profile, the surface layer is dark grayish brown loam about 8 inches thick. The subsoil is about 28 inches thick. The upper part is dark yellowish brown, friable fine sandy loam, and the lower part is dark yellowish brown, firm sandy clay loam. The substratum to a depth of 60 inches is yellowish brown sandy loam. In some places the surface layer and the subsoil contain more sand. In other places the subsoil and the substratum contain more clay.

Included with this soil in mapping are a few small areas of the somewhat poorly drained Crosier soils on the lower parts of the landscape. Also included are small, severely eroded areas where the slope is more than 6 percent. Included areas make up 5 to 7 percent of the unit.

Available water capacity is high in the Wawasee soil. Permeability is moderate. Runoff is medium. Organic matter content is moderate. The surface layer is friable and can be easily tilled throughout a fairly wide range in moisture content.

Most areas are used for row crops. Some are used for hay or pasture. Some are wooded.

This soil is suited to corn, soybeans, and small grain. Measures that control erosion and runoff are needed if cultivated crops are grown. Examples are cover crops, crop rotation, terraces, diversions, contour farming, grassed waterways, grade stabilization structures, and a conservation tillage system that leaves a protective amount of crop residue on the surface. Planting cover crops and leaving crop residue on the surface also improve tilth and increase the organic matter content. In the seepy parts of some drainageways and swales, subsurface drains are needed.

Growing grasses and legumes for hay or pasture is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well only if competing vegetation is controlled. The competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling.

This soil is suitable as a site for dwellings and septic tank absorption fields. Frost action is a moderate limitation on sites for local roads and streets. Drainage ditches help to keep water from seeping under the road surface and thus help to prevent the damage caused by frost action.

The capability subclass is IIe; woodland suitability subclass 1o.

WsC—Wawasee loam, 6 to 12 percent slopes. This moderately sloping, deep, well drained soil is on ridges and knolls on till plains (fig. 7). Areas range from 4 to 160 acres in size.

In a typical profile, the surface layer is dark grayish brown loam about 7 inches thick. The subsoil is about 26 inches thick. The upper part is dark yellowish brown, friable fine sandy loam, and the lower part is dark yellowish brown, firm sandy clay loam. The substratum to a depth of 60 inches is yellowish brown, friable loam. In some places the surface layer and the subsoil contain more sand. In other places the subsoil and the substratum contain more clay. In a few areas stones are on the surface. Using farm machinery is difficult in the stony areas.

Figure 7.—An area of Wawasee loam, 6 to 12 percent slopes, in the foreground and Histosols, ponded, in the background.

Included with this soil in mapping are a few small, severely eroded areas where the surface layer is sandy clay loam and a few small areas where the slope is more than 12 percent. Included areas make up 9 to 12 percent of the unit.

Available water capacity is high in the Wawasee soil. Permeability is moderate. Runoff is medium. Organic matter content is moderate. The surface layer is friable and can be easily tilled throughout a fairly wide range in moisture content.

Some areas are used for row crops. Some are used for hay or pasture. Some are wooded.

This soil is suited to corn, soybeans, and small grain grown in rotation with grasses and legumes. Measures that control erosion and runoff are needed if cultivated crops are grown. Examples are cover crops, crop rotation, terraces, diversions, contour farming, grassed waterways, grade stabilization structures, and a conservation tillage system that leaves a protective amount of crop residue on the surface. Planting cover crops and leaving crop residue on the surface also improve tilth and increase the organic matter content.

Growing grasses and legumes for hay or pasture is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates,

pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well only if competing vegetation is controlled. The competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling.

Slope is a moderate limitation if this soil is used as a site for dwellings or septic tank absorption fields. Land shaping is needed in some areas. Dwellings should be designed to conform to the natural slope of the land. The distribution lines in septic tank absorption fields should be installed across the slope. Slope and frost action are moderate limitations on sites for local roads and streets. Building the roads and streets on the contour helps to overcome the slope. Drainage ditches help to keep water from seeping under the road surface and thus help to prevent the damage caused by frost action.

The capability subclass is IIIe; woodland suitability subclass 1o.

WsD—Wawasee loam, 12 to 18 percent slopes. This strongly sloping, deep, well drained soil is on ridges and knolls on till plains. Areas range from 4 to 70 acres in size.

In a typical profile, the surface layer is dark grayish brown loam about 7 inches thick. The subsoil is about 24 inches thick. The upper part is dark yellowish brown, friable fine sandy loam, and the lower part is dark yellowish brown, firm sandy clay loam. The substratum to a depth of 60 inches is yellowish brown, friable sandy loam. In some places the surface layer and the subsoil contain more sand. In other places the subsoil and the substratum contain more clay. In some areas stones are on the surface. Using farm machinery is difficult in the stony areas.

Included with this soil in mapping are a few small, severely eroded areas where the surface layer is sandy clay loam and a few small areas where the slope is more than 18 percent. Included areas make up 9 to 12 percent of the unit.

Available water capacity is high in the Wawasee soil. Permeability is moderate. Runoff is rapid. Organic matter content is moderate. The surface layer is friable and can be easily tilled throughout a fairly wide range in moisture content.

Some areas are used for row crops. Some are used for hay or pasture. Some are wooded.

This soil is suited to corn, soybeans, and small grain grown in rotation with grasses and legumes. Measures that control erosion and runoff are needed if cultivated crops are grown. Examples are cover crops, crop rotation, terraces, diversions, contour farming, grassed waterways, grade stabilization structures, and a conservation tillage system that leaves a protective amount of crop residue on the surface. Planting cover crops and leaving crop residue on the surface also improve tilth and increase the organic matter content.

Growing grasses and legumes for hay or pasture is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well only if competing vegetation is controlled. The competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling.

Slope is a severe limitation if this soil is used as a site for dwellings, local roads and streets, or septic tank absorption fields. Land shaping is needed in some areas. Dwellings should be designed to conform to the natural slope of the land. Roads and streets should be built on the contour if possible. The distribution lines in septic tank absorption fields should be installed across the slope.

The capability subclass is IVe; woodland suitability subclass 1o.

WsE—Wawasee loam, 18 to 25 percent slopes. This moderately steep, deep, well drained soil is on ridges and knolls on till plains. Areas range from 4 to 50 acres in size.

In a typical profile, the surface layer is dark grayish brown loam about 7 inches thick. The subsoil is about 22 inches thick. The upper part is dark yellowish brown, friable fine sandy loam, and the lower part is dark yellowish brown, firm sandy clay loam. The substratum to a depth of 60 inches is yellowish brown, friable sandy loam. In places the surface layer and the subsoil contain more sand. In a few areas, the subsoil and the substratum contain more clay or stones are on the surface.

Included with this soil in mapping are small, severely eroded areas where the surface layer is sandy clay loam and a few small areas where the slope is more than 25 percent. Included areas make up 9 to 12 percent of the unit.

Available water capacity is high in the Wawasee soil. Permeability is moderate. Runoff is rapid. Organic matter content is moderate. The surface layer is friable and can be easily tilled throughout a fairly wide range in moisture content.

Some areas are used for hay or pasture. Some are wooded. Very few are used for row crops.

This soil generally is unsuited to corn, soybeans, and small grain because of the slope. It is better suited to grasses and legumes for hay or pasture. A cover of these plants is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture and the soil in good condition.

This soil is suited to trees. The hazard of erosion, equipment limitations, and plant competition are

moderate. Seedlings survive and grow well only if competing vegetation is controlled. The competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling.

This soil is poorly suited to building site development and septic tank absorption fields because the slope is a severe limitation. A better suited soil should be selected. The slope also is a severe limitation on sites for local roads and streets. Land shaping and building the roads and streets on the contour help to overcome this limitation.

The capability subclass is VIe; woodland suitability subclass 1r.

WvC3—Wawasee sandy clay loam, 6 to 12 percent slopes, severely eroded. This moderately sloping, deep, well drained soil is on ridges and knolls on till plains. Areas range from 5 to 50 acres in size.

In a typical profile, the surface layer is brown sandy clay loam about 7 inches thick. The subsoil is about 20 inches thick. The upper part is dark yellowish brown, firm sandy clay loam; the next part is yellowish brown, firm sandy clay loam; and the lower part is yellowish brown, friable loam. The substratum to a depth of 60 inches is yellowish brown, friable sandy loam. In places the subsoil and the substratum contain more clay. In a few areas the subsoil is more sandy.

Included with this soil in mapping are a few areas that are only slightly eroded, a few small areas where the slope is more than 12 percent, and areas where stones are on the surface. Using farm machinery is difficult in the stony areas. Included areas make up 6 to 8 percent of the unit.

Available water capacity is high in the Wawasee soil. Permeability is moderate. Runoff is rapid. Organic matter content is low. The surface layer can be easily tilled unless it is too wet.

Most areas are used for row crops. Some are used for hay or pasture. Some are wooded.

This soil is suited to corn, soybeans, and small grain grown in rotation with grasses and legumes. Measures that control erosion and runoff are needed if cultivated crops are grown. Examples are cover crops, crop rotation, terraces, diversions, contour farming, grassed waterways, grade stabilization structures, and a conservation tillage system that leaves a protective amount of crop residue on the surface. Planting cover crops and leaving crop residue on the surface also improve tilth and increase the organic matter content.

Growing grasses and legumes for hay or pasture is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing improve the pasture.

This soil is suited to trees. Plant competition is moderate. Seedlings survive and grow well only if competing vegetation is controlled. The competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling.

Slope is a moderate limitation if this soil is used as a site for dwellings or septic tank absorption fields. Land shaping is needed in some areas. Dwellings should be designed to conform to the natural slope of the land. The distribution lines in septic tank absorption fields should be installed across the slope. Slope and frost action are moderate limitations on sites for local roads and streets. Building the roads and streets on the contour helps to overcome the slope. Drainage ditches help to keep water from seeping under the road surface and thus help to prevent the damage caused by frost action.

The capability subclass is IVe; woodland suitability subclass 1o.

WvD3—Wawasee sandy clay loam, 12 to 18 percent slopes, severely eroded. This strongly sloping, deep, well drained soil is on ridges and knolls on till plains. Areas range from 2 to 40 acres in size.

In a typical profile, the surface layer is brown sandy clay loam about 7 inches thick. The subsoil is about 18 inches thick. The upper part is yellowish brown, firm sandy clay loam, and the lower part is yellowish brown, friable loam. The substratum to a depth of 60 inches is yellowish brown, friable sandy loam. In places the subsoil and the substratum are more sandy or clayey.

Included with this soil in mapping are a few areas that are only slightly eroded, a few small areas where the slope is more than 18 percent, and areas where stones are on the surface. Using farm machinery is difficult in the stony areas. Included areas make up 6 to 8 percent of the unit.

Available water capacity is high in the Wawasee soil. Permeability is moderate. Runoff is very rapid. Organic matter content is low. The surface layer can be easily tilled unless it is too wet.

Some areas are used for row crops. Some are used for hay or pasture. Some are wooded.

This soil generally is unsuited to corn, soybeans, and small grain because of the slope and the erosion. Crops should be grown only to reestablish grasses.

Growing grasses and legumes for hay or pasture is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing improve the pasture.

This soil is suited to trees. Plant competition is moderate. Seedlings survive and grow well only if competing vegetation is controlled. The competing trees and shrubs can be controlled by site preparation or by spraying, cutting, or girdling.

Slope is a severe limitation if this soil is used as a site for dwellings, local roads and streets, or septic tank absorption fields. Land shaping is needed in some areas. Dwellings should be designed to conform to the natural

slope of the land. Roads and streets should be built on the contour. The distribution lines in septic tank absorption fields should be installed across the slope. If these measures are not feasible, a better suited soil should be selected.

The capability subclass is VIe; woodland suitability subclass 1o.

Wx—Whitaker loam. This deep, nearly level, somewhat poorly drained soil is on outwash plains. Areas generally are elongated or oval. They range from 2 to 95 acres in size.

In a typical profile, the surface layer is dark grayish brown loam about 11 inches thick. The subsoil is about 38 inches thick. The upper part is brown, mottled, friable sandy clay loam; the next part is grayish brown, mottled, firm sandy clay loam; and the lower part is light brownish gray, mottled, firm clay loam. The substratum to a depth of 60 inches is light brownish gray, firm clay loam that has thin starta of fine sand. In places calcareous material is at a depth of 24 to 36 inches. In some areas the surface layer and the upper part of the subsoil are loamy sand or sand.

Included with this soil in mapping are a few small areas of Rensselaer soils in small depressions and Martinsville soils on the higher parts of the landscape. Renesselaer soils are very poorly drained. Martinsville soils are well drained. Included soils make up 8 to 12 percent of the unit.

Available water capacity is high in the Whitaker soil. Permeability is moderate. Runoff is slow. The water table is at a depth of 1 to 3 feet for much of the year. Organic matter content is moderate. The surface layer is friable and can be easily tilled throughout a wide range in moisture content.

Nearly all areas are used for cultivated crops. A few are used for grasses or legumes for hay or pasture. A few are wooded.

If adequately drained, this soil is suited to corn, soybeans, and small grain. Wetness is the major limitation if crops are grown. A conservation cropping system that includes row crops is suitable if subsurface drains are installed to control the wetness. Cover crops and a conservation tillage system that leaves crop residue on the surface increase the organic matter content and improve tilth.

If adequately drained, this soil is well suited to grasses and legumes for hay or pasture. Deep rooted legumes, such as alfalfa, are not so well suited as shallow rooted legumes. The major concerns of management are overgrazing and grazing when the soil is wet. Grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suited to trees. Plant competition is moderate. Seedlings survive and grow well only if competing vegetation is controlled by spraying, cutting, or girdling.

Wetness is a severe limitation if this soil is used as a site for dwellings or septic tank absorption fields. Installing an adequate drainage system that lowers the water table helps to overcome the wetness. Low strength and frost action are severe limitations on sites for local roads and streets. Drainage ditches remove excess water and thus help to prevent the damage caused by frost action. Providing coarser grained subgrade or base material helps to prevent the damage caused by low strength and frost action.

The capability subclass is IIw; woodland suitability subclass 3o.

prime farmland

Prime farmland is one of several kinds of important farmlands defined by the U.S. Department of Agriculture. It is of major importance in providing the Nation's short- and long-range needs for food and fiber. 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 cropland, 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 or is available for these uses. The soil qualities, growing season, and moisture supply are those needed for a well managed soil economically to produce a sustained high yield of crops. Prime farmland produces the highest yields with minimal inputs of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland usually has an adequate and dependable supply of moisture from precipitation or irrigation. 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 local offices of the Soil Conservation Service.

In Steuben County about 64,000 acres, or about 30 percent of the total acreage, meets the requirements for prime farmland. On an additional 41,000 acres, the soil meets the requirements only in areas where it is drained or protected from flooding, or both. The prime farmland occurs as scattered areas throughout the county, mainly areas of the Blount, Glynwood, Kosciusko, Miami, and Riddles soils. Nearly all of the areas considered prime farmland are used for corn and soybeans.

Some parts of the county have been losing 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 difficult to cultivate and are less productive.

The map units that meet the requirements for prime farmland in Steuben County are listed in this section. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 5. 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 in the section "Detailed soil map units."

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

BnA—Blount silt loam, 0 to 3 percent slopes (where drained)
Bz—Brookston loam (where drained)
CcA—Carmi sandy loam, 0 to 2 percent slopes
Co—Cohoctah sandy loam (where drained and protected from flooding)
CrA—Crosier loam, 0 to 3 percent slopes (where drained)
Dr—Del Rey silt loam (where drained)
GnB—Glynwood silt loam, 2 to 6 percent slopes
HaA—Haskins loam, 0 to 3 percent slopes (where drained)
KoA—Kosciusko sandy loam, 0 to 2 percent slopes
KoB—Kosciusko sandy loam, 2 to 6 percent slopes
MbA—Martinsville loam, 0 to 2 percent slopes
MbB—Martinsville loam, 2 to 6 percent slopes
MfB—Metea loamy sand, 1 to 6 percent slopes
MfC—Metea loamy sand, 6 to 12 percent slopes
MhB—Miami loam, 2 to 6 percent slopes
Mm—Millgrove loam (where drained)
Mn—Milford silty clay loam (where drained)
Pe—Pewamo silty clay loam (where drained)
RaB—Rawson loam, 2 to 6 percent slopes
Rb—Rensselaer loam (where drained)
RxA—Riddles sandy loam, 0 to 2 percent slopes
RxB—Riddles sandy loam, 2 to 6 percent slopes
Wa—Wallkill silt loam (where drained)
Wh—Washtenaw silt loam (where drained)
WsB—Wawasee loam, 2 to 6 percent slopes
Wx—Whitaker loam (where drained)

use and management of the soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

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

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

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

crops and pasture

Arthur L. Mumma, district conservationist, Soil Conservation Service, helped prepare this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed soil map units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

More than 136,465 acres in the survey area was used for crops and pasture in 1967, according to the Conservation Needs Inventory. Of this total, about 12,528 acres was used for permanent pasture; 44,168 acres for row crops, mainly corn; 16,498 acres for close-grown crops, mainly wheat and oats; and 36,025 acres for rotation hay and pasture. The rest was idle cropland (*3*).

The potential of the soils in Steuben County for increased production of food is fair. About 20,154 acres of potentially good cropland is currently used as woodland and 10,650 acres as pasture (*3*). In addition to the reserve productive capacity represented by this land, food production could also be increased considerably by extending the latest crop production technology to all of the cropland in the county. This soil survey can greatly facilitate the application of such technology.

Soil erosion is the major problem on about 72 percent of the cropland and 68 percent of the pasture in Steuben County. If the slope is more than 2 percent, erosion is a hazard. On about 4 percent of the acreage, the hazard is so severe that the soil should not be used as cropland.

Loss of the surface layer through erosion reduces the productivity of soils and results in sedimentation in streams. Productivity is reduced as the surface layer is lost and part of the subsoil is incorporated into a plow layer. Loss of the surface layer is especially damaging on Miami and Morley soils. Erosion also reduces the productivity of soils that tend to be droughty, such as the Boyer, Casco, Chelsea, Kosciusko, Metea, Oshtemo, and Plainfield soils. Control of erosion helps to maintain the productivity of soils and improves the quality of water for municipal use, for recreation, and for fish and wildlife by minimizing the pollution of streams.

In clayey spots on many sloping fields, preparing a good seedbed and tilling are difficult because the original friable surface soil has been eroded away. Such spots are common in areas of the eroded or severely eroded Miami and Morley soils.

Erosion control provides a protective plant cover, reduces the runoff rate, and increases the infiltration

rate. A cropping system that keeps a plant cover on the soil for extended periods can hold soil losses to an amount that will not reduce the productive capacity of the soils. On livestock farms, where part of the acreage is pasture and hayland, including legumes and grasses in the cropping system not only provides nitrogen and improves tilth for the following crop but also reduces the risk or erosion of the sloping soils.

Slopes are so short and irregular that contour tillage or terracing is not practical on the sloping soils in Steuben County. On these soils a cropping system that provides substantial plant cover is needed unless erosion is controlled by a conservation tillage system that leaves crop residue on the surface. Minimizing or eliminating tillage and leaving crop residue on the surface increase the rate of infiltration and reduce the hazards of runoff and erosion. They are suited to most of the soils in the survey area but are less successful on the eroded soils and on the wetter soils that have a moderately fine textured surface layer, such as the Pewamo soils.

Grassed waterways are needed in many areas of the sloping soils, such as the Morley, Miami, and Riddles soils. In many areas the waterways drain across small areas of poorly drained soils. Also, many areas of the Miami and Morley soils are seepy along the drainageways. Installing tile beneath the waterways reduces the wetness in these areas.

Many open ditches are being reconstructed. They are the major outlet for water in the county. Grade stabilization structures are needed to help control erosion in areas where surface water drains into the open ditch. Also, these structures are commonly needed in some open ditches if the grade allows water to move so rapidly that erosion occurs on the sides and bottom of the channels.

Wind erosion is a hazard if the organic soils are drained. It can damage these soils in a few hours if winds are strong and the soils are dry and bare of plant cover or surface mulch. Wind erosion also is a hazard on the soils that have a sandy surface layer. If they are plowed in the fall, these soils are very susceptible to wind erosion the following spring. Maintaining a plant cover or surface mulch or keeping the surface rough through proper tillage minimizes wind erosion. Also, windbreaks of suitable trees and shrubs are effective in controlling wind erosion on the organic soils.

Soil drainage is the major problem on about 21 percent of the cropland and pasture in Steuben County (*3*). Because an artificial drainage system has been installed, some of the very poorly drained soils and most of the poorly drained soils are adequately drained. In a few areas, however, these soils cannot be economically drained because they are in depressions where suitable outlets are not available. Unless artificially drained, the somewhat poorly drained Blount, Crosier, Del Rey, Haskins, Morocco, Riverdale, Shoals, and Whitaker soils are so wet that crops are damaged during most years.

The design of both surface and subsurface drainage systems varies with the kind of soil. A combination of surface drains and subsurface drains is needed in most areas of the very poorly drained soils that are intensively row cropped. The drains should be more closely spaced in slowly permeable soils than in the more rapidly permeable soils. Finding adequate outlets for tile drainage systems is difficult in many areas of the Adrian, Edwards, Houghton, Martisco, and Millgrove soils.

Organic soils oxidize and subside when the pore space is filled with air; therefore, special drainage systems are needed to control the depth and the period of drainage. Keeping the water table at the level required by crops during the growing season and raising it to the surface during other parts of the year minimize the oxidation and subsidence of organic soils.

Information about the design of drainage systems for each kind of soil is available in local offices of the Soil Conservation Service.

Soil fertility is affected by reaction and by the content of plant nutrients. It is naturally low or moderate in most soils on uplands and terraces in Steuben County. The soils on flood plains, such as Cohoctah, Granby Variant, and Shoals soils, are neutral or mildly alkaline and are naturally higher in content of plant nutrients than most soils on uplands and terraces. The very poorly drained soils, such as Adrian, Brookston, Houghton, Palms, and Pewamo soils, are in slight depressions and receive runoff from adjacent upland soils. They normally are slightly acid or neutral.

Most soils on uplands and terraces are naturally slightly acid or medium acid. Applications of ground limestone generally are needed to raise the pH level sufficiently for alfalfa and other crops that grow well only on nearly neutral soils. Available phosphorus and potash levels are naturally low in most of these soils. Lime and fertilizer should be applied according to the results of soil tests, the need of the crop, and the expected level of yields. The Cooperative Extension Service can help in determining the kinds and amounts of fertilizer and lime needed.

Soil tilth is an important factor in the germination of seeds and in the infiltration of water into the soil. Soils with good tilth are granular and porous.

Many of the soils used for crops in the survey area have a surface layer of dark sandy loam or loam that is moderate in content of organic matter. Generally, the structure of these soils is moderate to weak.

Poor tilth is a problem on the dark Milford and Pewamo soils because of the content of clay. These soils often stay wet until late in spring. If plowed when wet, they become very cloddy when dry. As a result, preparing a good seedbed is difficult. Fall plowing generally results in good tilth in the spring.

Field crops suited to the soils and climate of the survey area include many that are not now commonly grown. Corn and soybeans are the main row crops. Wheat and oats are the common close-growing crops. Rye could be grown. Alfalfa, red clover, timothy, birdsfoot trefoil, smooth bromegrass, and orchardgrass are commonly grown for hay or pasture.

Special crops are of limited commercial importance in Steuben County. Only a small acreage is used for vegetables or for small fruits, such as strawberries and blueberries. The deep Oshtemo and Martinsville soils are well drained and warm up early in the spring. As a result, they are especially well suited to many vegetables and small fruits. If adequately drained, the organic soils are well suited to a wide range of vegetable crops. Mint, onions, and potatoes are grown on these soils.

Most of the well drained soils in the survey area are suitable for orchards and nursery plants. Soils in low areas where frost is frequent and air drainage is poor, however, generally are poorly suited to early vegetables, small fruits, and orchards.

The latest information and suggestions about growing special crops can be obtained from local offices of the Cooperative Extension Service and the Soil Conservation Service.

yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 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 yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that insures the smallest possible loss.

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

Crops other than those shown in table 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.

land capability classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland and for engineering purposes.

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

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

Class I soils have slight limitations that restrict their use.

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

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

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

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

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

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

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

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

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

woodland management and productivity

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 (woodland suitability) symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; file; and *r*, steep slopes. The letter *o* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: x, w, t, d, c, s, f, and r.

In table 8, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

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

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

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

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

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

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

windbreaks and environmental plantings

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

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

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

Table 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 nursery.

recreation

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 sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also

important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 10, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 10 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 13 and interpretations for dwellings without basements and for local roads and streets in table 12.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

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

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use (fig. 8). They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

wildlife habitat

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation (fig. 9), by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 11, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, sorghum, and sunflowers.

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

Figure 8.—Golf course in an area of Wawasee loam, 6 to 12 percent slopes, in the foreground and Riverdale loamy sand in the background.

fescue, timothy, lovegrass, bromegrass, bluegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, ragweed, pokeweed, sheepsorrel, dock, crabgrass, and dandelion.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are oak, poplar, beech, wild cherry, sweetgum, willow, black walnut, apple, hawthorn, dogwood, hickory, hazelnut, blackberry, elderberry, 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, seeds, and cones. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

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

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

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with

grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite, pheasant, dove, meadowlark, field sparrow, cottontail, red fox, and woodchuck.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and white-tailed 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, rails, kingfishers, muskrat, mink, and beaver.

engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Figure 9.—Wildlife food plot on Glynwood silt loam, 2 to 6 percent slopes.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

building site development

Table 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 bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

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

sanitary facilities

Table 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 landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to effectively filter the effluent. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 13 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

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

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

The ratings in table 13 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

construction materials

Table 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 determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 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, a water table, rock fragments, bedrock, and toxic material.

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

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

water management

Table 15 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are

not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment (fig. 10). Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

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

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

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

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

Drainage is the removal of excess surface and

Figure 10.—Fishpond built in a ravine on Morley silt loam, 6 to 12 percent slopes, eroded.

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

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances, such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

soil properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

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

engineering index properties

Table 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 "Soil series and their morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 or 20 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, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

physical and chemical properties

Table 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, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion and the amount of soil lost. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.
2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to wind erosion.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 17, the estimated content of organic matter of the plow layer is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

soil and water features

Table 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 intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes are not considered flooding.

Table 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, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered is local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 18 are the depth to the seasonal high water table; the kind of water table—that is,

perched, artesian, or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 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. An artesian water table is under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. A perched water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations generally can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavations.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*6*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 19, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Alfisol.

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 Udalf (*Ud*, meaning humid, plus *alf*, from Alfisol).

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 Hapludalfs (*Hapl*, meaning minimal horizonation, plus *udalf*, the suborder of the Alfisols that have a udic 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 Hapludalfs.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, mesic Typic Hapludalfs.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

soil series and their morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the *Soil Survey Manual* (*5*). Many of the technical terms used in the descriptions are defined in *Soil Taxonomy* (*6*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed soil map units."

Adrian series

The Adrian series consists of deep, very poorly drained soils in depressions. These soils formed in decayed reeds and marsh grasses over sand or gravelly coarse sand. Permeability is moderately slow to moderately rapid in the organic material and rapid in the underlying sand. Slopes range from 0 to 2 percent.

Adrian soils are similar to Houghton and Palms soils and commonly are adjacent to Morocco soils. Houghton soils have an organic layer that is more than 50 inches thick. Palms soils are loamy at a depth of 16 to 50 inches. Morocco soils are mineral soils. They are slightly higher on the landscape than the Adrian soils.

A typical pedon of Adrian muck, drained, in an uncultivated field; 350 feet west and 500 feet north of the center of sec. 18, T. 37 N., R. 12 E.

Oa1—0 to 9 inches; black (N 2/0), broken face and rubbed, sapric material, black (N 2/0) dry; about 10 percent fiber, less than 5 percent rubbed; moderate medium granular structure; common clean sand grains; strongly acid; abrupt wavy boundary.

0a2—9 to 20 inches; black (N 2/0), broken face, dark reddish brown (5YR 2/2), rubbed, sapric material; about 10 percent fiber, less than 5 percent rubbed; weak coarse subangular blocky structure; common clean sand grains; strongly acid; gradual wavy boundary.

Oa3—20 to 28 inches; dark reddish brown (5YR 2/2), broken face, black (5YR 2/1), rubbed, sapric material; about 20 percent fiber, less than 5 percent rubbed; weak thick platy structure; strongly acid; abrupt smooth boundary.

IIC—28 to 60 inches; gray (10YR 5/1) sand; single grain; loose; slightly acid.

The depth to the sandy IIC horizon ranges from 16 to 50 inches. The surface layer is black (10YR 2/1 or N 2/0). It commonly has granular structure, but in some pedons it is massive. The subsurface and bottom tiers have hue of 10YR, 7.5YR, or 5YR, value of 2 or 3, and chroma of 1 or 2 or have hue of N and value of 2 or 3. The organic layers range from strongly acid to neutral. The IIC horizon is sand or gravelly sand. It ranges from slightly acid to moderately alkaline.

Blount series

The Blount series consists of deep, somewhat poorly drained, slowly permeable soils on till plains. These soils formed in glacial till. Slopes range from 0 to 3 percent.

Blount soils are similar to Crosier and Haskins soils and are adjacent to Glynwood, Morley, and Pewamo soils. Crosier and Haskins soils contain less clay in the solum than the Blount soils. Glynwood and Morley soils are higher on the landscape than the Blount soils. Also, they have brighter colors throughout the solum. Pewamo soils are in depressions. Their surface layer is darker than that of the Blount soils, and their solum is grayer throughout.

A typical pedon of Blount silt loam, 0 to 3 percent slopes, in a cultivated field; 2,250 feet south and 600 feet west of the center of sec. 26, T. 36 N., R. 13 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; many fine roots; about 1 percent fine gravel; neutral; abrupt smooth boundary.

B21t—8 to 13 inches; brown (10YR 5/3) silty clay loam; many medium faint grayish brown (10YR 5/2) and light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; firm; common fine roots; thin continuous grayish brown (10YR 5/2) clay films on faces of peds; about 1 percent fine gravel; medium acid; clear wavy boundary.

B22t—13 to 18 inches; brown (10YR 5/3) silty clay loam; many coarse distinct dark yellowish brown (10YR 4/4) and many coarse faint grayish brown (10YR 5/2) mottles; strong medium angular blocky structure; very firm; few fine roots; thin continuous grayish brown (10YR 5/2) clay films on faces of peds; common black (10YR 2/1) iron and manganese oxide accumulations; about 2 percent fine gravel; slightly acid; clear wavy boundary.

B23t—18 to 24 inches; grayish brown (10YR 5/2) silty clay; many fine distinct yellowish brown (10YR 5/4) and gray (10YR 6/1) mottles; moderate coarse prismatic structure parting to strong medium angular blocky; very firm; few fine roots; thin continuous grayish brown (10YR 5/2) clay films on faces of peds; common fine black (10YR 2/1) iron and manganese oxide accumulations; about 2 percent fine gravel; neutral; clear wavy boundary.

B3t—24 to 30 inches; brown (10YR 5/3) silty clay; few fine distinct yellowish brown (10YR 5/6) and light brownish gray (10YR 6/2) mottles; strong medium angular blocky structure; very firm; few fine roots; thin discontinuous grayish brown (10YR 5/2) clay films and thin discontinuous white (10YR 8/1) calcium carbonate coatings on faces of peds; about 1 percent fine gravel; strong effervescence; moderately alkaline; gradual wavy boundary.

C—30 to 60 inches; brown (10YR 5/3) clay loam; common medium distinct yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) mottles; massive; very firm; about 5 percent fine gravel; strong effervescence; moderately alkaline.

The solum is 20 to 36 inches thick. The Ap horizon has hue of 10YR, value of 4, and chroma of 1 or 2. It is silt loam or loam. The B2t horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 4. It is clay loam, silty clay loam, or silty clay. It is strongly acid to slightly acid in the upper part and slightly acid to moderately alkaline in the lower part. The C horizon is clay loam or silty clay loam.

Boyer series

The Boyer series consists of well drained soils on outwash plains and in small areas on moraines. Permeability is moderately rapid in the solum and very rapid in the substratum. These soils are moderately deep over very gravelly coarse sand. They formed in loamy glacial outwash. Slopes range from 0 to 18 percent.

Boyer soils are similar to Kosciusko and Oshtemo soils and commonly are adjacent to those soils and to Riverdale soils. Kosciusko soils contain more clay in the

solum than the Boyer soils. Oshtemo soils are leached of carbonates to a greater depth than the Boyer soils. Also, their solum is thicker. Riverdale soils are lower on the landscape than the Boyer soils. Also, they have a darker surface layer and have low chroma mottles in the subsoil.

A typical pedon of Boyer loamy sand, in an area of Boyer-Ormas loamy sands, 0 to 6 percent slopes, in a cultivated field; 1,900 feet west and 400 feet south of the northeast corner of sec. 14, T. 37 N., R. 13 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) loamy sand, brown (10YR 5/3) dry; weak fine granular structure; very friable; many fine roots; medium acid; abrupt smooth boundary.
A2—8 to 17 inches; light yellowish brown (10YR 6/4) loamy sand; weak fine subangular blocky structure; very friable; few fine roots; about 10 percent gravel; slightly acid; clear wavy boundary.
B21t—17 to 22 inches; reddish brown (5YR 4/4) sandy loam; moderate medium subangular blocky structure; firm; few fine roots; thin continuous dark reddish brown (5YR 3/3) clay films on faces of peds; about 10 percent gravel; slightly acid; clear wavy boundary.
B22t—22 to 27 inches; reddish brown (5YR 4/4) sandy loam; weak coarse subangular blocky structure; friable; few fine roots; thin discontinuous dark reddish brown (5YR 3/3) clay films on faces of peds; about 10 percent gravel; neutral; abrupt irregular boundary.
IIC—27 to 60 inches; yellowish brown (10YR 5/4) very gravelly coarse sand; single grain; loose; strong effervescence; moderately alkaline.

The thickness of the solum is 22 to 40 inches and corresponds to the depth to calcareous very gravelly coarse sand. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is loamy sand or sandy loam. Some pedons do not have an A2 horizon. The B2t horizon has hue of 10YR, 7.5YR, or 5YR, value of 4 or 5, and chroma of 4 to 6. It is medium acid to neutral. It is sandy loam, gravelly sandy loam, sandy clay loam, or gravelly sandy clay loam. The content of gravel in this horizon is 8 to 20 percent. Some pedons have a B3 horizon. In some pedons the C horizon has strata of fine sand, coarse sand, or very gravelly sand.

Brems series

The Brems series consists of deep, moderately well drained, rapidly permeable soils on outwash plains. These soils formed in sandy glacial outwash. Slopes range from 0 to 2 percent.

Brems soils commonly are adjacent to Morocco and Plainfield soils. Morocco soils are lower on the landscape than the Brems soils. Also, their subsoil is grayer throughout. Plainfield soils are higher on the landscape than the Brems soils. Also, their subsoil is brighter colored throughout.

A typical pedon of Brems loamy sand, 0 to 2 percent slopes, in a cultivated field; 500 feet north and 300 feet east of the center of sec. 18, T. 37 N., R. 12 E.

Ap—0 to 8 inches; dark brown (10YR 4/3) loamy sand, brown (10YR 5/3) dry; weak fine granular structure; very friable; medium acid; abrupt smooth boundary.
B21—8 to 20 inches; yellowish brown (10YR 5/6) sand; weak coarse subangular blocky structure; very friable; small fillings of Ap material in old root channels and worm holes; strongly acid; clear wavy boundary.
B22—20 to 25 inches; pale brown (10YR 6/3) sand; few fine distinct brownish yellow (10YR 6/6) mottles; weak coarse subangular blocky structure; very friable; strongly acid; clear wavy boundary.
B3—25 to 45 inches; light brownish gray (10YR 6/2) sand; few fine distinct brownish yellow (10YR 6/6) mottles; single grain; very friable; few thin strong brown (7.5YR 5/6) bands in the lower part; medium acid; gradual wavy boundary.
C—45 to 60 inches; brownish yellow (10YR 6/6) sand; single grain; loose; few thin yellowish red (5YR 5/8) bands; medium acid.

The solum is 40 to 60 inches thick. The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. It is loamy sand or sand. The B2 horizon has hue of 10YR, value of 5 or 6, and chroma of 3 to 8.

Brookston series

The Brookston series consists of deep, very poorly drained soils on till plains. These soils formed in loamy glacial till. Permeability is moderate in the solum and moderately slow in the substratum. Slopes range from 0 to 2 percent.

Brookston soils are similar to Pewamo and Rensselaer soils and commonly are adjacent to Crosier soils. Pewamo soils contain more clay in the solum than the Brookston soils. Rensselaer soils formed in stratified loamy outwash. Crosier soils do not have a mollic epipedon. They are slightly higher on the landscape than the Brookston soils.

A typical pedon of Brookston loam, in a cultivated field; 400 feet south and 200 feet east of the northwest corner of sec. 14, T. 37 N., R. 12 E.

Ap—0 to 10 inches; black (10YR 2/1) loam, very dark grayish brown (10YR 3/2) dry; weak fine granular structure; about 2 percent fine gravel; neutral; abrupt smooth boundary.
A12—10 to 17 inches; black (N 2/0) clay loam; few fine prominent grayish brown (10YR 5/2) and yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; friable; about 2 percent fine gravel; neutral; clear wavy boundary.

B1g—17 to 22 inches; gray (10YR 5/1) sandy clay loam; few fine distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; thin discontinuous very dark gray (10YR 3/1) clay films on faces of peds; about 3 percent fine gravel; neutral; clear wavy boundary.

B21tg—22 to 32 inches; gray (10YR 5/1) clay loam; few medium distinct yellowish brown (10YR 5/6) and few fine prominent light reddish brown (5YR 6/4) and yellowish red (5YR 4/6) mottles; moderate medium subangular blocky structure; firm; thin discontinuous very dark gray (10YR 3/1) clay films on faces of peds; about 5 percent fine gravel; neutral; gradual wavy boundary.

B22tg—32 to 44 inches; gray (10YR 5/1) clay loam; few fine distinct yellowish brown (10YR 5/6) and very pale brown (10YR 7/3) mottles; moderate medium subangular blocky structure; firm; thin discontinuous very dark gray (10YR 3/1) clay films on faces of peds; about 5 percent fine gravel; neutral; clear irregular boundary.

C—44 to 60 inches; gray (10YR 5/1) loam; common medium distinct yellowish brown (10YR 5/6) mottles; massive; friable; about 5 percent fine gravel; strong effervescence; moderately alkaline.

The thickness of the solum is 31 to 50 inches and corresponds to the depth to calcareous till. The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is loam or silt loam. The B horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 or 6, and chroma of 1 or 2. It is clay loam, silty clay loam, or sandy clay loam.

Carmi series

The Carmi series consists of well drained soils that are moderately deep over very gravelly coarse sand. Permeability is moderately rapid in the solum and very rapid in the substratum. These soils formed in loamy and sandy glacial outwash on outwash plains. Slopes range from 0 to 2 percent.

Carmi soils commonly are adjacent to Kosciusko and Millgrove soils. The surface layer of the Kosciusko soils is lighter colored than that of the Carmi soils. Millgrove soils are lower on the landscape than the Carmi soils. Also, they are grayer between the surface layer and the substratum.

A typical pedon of Carmi sandy loam, 0 to 2 percent slopes, in a cultivated field; 780 feet south and 1,300 feet west of the center of sec. 5, T. 37 N., R. 12 E.

Ap—0 to 6 inches; very dark brown (10YR 2/2) sandy loam, very dark grayish brown (10YR 3/2) dry; moderate fine granular structure; friable; common roots; about 5 percent fine gravel; slightly acid; abrupt smooth boundary.

A12—6 to 12 inches; very dark brown (10YR 2/2) sandy loam; moderate medium subangular blocky structure; friable; common roots; about 5 percent fine gravel; medium acid; clear smooth boundary.

B1—12 to 17 inches; dark yellowish brown (10YR 4/4) sandy loam; moderate medium subangular blocky structure; friable; common roots; few small vertical root holes; thin discontinuous very dark grayish brown (10YR 3/2) clay films on faces of peds; about 5 percent fine gravel; strongly acid; clear wavy boundary.

B21t—17 to 22 inches; dark yellowish brown (10YR 4/4) sandy loam; moderate medium subangular blocky structure; firm; common roots; common small vertical root holes; thin continuous dark yellowish brown (10YR 3/4) clay films on faces of peds; about 10 percent gravel; very strongly acid; abrupt smooth boundary.

B22t—22 to 29 inches; dark brown (7.5YR 4/4) gravelly sandy clay loam; weak medium subangular blocky structure; firm; common roots; thin continuous dark yellowish brown (10YR 3/4) clay films on faces of peds; very strongly acid; clear wavy boundary.

B23t—29 to 35 inches; dark brown (7.5YR 4/4) gravelly sandy loam; weak coarse subangular blocky structure; friable; thin continuous dark yellowish brown (10YR 3/4) clay films on faces of peds; strongly acid; abrupt wavy boundary.

B3t—35 to 36 inches; dark brown (7.5YR 3/2) gravelly sandy loam; weak coarse subangular blocky structure; friable; thin continuous dark brown (7.5YR 3/2) clay films on pebbles and sand grains; neutral; abrupt wavy boundary.

IIC—36 to 60 inches; light yellowish brown (10YR 6/4) and yellow (10YR 7/6) very gravelly coarse sand; single grain; loose; strong effervescence; moderately alkaline.

The thickness of the solum is 30 to 40 inches and is the same as the depth to carbonates. The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. Some pedons do not have an A12 horizon, and some do not have a B1 horizon. The B2t horizon has hue of 10YR or 7.5YR and value and chroma of 3 or 4. It is sandy loam, sandy clay loam, gravelly sandy loam, or gravelly sandy clay loam. It is strongly acid or very strongly acid. The B3 horizon is strongly acid to neutral.

Casco series

The Casco series consists of somewhat excessively drained soils that are shallow over very gravelly coarse sand. Permeability is moderate in the solum and very rapid in the substratum. These soils formed in loamy and sandy glacial outwash on outwash plains. Slopes range from 6 to 18 percent.

Casco soils are similar to Boyer and Kosciusko soils and commonly are adjacent to Millgrove soils. The solum of the Boyer and Kosciusko soils is thicker than that of the Casco soils. Also, Boyer soils contain less clay than

the Casco soils. Millgrove soils have a mollic epipedon. They are lower on the landscape than the Casco soils.

A typical pedon of Casco gravelly sandy loam, 6 to 12 percent slopes, in a cultivated field; 1,600 feet north and 1,000 feet east of the southwest corner of sec. 13, T. 37 N., R. 12 E.

Ap—0 to 7 inches; brown (10YR 4/3) gravelly sandy loam, yellowish brown (10YR 5/4) dry; moderate medium granular structure; friable; few fine roots; about 25 percent gravel; medium acid; abrupt smooth boundary.

B2t—7 to 16 inches; brown (7.5YR 5/4) gravelly clay loam; moderate medium subangular blocky structure; firm; few fine roots; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds; about 30 percent gravel; slightly acid; abrupt irregular boundary.

IIC—16 to 60 inches; yellowish brown (10YR 5/4) very gravelly coarse sand; single grain; loose; strong effervescence; moderately alkaline.

The thickness of the solum is 12 to 22 inches and corresponds to the depth to calcareous very gravelly coarse sand. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is sandy loam or gravelly sandy loam. Some pedons have an A2 horizon. The B2t horizon has hue of 10YR, 7.5YR, or 5YR, value of 3 to 5, and chroma of 4. It is gravelly clay loam or sandy clay loam. It is medium acid to neutral.

Chelsea series

The Chelsea series consists of deep, excessively drained, rapidly permeable soils on outwash plains. These soils formed in windblown sand. Slopes range from 1 to 12 percent.

Chelsea soils are similar to Plainfield soils and commonly are adjacent to Cohoctah soils. The texture of Plainfield soils is sand or fine sand to a depth of 60 inches or more. Cohoctah soils have a mollic epipedon. They contain more clay in the solum than the Chelsea soils. They are on the lower parts of the landscape.

A typical pedon of Chelsea fine sand, 1 to 6 percent slopes, in an uncultivated field; 1,100 feet west and 850 feet north of the center of sec. 16, T. 38 N., R. 15 E.

Ap—0 to 8 inches; brown (10YR 4/3) fine sand, pale brown (10YR 6/3) dry; weak fine granular structure; very friable; many fine roots; medium acid; abrupt smooth boundary.

A21—8 to 20 inches; yellowish brown (10YR 5/4) fine sand; weak fine granular structure; very friable; few fine roots; medium acid; gradual smooth boundary.

A22—20 to 32 inches; light yellowish brown (10YR 6/4) fine sand; single grain; loose; few fine roots; few fine dark yellowish brown (10YR 4/4) loamy sand pellets in the lower part; strongly acid; gradual wavy boundary.

A&B—32 to 80 inches; very pale brown (10YR 7/4) fine sand (A2); single grain; loose; dark brown (7.5YR 3/4) lamellae or bands of loamy fine sand (Bt); weak medium subangular blocky structure in the thicker bands; very friable; discontinuous bands are 1/4 to 1/2 inch thick and are 2 to 6 inches apart; one discontinuous layer of sandy loam 2 inches thick at a depth of 45 inches; strongly acid.

The thickness of the solum ranges from 60 to 100 inches. The Ap horizon has hue of 10YR, value of 4, and chroma of 2 or 3. It is fine sand or loamy fine sand. The A2 horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 3 or 4. The A&B horizon has lamellae 1/4 inch to 2 inches thick. The lamellae have hue of 10YR or 7.5YR and value and chroma of 3 or 4. They are loamy fine sand, fine sandy loam, or sandy loam.

Cohoctah series

The Cohoctah series consists of deep, very poorly drained, moderately rapidly permeable soils on bottom land. These soils formed in alluvium along streams or lakes. Slopes range from 0 to 2 percent.

Cohoctah soils are similar to Granby Variant and Millgrove soils and commonly are adjacent to Chelsea soils. Granby Variant soils contain less clay in the solum than the Cohoctah soils. Millgrove soils contain more clay in the subsoil than the Cohoctah soils. Chelsea soils are higher on the landscape than the Cohoctah soils. Also, they have brighter colors.

A typical pedon of Cohoctah sandy loam, in a cultivated field; 900 feet east and 50 feet south of the northwest corner of sec. 28, T. 37 N., R. 12 E.

Ap—0 to 11 inches; black (10YR 2/1) sandy loam, dark gray (10YR 4/1) dry; weak fine granular structure; very friable; about 2 percent fine gravel; medium acid; abrupt smooth boundary.

B21g—11 to 18 inches; dark gray (10YR 4/1) loamy sand; few fine faint gray (10YR 5/1) mottles; weak medium subangular blocky structure; very friable; few very dark grayish brown (10YR 3/2) organic stains on faces of peds; black (10YR 2/1) Ap soil material in old root channels and worm holes; about 5 percent fine gravel; slightly acid; gradual wavy boundary.

B22g—18 to 24 inches; grayish brown (10YR 5/2) loamy sand; common medium faint gray (10YR 5/1) mottles; weak medium subangular blocky structure; very friable; few very dark grayish brown (10YR 3/2) organic stains on faces of peds; about 5 percent fine gravel; slightly acid; clear wavy boundary.

B23g—24 to 30 inches; dark gray (10YR 4/1) sandy clay loam; common coarse faint gray (10YR 5/1) mottles; moderate medium subangular blocky structure; friable; thin continuous very dark gray (10YR 3/1) clay films on faces of peds; about 5 percent fine gravel; slightly acid; clear wavy boundary.

B3g—30 to 35 inches; dark gray (10YR 4/1) sandy loam; common coarse faint gray (10YR 5/1) mottles; weak medium subangular blocky structure; friable; thin patchy clay films on faces of peds; about 5 percent fine gravel; slightly acid; clear wavy boundary.
C1g—35 to 40 inches; gray (10YR 5/1) loamy sand; single grain; loose; about 5 percent fine gravel; neutral; clear wavy boundary.
C2g—40 to 48 inches; dark gray (10YR 4/1) loamy sand; single grain; loose; about 5 percent fine gravel; neutral; clear wavy boundary.
C3g—48 to 60 inches; grayish brown (10YR 5/2) loamy sand; single grain; loose; about 5 percent fine gravel; slight effervescence; moderately alkaline.

The solum is 20 to 44 inches thick. The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1. The B2g horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. It is loamy sand, sandy loam, or sandy clay loam. It is medium acid to neutral. The C horizon is loamy sand, sand, or gravelly sand. It is neutral to moderately alkaline.

Crosier series

The Crosier series consists of deep, somewhat poorly drained, moderately slowly permeable soils on moraines and till plains. These soils formed in loamy glacial till. Slopes range from 0 to 3 percent.

Crosier soils are similar to Whitaker soils and commonly are adjacent to Brookston and Miami soils. Whitaker soils formed in stratified loamy outwash. Brookston soils have a mollic epipedon. They are grayer than the Crosier soils. They are on the lower parts of the landscape. Miami soils are higher on the landscape than the Crosier soils. Also, they have brighter colors.

A typical pedon of Crosier loam, 0 to 3 percent slopes, in a cultivated field; 2,000 feet east and 100 feet north of the center of sec. 20, T. 38 N., R. 13 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; about 2 percent fine gravel; medium acid; abrupt smooth boundary.
B21t—8 to 20 inches; yellowish brown (10YR 5/4) clay loam; many medium distinct grayish brown (10YR 5/2) and many medium faint yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; thin continuous grayish brown (10YR 5/2) clay films on faces of peds; few dark reddish brown (5YR 2/2) iron and manganese oxide accumulations; about 5 percent fine gravel; slightly acid; gradual wavy boundary.
B22t—20 to 26 inches; brown (10YR 5/3) clay loam; many medium faint grayish brown (10YR 5/2) and common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; many continuous grayish brown (10YR 5/2) clay films on faces of peds; few dark reddish brown (5YR 2/2) iron and manganese accumulations; about 5 percent fine gravel; slightly acid; gradual wavy boundary.
B3t—26 to 32 inches; brown (10YR 5/3) loam; many medium faint grayish brown (10YR 5/2) and common medium distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; thin discontinuous dark gray (10YR 4/1) clay films on faces of peds; about 5 percent fine gravel; strong effervescence; moderately alkaline; gradual wavy boundary.
C—32 to 60 inches; yellowish brown (10YR 5/4) loam; massive; friable; many gray (10YR 6/1) streaks; about 5 percent fine gravel; strong effervescence; moderately alkaline.

The solum is 26 to 40 inches thick. The Ap horizon has hue of 10YR, value of 4, and chroma of 2 or 3. It is loam or sandy loam. Some pedons have an A2 horizon. The Bt horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 4. It is slightly acid or neutral in the upper part and neutral to moderately alkaline in the lower part.

Del Rey series

The Del Rey series consists of deep, somewhat poorly drained, slowly permeable soils on lake plains. These soils formed in lacustrine deposits. Slopes range from 0 to 3 percent.

Del Rey soils are similar to Blount and Haskins soils and commonly are adjacent to Milford soils. Blount soils formed in glacial till. Haskins soils contain less clay in the solum than the Del Rey soils. Milford soils have a mollic epipedon. They are slightly lower on the landscape than the Del Rey soils.

A typical pedon of Del Rey silt loam, in a cultivated field; 500 feet west and 700 feet south of the center of sec. 24, T. 36 N., R. 14 E.

Ap—0 to 8 inches; brown (10YR 4/3) silt loam, very pale brown (10YR 7/3) dry; moderate medium granular structure; friable; few fine roots; medium acid; abrupt smooth boundary.
B21t—8 to 11 inches; brown (10YR 5/3) silty clay loam; few fine faint gray (10YR 5/1) and few fine distinct yellowish brown (10YR 5/6) mottles; moderate medium angular blocky structure; very firm; thin patchy clay films; few fine roots; slightly acid; abrupt smooth boundary.
B22t—11 to 17 inches; grayish brown (10YR 5/2) silty clay; many coarse distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate medium angular blocky; very firm; few fine roots; thin continuous dark gray (10YR 4/1) clay films on faces of peds; neutral; gradual smooth boundary.
B23t—17 to 24 inches; grayish brown (10YR 5/2) silty clay; many coarse distinct yellowish brown (10YR

5/6) mottles; weak coarse prismatic structure parting to moderate medium angular blocky; very firm; few fine roots; thin continuous dark gray (10YR 4/1) clay films on faces of peds; neutral; gradual smooth boundary.

B3t—24 to 40 inches; grayish brown (10YR 5/2) silty clay; common coarse distinct yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure parting to moderate medium angular blocky; very firm; few fine roots to a depth of 35 inches; thin discontinuous dark gray (10YR 4/1) clay films on faces of peds; strong effervescence; moderately alkaline; gradual smooth boundary.

C—40 to 60 inches; grayish brown (10YR 5/2) silty clay loam; many coarse distinct yellowish brown (10YR 5/6) mottles; massive; firm; strong effervescence; moderately alkaline.

The solum is 29 to 40 inches thick. The Ap horizon has hue of 10YR, value of 4, and chroma of 2 or 3. The B2t horizon has hue of 10YR, value of 5 or 6, and chroma of 2 to 6. It is slightly acid or medium acid in the upper part and neutral to moderately alkaline in the lower part. The C horizon has thin strata of sand, silt loam, or silty clay in some pedons.

Edwards series

The Edwards series consists of deep, very poorly drained soils in depressions. These soils formed in organic material over marl. Permeability is moderately slow to moderately rapid in the organic layers and slow in the underlying marl. Slopes range from 0 to 2 percent.

Edwards soils are similar to Adrian and Palms soils and commonly are adjacent to Martisco soils. Adrian soils are underlain by sand. Palms soils are underlain by loamy material. The organic material in the Martisco soils is less than 16 inches deep over marl.

A typical pedon of Edwards muck, drained, in an uncultivated field; 1,800 feet south and 500 feet west of the center of sec. 17, T. 37 N., R. 12 E.

Oa1—0 to 10 inches; black (N 2/0), broken face and rubbed, sapric material, black (5YR 2/1) dry; about 10 percent fiber, less than 5 percent rubbed; moderate medium granular structure; friable; very dark grayish brown (10YR 3/2) sodium pyrophosphate; herbaceous fibers; mildly alkaline; abrupt smooth boundary.

Oa2—10 to 32 inches; black (N 2/0), broken face and rubbed, sapric material; about 5 percent fiber, 1 percent rubbed; weak thick platy structure; friable; very dark grayish brown (10YR 3/2) sodium pyrophosphate; herbaceous fibers; mildly alkaline; clear smooth boundary.

Lca—32 to 60 inches; light gray (10YR 7/1) marl; massive; friable; violent effervescence; moderately alkaline.

The depth to the Lca horizon ranges from 16 to 49 inches. The surface layer is black (10YR 2/1 or N 2/0). It commonly has granular structure, but in some pedons it is massive. The subsurface tier has hue of 10YR, 7.5YR, or 5YR, value of 2 or 3, and chroma of 1 or 2 or has hue of N and value of 2 or 3. The organic layers are neutral or mildly alkaline. In some pedons the marl has a layer of sandy material 4 to 12 inches thick within a depth of 51 inches.

Glynwood series

The Glynwood series consists of deep, moderately well drained, slowly permeable soils on moraines and till plains. These soils formed in glacial till. Slopes range from 2 to 6 percent.

Glynwood soils are similar to Miami and Rawson soils and commonly are adjacent to Blount soils. Miami and Rawson soils contain less clay in the subsoil than the Glynwood soils. Also, the Miami soils contain less clay in the substratum. Blount soils have a grayer subsoil than the Glynwood soils. They are on the lower parts of the landscape.

A typical pedon of Glynwood silt loam, 2 to 6 percent slopes, in a cultivated field; 100 feet north and 850 feet west of the southeast corner of sec. 32, T. 38 N., R. 14 E.

Ap—0 to 6 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate fine subangular blocky structure; friable; common fine roots; neutral; abrupt smooth boundary.

B1t—6 to 10 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; firm; few fine roots; about 2 percent fine gravel; neutral; clear smooth boundary.

B21t—10 to 15 inches; yellowish brown (10YR 5/4) clay; strong medium subangular blocky structure; very firm; few fine roots; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; about 3 percent gravel; slightly acid; clear smooth boundary.

B22t—15 to 25 inches; yellowish brown (10YR 5/4) clay; strong medium subangular blocky structure; very firm; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; about 3 percent gravel; neutral; clear smooth boundary.

B3t—25 to 33 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; firm; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; about 3 percent gravel; slight effervescence; moderately alkaline; gradual wavy boundary.

C—33 to 60 inches; brown (10YR 5/3) clay loam; massive; very firm; strong effervescence; moderately alkaline.

The solum is 20 to 40 inches thick. The Ap horizon has hue of 10YR, value of 4, and chroma of 2 or 3. It is

loam or silt loam. The Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 4 to 6. It is clay loam, silty clay, loam, clay, or silty clay. It is neutral to strongly acid in the upper part and medium acid to moderately alkaline in the lower part. The C horizon is silty clay loam or clay loam.

Granby Variant

The Granby Variant consists of deep, very poorly drained, rapidly permeable soils on bottom land. These soils formed in sandy alluvium. Slopes range from 0 to 2 percent.

Granby Variant soils are similar to Cohoctah soils and commonly are adjacent to Morocco soils. Cohoctah soils contain more clay in the solum than the Granby Variant soils. Morocco soils are more acid than the Granby Variant soils. They are on the slightly higher parts of the landscape.

A typical pedon of Granby Variant loamy sand, in a cultivated field; 600 feet west and 1,500 feet south of the northeast corner of sec. 18, T. 37 N., R. 12 E.

Ap—0 to 12 inches; very dark grayish brown (10YR 3/2) loamy sand, dark gray (10YR 4/1) dry; weak fine granular structure; very friable; common roots; medium acid; abrupt smooth boundary.
B21g—12 to 15 inches; grayish brown (2.5Y 5/2) loamy sand; few medium distinct gray (N 6/0) mottles; weak fine granular structure; very friable; few brown (10YR 5/3) splotches; medium acid; clear smooth boundary.
B22g—15 to 20 inches; light brownish gray (2.5Y 6/2) sand; few medium distinct gray (N 6/0) mottles; single grain; loose; few brown (10YR 5/3) splotches; medium acid; clear wavy boundary.
B3g—20 to 30 inches; light brownish gray (2.5Y 6/2) sand; common medium distinct gray (N 6/0) mottles; single grain; loose; about 2 percent fine gravel; slightly acid; clear wavy boundary.
Cg—30 to 60 inches; light gray (10YR 7/2) sand; single grain; loose; neutral.

The solum is 25 to 52 inches thick. The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is loamy sand or loamy fine sand. The Bg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. It is fine sand, sand, or loamy sand. It is medium acid to neutral. The C horizon is sand or fine sand that in some pedons has thin strata of loamy material. It is neutral to moderately alkaline.

Haskins series

The Haskins series consists of deep, somewhat poorly drained soils on till plains and former lakebeds. Permeability is moderate in the solum and slow in the substratum. These soils formed in loamy material and in the underlying moderately fine textured till or lacustrine deposits. Slopes range from 0 to 3 percent.

Haskins soils are similar to Blount and Whitaker soils and commonly are adjacent to Rawson soils. Blount soils contain more clay in the solum than the Haskins soils. Whitaker soils contain less clay in the substratum than the Haskins soils. Rawson soils are higher on the landscape than the Haskins soils. Also, they have brighter colors.

A typical pedon of Haskins loam, 0 to 3 percent slopes, in a cultivated field; 700 feet south and 1,250 feet west of the center of sec. 13, T. 38 N., R. 13 E.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; neutral; abrupt smooth boundary.
B1t—9 to 13 inches; grayish brown (10YR 5/2) sandy loam; few fine faint light brownish gray (10YR 6/2) and gray (10YR 5/1) and few fine distinct yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; friable; neutral; abrupt smooth boundary.
B21t—13 to 20 inches; yellowish brown (10YR 5/4) sandy loam; many medium distinct light gray (10YR 7/2) mottles; weak fine subangular blocky structure; friable; neutral; clear smooth boundary.
B22tg—20 to 26 inches; light brownish gray (10YR 6/2) clay loam; common medium prominent strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; thin discontinuous dark gray (10YR 4/1) clay films on faces of peds; medium acid; clear smooth boundary.
B23tg—26 to 34 inches; gray (10YR 5/1) clay loam; common medium prominent strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; thin continuous dark gray (10YR 4/1) clay films on faces of peds; about 2 percent fine gravel; slightly acid; clear smooth boundary.
IIB3—34 to 50 inches; gray (10YR 5/1) silty clay loam; common medium distinct dark yellowish brown (10YR 4/4) mottles; moderate coarse prismatic structure parting to moderate medium subangular blocky; firm; slight effervescence; moderately alkaline; clear smooth boundary.
IIC—50 to 60 inches; dark gray (10YR 4/1) silty clay loam; massive; very firm; thin white (10YR 8/1) deposits of free carbonates; strong effervescence; moderately alkaline.

The solum is 28 to 50 inches thick. The Ap horizon is loam or sandy loam. The B2t horizon has hue of 10YR, value of 4 to 6, and chroma of 1 to 4. It is sandy loam, loam, clay loam, or sandy clay loam. It is neutral to medium acid. The IIB horizon has colors similar to those of the B2t horizon. It is clay loam or silty clay loam. It is slightly acid to moderately alkaline. The IIC horizon is clay loam, silty clay loam, or silty clay and in some pedons has thin strata of material that is more loamy.

Houghton series

The Houghton series consists of deep, very poorly drained soils in depressions. Permeability is moderately slow to moderately rapid. These soils formed in organic material. Slopes range from 0 to 2 percent.

Houghton soils are similar to Muskego soils and commonly are adjacent to Edwards and Muskego soils. The organic material in Muskego soils is 16 to 50 inches deep over coprogenous earth. That in Edwards soils is 16 to 50 inches deep over marl.

A typical pedon of Houghton muck, drained, in a cultivated field; 2,000 feet north and 200 feet east of the southwest corner of sec. 1, T. 37 N., R. 14 E.

Oa1—0 to 16 inches; black (N 2/0), broken face and rubbed, sapric material, black (5YR 2/1) dry; about 5 percent fiber, less than 1 percent rubbed; weak fine granular structure; friable; very dark grayish brown (10YR 3/2) sodium pyrophosphate; herbaceous fibers; neutral; abrupt smooth boundary.

Oa2—16 to 30 inches; black (N 2/0), broken face and rubbed, sapric material; about 5 percent fiber, less than 1 percent rubbed; weak medium platy structure; friable; very dark grayish brown (10YR 3/2) sodium pyrophosphate; herbaceous fibers; neutral; clear smooth boundary.

Oa3—30 to 50 inches; black (10YR 2/1), broken face and rubbed, sapric material; about 5 percent fiber, less than 1 percent rubbed; weak thick platy structure; friable; very dark grayish brown (10YR 3/2) sodium pyrophosphate; herbaceous fibers; neutral; clear smooth boundary.

Oa4—50 to 60 inches; black (10YR 2/1), broken face and rubbed, sapric material; about 5 percent fiber, less than 1 percent rubbed; massive; friable; very dark grayish brown (10YR 3/2) sodium pyrophosphate; herbaceous fibers; mildly alkaline.

The organic layers are more than 50 inches thick. The surface layer is black (10YR 2/1 or N 2/0). It commonly has granular structure, but in some pedons it is massive. It is strongly acid to neutral. The subsurface and bottom tiers have hue of 10YR, 7.5YR, or 5YR, value of 2 or 3, and chroma of 1 or 2 or have hue of N and value of 2 or 3. They are strongly acid to mildly alkaline.

Kosciusko series

The Kosciusko series consists of well drained soils on outwash plains and moraines. Permeability is moderate in the solum and very rapid in the substratum. These soils are moderately deep over very gravelly coarse sand. They formed in glacial outwash. Slopes range from 0 to 12 percent.

Kosciusko soils are similar to Boyer and Casco soils and commonly are adjacent to Millgrove soils. Boyer soils contain less clay in the subsoil than the Kosciusko soils. Casco soils are shallower to very gravelly coarse sand than the Kosciusko soils. Millgrove soils have a mollic epipedon. They are lower on the landscape than the Kosciusko soils.

A typical pedon of Kosciusko sandy loam, 0 to 2 percent slopes, in a cultivated field; 850 feet north and 2,100 feet west of the southeast corner of sec. 12, T. 37 N., R. 12 E.

Ap—0 to 8 inches; dark brown (10YR 4/3) sandy loam, brown (10YR 5/3) dry; moderate medium granular structure; friable; many fine roots; about 5 percent gravel; medium acid; abrupt smooth boundary.

B21t—8 to 15 inches; strong brown (7.5YR 5/6) gravelly sandy clay loam; moderate medium subangular blocky structure; firm; few fine roots; thin patchy reddish brown (5YR 4/4) clay films on faces of peds; about 15 percent gravel; slightly acid; gradual wavy boundary.

B22t—15 to 23 inches; strong brown (7.5YR 5/6) gravelly sandy clay loam; moderate medium subangular blocky structure; firm; few fine roots; thin discontinuous dark reddish brown (5YR 3/4) clay films on faces of peds; about 20 percent gravel; slightly acid; gradual wavy boundary.

B31—23 to 30 inches; strong brown (7.5YR 5/6) gravelly sandy loam; weak medium subangular blocky structure; friable; few fine roots; thin patchy dark reddish brown (5YR 3/4) clay films on pebbles; about 20 percent gravel; slightly acid; gradual wavy boundary.

B32—30 to 34 inches; yellowish red (5YR 4/6) gravelly loamy sand; weak fine granular structure; very friable; few fine roots; about 20 percent gravel; strongly acid; clear irregular boundary.

IIC—34 to 60 inches; light yellowish brown (10YR 6/4) very gravelly coarse sand; single grain; loose; strong effervescence; moderately alkaline.

The thickness of the solum is 24 to 40 inches and corresponds to the depth to calcareous very gravelly coarse sand. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is sandy loam, gravelly sandy loam, or loam. The Bt horizon has hue of 10YR, 7.5YR, or 5YR, value of 3 to 5, and chroma of 3 to 6. It is slightly acid to strongly acid. It is sandy clay loam, clay loam, sandy loam, or the gravelly phases of these textures. The content of gravel in this horizon is 10 to 20 percent.

Martinsville series

The Martinsville series consists of deep, well drained, moderately permeable soils on outwash plains. These soils formed in stratified loamy outwash. Slopes range from 0 to 12 percent.

Martinsville soils are similar to Miami and Rawson soils and commonly are adjacent to Whitaker soils. Miami

soils are underlain by loam till. Rawson soils are underlain by moderately fine textured till or lacustrine deposits. Whitaker soils are grayer than the Martinsville soils. They are on the lower parts of the landscape.

A typical pedon of Martinsville loam, 2 to 6 percent slopes, in a cultivated field; 1,600 feet east and 1,300 feet north of the southwest corner of sec. 13, T. 38 N., R. 13 E.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; very friable; neutral; abrupt smooth boundary.
A2—9 to 14 inches; dark yellowish brown (10YR 4/4) loam; weak fine subangular blocky structure; friable; few fine distinct pale brown (10YR 6/3) silt coatings on faces of peds; neutral; clear smooth boundary.
B21t—14 to 18 inches; dark yellowish brown (10YR 4/4) clay loam; few fine faint yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; thin clay films on faces of peds; neutral; clear smooth boundary.
B22t—18 to 25 inches; strong brown (7.5YR 5/6) clay loam; moderate medium subangular blocky structure; firm; continuous thin yellowish brown (10YR 5/4) clay films on faces of peds; medium acid; clear smooth boundary.
B23t—25 to 38 inches; strong brown (7.5YR 5/6) clay loam; moderate medium subangular blocky structure; firm; discontinuous thin dark yellowish brown (10YR 4/4) clay films on faces of peds; neutral; clear smooth boundary.
IIC—38 to 60 inches; yellowish brown (10YR 5/4) sandy loam that has thin strata of fine sand and silt; massive; friable; strong effervescence; moderately alkaline.

The solum is 36 to 58 inches thick. The Ap horizon has hue of 10YR, value of 4, and chroma of 2 or 3. It is sandy loam or loam. The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is clay loam or sandy clay loam. It is medium acid to neutral in the upper part and slightly acid or neutral in the lower part.

Martisco series

The Martisco series consists of very poorly drained soils that are shallow over marl. These soils formed in organic material over marl. Permeability is moderately slow to moderately rapid in the organic material and slow in the marl. Slopes range from 0 to 2 percent.

Martisco soils are similar to Edwards and Muskego soils and commonly are adjacent to Edwards soils. The organic material in Edwards soils is 16 to 50 inches deep over marl. Muskego soils formed in organic material over coprogenous earth.

A typical pedon of Martisco muck, undrained, in an uncultivated field; 1,400 feet north and 1,600 feet east of the southwest corner of sec. 18, T. 36 N., R. 12 E.

Oa1—0 to 12 inches; black (5YR 2/1), broken face and rubbed, sapric material, black (5YR 2/1) dry; less than 5 percent fiber before and after rubbing; weak fine granular structure; friable; very dark grayish brown (10YR 3/2) sodium pyrophosphate; herbaceous fibers; slight effervescence; moderately alkaline; clear smooth boundary.
Oa2—12 to 14 inches; black (10YR 2/1), broken face and rubbed, sapric material; less than 5 percent fiber before and after rubbing; weak medium granular structure; friable; very dark grayish brown (10YR 3/2) sodium pyrophosphate; herbaceous fibers; few small light gray (10YR 6/1) flecks of marl; strong effervescence; moderately alkaline; abrupt smooth boundary.
Lca—14 to 60 inches; light gray (10YR 6/1) marl; massive; friable; violent effervescence; moderately alkaline.

The depth to the Lca horizon is 8 to 16 inches. The surface layer is black (N 2/0, 10YR 2/1, or 5YR 2/1). It commonly has granular structure, but in some pedons it is massive. It is neutral to moderately alkaline.

Metea series

The Metea series consists of deep, well drained soils on till plains. Permeability is very rapid in the upper part of the solum and moderate in the lower part and in the substratum. These soils formed in sandy material and in the underlying glacial till. Slopes range from 1 to 12 percent.

The Metea soils in this survey area contain more gravel in the upper sandy layers than is defined as the range for the Metea series. This difference, however, does not alter the use or behavior of the soils.

Metea soils are similar to Rawson soils and commonly are adjacent to Miami soils. Rawson soils have a loam surface layer, contain more clay in the solum than the Metea soils, and have a moderately fine textured substratum. Miami soils have a loam surface layer and contain more clay in the subsoil than the Metea soils.

A typical pedon of Metea loamy sand, 1 to 6 percent slopes, in a cultivated field; 800 feet north and 1,550 feet east of the southwest corner of sec. 31, T. 38 N., R. 12 E.

Ap—0 to 10 inches; brown (10YR 4/3) loamy sand, pale brown (10YR 6/3) dry; weak fine granular structure; very friable; few fine roots; many clean sand grains; about 10 percent fine gravel; medium acid; abrupt smooth boundary.
B1—10 to 35 inches; yellowish brown (10YR 5/4) loamy sand; weak fine granular structure; very friable; few

particles of brown (10YR 4/3) soil material in root channels; about 5 percent gravel; slightly acid; clear wavy boundary.

IIB21t—35 to 40 inches; yellowish brown (10YR 5/4) sandy clay loam; moderate medium subangular blocky structure; firm; thin patchy grayish brown (10YR 5/2) clay films on faces of peds; about 5 percent gravel; neutral; gradual wavy boundary.

IIB22t—40 to 50 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; firm; thin patchy grayish brown (10YR 5/2) clay films on faces of peds; about 3 percent gravel; neutral; gradual wavy boundary.

IIB3—50 to 60 inches; yellowish brown (10YR 5/6) clay loam; moderate fine subangular blocky structure; friable; neutral; gradual wavy boundary.

IIC—60 to 65 inches; brown (10YR 5/3) loam; massive; friable; strong effervescence; moderately alkaline.

The solum is 36 to 60 inches thick. The Ap horizon has hue of 10YR, value of 3 to 5, and chroma of 2 or 3. It is loamy sand or sand. The IIB2t horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. It is sandy clay loam or clay loam. It is slightly acid or neutral.

Miami series

The Miami series consists of deep, well drained soils on till plains. Permeability is moderate in the solum and moderately slow in the substratum. These soils formed in loamy glacial till. Slopes range from 2 to 25 percent.

Miami soils are similar to Rawson and Riddles soils and commonly are adjacent to Crosier soils. Rawson soils contain more clay in the lower part of the subsoil and in the substratum than the Miami soils. Riddles soils have a sandy loam surface layer. Their solum is thicker than that of the Miami soils. Crosier soils are lower on the landscape than the Miami soils. Also, their subsoil is grayer throughout.

A typical pedon of Miami loam, 2 to 6 percent slopes, in a cultivated field; 2,000 feet south and 700 feet west of the northeast corner of sec. 28, T. 37 N., R. 13 E.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; about 1 percent fine gravel; slightly acid; abrupt smooth boundary.

A2—7 to 11 inches; brown (10YR 5/3) loam; weak medium platy structure; friable; dark grayish brown (10YR 4/2) soil material in root channels; about 1 percent fine gravel; slightly acid; clear smooth boundary.

B21t—11 to 16 inches; dark yellowish brown (10YR 4/4) clay loam; moderate medium subangular blocky structure; firm; thin discontinuous dark brown (10YR 3/3) clay films and dark brown (7.5YR 3/2) organic stains on faces of peds; about 2 percent fine gravel; slightly acid; clear wavy boundary.

B22t—16 to 20 inches; dark yellowish brown (10YR 4/4) clay loam; moderate medium subangular blocky structure; firm; thin continuous dark brown (10YR 3/3) clay films and dark brown (7.5YR 3/2) organic stains on faces of peds; about 2 percent fine gravel; neutral; clear wavy boundary.

B23t—20 to 24 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; firm; thin continuous dark brown (10YR 3/3) clay films and dark brown (7.5YR 3/2) organic stains on faces of peds; about 2 percent fine gravel; neutral; clear wavy boundary.

B24t—24 to 27 inches; yellowish brown (10YR 5/4) loam; common fine faint yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; thin discontinuous dark brown (10YR 3/3) clay films on faces of peds; about 2 percent fine gravel; neutral; clear wavy boundary.

B3—27 to 32 inches; yellowish brown (10YR 5/4) loam; common medium distinct yellowish brown (10YR 5/8) mottles; weak medium subangular blocky structure; friable; thin discontinuous very dark gray (10YR 3/1) organic stains on faces of peds; about 2 percent fine gravel; neutral; clear wavy boundary.

C—32 to 60 inches; brown (10YR 5/3) loam; massive; friable; discontinuous light gray (10YR 7/2) calcium carbonate layer at the top of the horizon; about 5 percent fine gravel; strong effervescence; moderately alkaline.

The solum is 25 to 42 inches thick. The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. It is loam, sandy loam, or silt loam. The A2 horizon has hue of 10YR, value of 5, and chroma of 3 or 4. It is loam or silt loam. The B2t horizon has hue of 10YR, 7.5YR, or 5YR and value and chroma of 4 to 6. It is clay loam or loam. It is medium acid to neutral in the upper part and neutral or mildly alkaline in the lower part.

Milford series

The Milford series consists of deep, very poorly drained, slowly permeable soils in depressions in former glacial lakebeds. These soils formed in lacustrine deposits. Slopes range from 0 to 2 percent.

Milford soils are similar to Pewamo soils and commonly are adjacent to Del Rey soils. Pewamo soils are underlain by glacial till. Del Rey soils do not have a mollic epipedon. They are slightly higher on the landscape than the Milford soils.

A typical pedon of Milford silty clay loam, in a cultivated field; 100 feet north and 500 feet east of the center of sec. 26, T. 37 N., R. 14 E.

Ap—0 to 12 inches; very dark gray (10YR 3/1) silty clay loam, dark grayish brown (10YR 4/2) dry; moderate fine and very fine subangular blocky structure; friable; neutral; abrupt smooth boundary.

A12—12 to 20 inches; dark gray (10YR 4/1) silty clay loam, grayish brown (10YR 5/2) dry; common medium distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; neutral; gradual wavy boundary.
B1g—20 to 32 inches; dark gray (5Y 4/1) silty clay loam; common medium prominent dark brown (7.5YR 4/4) mottles; moderate medium subangular blocky structure; firm; thin seam of fine sand at a depth of 28 inches; neutral; gradual wavy boundary.
B21g—32 to 41 inches; dark gray (10YR 4/1) clay loam; common medium prominent red (2.5YR 4/8) and common medium distinct dark yellowish brown (10YR 4/4) mottles; moderate medium subangular blocky structure; firm; thin seam of sand at a depth of 39 inches; neutral; gradual wavy boundary.
B22g—41 to 47 inches; dark gray (5Y 4/1) silty clay loam; few fine faint dark grayish brown (2.5Y 4/2) mottles; moderate medium subangular blocky structure; firm; particles of organic matter; neutral; clear smooth boundary.
B3g—47 to 55 inches; dark gray (10YR 4/1) clay loam; common medium faint dark grayish brown (2.5Y 4/2) mottles; moderate medium subangular blocky structure; firm; thin continuous dark gray (N 4/0) clay films on faces of peds; a 1-inch layer of dark gray (5Y 4/1) sandy loam near the top of the horizon; neutral; clear smooth boundary.
C—55 to 60 inches; dark gray (5Y 4/1) clay loam that has thin strata of sandy loam, silty clay loam, and silty clay; common medium distinct dark yellowish brown (10YR 4/4) mottles; massive; firm; about 5 percent gravel; strong effervescence; moderately alkaline.

The thickness of the solum is 36 to 60 inches and corresponds to the depth to carbonates. The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1. The B2 horizon has hue of 10YR, 2.5Y, or 5Y, value of 3 to 5, and chroma of 1 or 2. It is silty clay loam, clay loam, or silty clay. It is neutral or slightly acid. The B3 horizon commonly is stratified with thin layers of fine sand or sandy loam. The C horizon is clay loam or silty clay loam that commonly has thin strata of sandy loam, fine sand, silty clay, or silty clay loam.

Millgrove series

The Millgrove series consists of deep, very poorly drained, moderately permeable soils on outwash plains. These soils formed in loamy glacial outwash. Slopes range from 0 to 2 percent.

Millgrove soils are similar to Rensselaer soils and commonly are adjacent to Kosciusko soils. Rensselaer soils are underlain by stratified loamy material. Kosciusko soils are higher on the landscape than the Millgrove soils. Also, they have brighter colors throughout the solum.

A typical pedon of Millgrove loam, in a cultivated field; 200 feet west and 400 feet north of the southeast corner of sec. 29, T. 38 N., R. 12 E.

Ap—0 to 11 inches; black (N 2/0) loam, very dark gray (N 3/0) dry; moderate fine and medium granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.
A12—11 to 13 inches; very dark gray (10YR 3/1) loam; moderate fine granular structure; friable; common fine roots; neutral; clear smooth boundary.
B1g—13 to 16 inches; dark gray (10YR 4/1) loam; moderate fine granular structure; friable; few fine roots; neutral; clear smooth boundary.
B21tg—16 to 26 inches; grayish brown (10YR 5/2) clay loam; common medium faint brown (10YR 5/3) mottles; moderate medium subangular blocky structure; firm; continuous thin grayish brown (10YR 5/2) clay films on faces of peds; about 10 percent gravel; neutral; gradual wavy boundary.
IIB22tg—26 to 32 inches; grayish brown (10YR 5/2) sandy clay loam; many medium faint brown (10YR 5/3) and distinct yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; firm; discontinuous thin grayish brown (10YR 5/2) clay films on faces of peds; common particles of black (10YR 2/1) soil material; about 15 percent gravel; neutral; gradual wavy boundary.
IIB3g—32 to 35 inches; pale brown (10YR 6/3) gravelly sandy clay loam; many medium faint grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; friable; about 20 percent gravel; mildly alkaline; clear wavy boundary.
IICg—35 to 60 inches; grayish brown (10YR 5/2) gravelly sandy loam; massive; friable; strong effervescence; moderately alkaline.

The thickness of the solum is 25 to 38 inches and is the same as the depth to carbonates. The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2 or has hue of N and value of 2 or 3. The B2 horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2 or has hue of N and value of 4 to 6. It is loam, clay loam, gravelly clay loam, or sandy clay loam. It is slightly acid to mildly alkaline.

Morley series

The Morley series consists of deep, well drained, slowly permeable soils on till plains. These soils formed in glacial till. Slopes range from 6 to 25 percent.

Morley soils are similar to Miami and Rawson soils and commonly are adjacent to Glynwood soils. Miami and Rawson soils contain less clay in the solum than the Morley soils. Also, the Miami soils contain less clay in the substratum. Glynwood soils are less sloping than the Morley soils. Also, their solum is grayer.

A typical pedon of Morley silt loam, 6 to 12 percent slopes, eroded, in a cultivated field; 1,150 feet north and 550 feet east of the center of sec. 14, T. 37 N., R. 14 E.

Ap—0 to 7 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; common fine roots; neutral; abrupt smooth boundary.
B21t—7 to 11 inches; yellowish brown (10YR 5/6) clay loam; moderate medium subangular blocky structure; firm; few fine roots; thin discontinuous brown (10YR 4/3) clay films on faces of peds; about 3 percent fine gravel; neutral; clear smooth boundary.
B22t—11 to 18 inches; yellowish brown (10YR 5/4) clay; strong medium subangular blocky structure; very firm; few fine roots; thin continuous brown (10YR 4/3) clay films on faces of peds; about 3 percent gravel; slightly acid; clear smooth boundary.
B23t—18 to 29 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; firm; thin continuous brown (10YR 4/3) clay films on faces of peds; about 3 percent gravel; neutral; clear smooth boundary.
C—29 to 60 inches; brown (10YR 5/3) clay loam; massive; firm; strong effervescence; moderately alkaline.

The solum is 20 to 48 inches thick. The Ap horizon has hue of 10YR, value of 4, and chroma of 2 or 3. It is loam or silt loam. The Bt horizon has hue of 10YR, value of 5 or 6, and chroma of 4 to 6. It is clay loam, silty clay loam, clay, or silty clay. It is neutral to strongly acid in the upper part and medium acid to moderately alkaline in the lower part. The C horizon is silty clay loam or clay loam.

Morocco series

The Morocco series consists of deep, somewhat poorly drained, rapidly permeable soils on outwash plains. These soils formed in sandy glacial outwash. Slopes range from 0 to 2 percent.

Morocco soils are similar to Riverdale soils and commonly are adjacent to Granby Variant soils. Riverdale soils contain more clay in the subsoil than the Morocco soils. Granby Variant soils have a grayer solum than the Morocco soils. They are on the slightly lower parts of the landscape.

A typical pedon of Morocco loamy sand, in an idle field; 1,000 feet north and 200 feet east of the center of sec. 18, T. 37 N., R. 12 E.

Ap—0 to 6 inches; very dark grayish brown (10YR 3/2) loamy sand, grayish brown (10YR 5/2) dry; weak fine granular structure; very friable; common fine roots; slightly acid; abrupt smooth boundary.
A2—6 to 14 inches; yellowish brown (10YR 5/4) loamy sand; few fine faint pale brown (10YR 6/3) and few medium faint yellowish brown (10YR 5/6) mottles; single grain; loose; few fine roots; medium acid; clear wavy boundary.
B21—14 to 21 inches; light yellowish brown (10YR 6/4) sand; common medium faint light brownish gray (10YR 6/2) mottles; single grain; loose; few fine roots; slightly acid; clear wavy boundary.
B22—21 to 27 inches; brownish yellow (10YR 6/6) sand; many coarse distinct light brownish gray (10YR 6/2) mottles; single grain; loose; medium acid; clear wavy boundary.
B23—27 to 32 inches; light yellowish brown (10YR 6/4) sand; many coarse faint light brownish gray (10YR 6/2) and few fine prominent strong brown (7.5YR 5/8) mottles; single grain; loose; medium acid; clear wavy boundary.
C1—32 to 44 inches; pale brown (10YR 6/3) sand; many coarse faint light brownish gray (10YR 6/2) mottles; single grain; loose; medium acid; gradual wavy boundary.
C2—44 to 60 inches; light yellowish brown (10YR 6/4) sand; many coarse faint light brownish gray (10YR 6/2) and few fine prominent strong brown (7.5YR 5/8) mottles; single grain; loose; medium acid.

The solum is 26 to 48 inches thick. The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 1 or 2. It is loamy sand or fine sand. The A2 horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is fine sand or loamy sand. It is slightly acid or medium acid. The B2 horizon has hue of 10YR, value of 5 to 7, and chroma of 2 to 6. It is strongly acid to slightly acid in the upper part and medium acid or strongly acid in the lower part.

Muskego series

The Muskego series consists of deep, very poorly drained soils that formed in organic material over coprogenous earth. These soils are in depressions or former drainageways or along streams and lakeshores. Permeability is moderately slow to moderately rapid in the organic material and slow in the coprogenous earth. Slopes range from 0 to 2 percent.

Muskego soils are similar to Edwards soils and commonly are adjacent to Houghton soils. The organic material in Edwards soils is 16 to 50 inches deep over marl. That in Houghton soils is more than 50 inches thick.

A typical pedon of Muskego muck, drained, in a cultivated field; 900 feet north and 100 feet east of the center of sec. 2, T. 37 N., R. 14 E.

Oap—0 to 8 inches; black (10YR 2/1), broken face and rubbed and pressed, sapric material, black (10YR 2/1) dry; about 1 percent fiber, none rubbed; moderate fine granular structure; very friable; many fine roots; mostly herbaceous fiber; about 20

percent mineral material; very strongly acid; abrupt smooth boundary.

Oa2—8 to 21 inches; very dark brown (10YR 2/2), broken face, and black (10YR 2/1), rubbed and pressed, sapric material; about 15 percent fiber, 2 percent rubbed; weak very thick platy structure; friable; few fine roots; mostly herbaceous material; about 10 percent mineral material; medium acid; clear wavy boundary.

Oa3—21 to 29 inches; black (10YR 2/1) and dark brown (7.5YR 3/2), broken face, and very dark brown (10YR 2/2), rubbed and pressed, sapric material; about 15 percent fiber, 2 percent rubbed; weak thick platy structure; firm; few fine roots; mostly herbaceous material; about 25 percent mineral material; medium acid; clear wavy boundary.

Lco1—29 to 35 inches; very dark grayish brown (2.5Y 3/2) coprogenous earth; weak very thick platy structure; firm; about 60 percent mineral material; slightly acid; clear wavy boundary.

Lco2—35 to 42 inches; very dark gray (5Y 3/1) coprogenous earth; massive; about 70 percent mineral material; strong effervescence; moderately alkaline; clear wavy boundary.

Lco3—42 to 60 inches; dark gray (5Y 4/1) coprogenous earth; massive; about 80 percent mineral material; violent effervescence; moderately alkaline.

The depth to the Lco horizon ranges from 16 to 50 inches. The surface layer has hue of 10YR, value of 2, and chroma of 1 or 2. It commonly has granular structure, but in some pedons it is massive. The subsurface and bottom organic tiers have hue of 10YR or 7.5YR, value of 2 or 3, and chroma of 1 to 3 or have hue of N and value of 2 or 3. They are strongly acid to neutral. The coprogenous earth is massive or has platy structure. It has thin layers of organic material between the horizontal planes.

Ormas series

The Ormas series consists of deep, well drained soils on outwash plains. Permeability is moderately rapid in the solum and very rapid in the substratum. These soils formed in loamy and sandy glaciofluvial deposits. Slopes range from 0 to 18 percent.

Ormas soils are similar to Oshtemo soils and commonly are adjacent to Cohoctah soils. Oshtemo soils contain more clay in the subsoil than the Ormas soils. Cohoctah soils are lower on the landscape than the Ormas soils. Also, their surface layer is darker.

A typical profile of Ormas loamy sand, in an area of Oshtemo-Ormas loamy sands, 2 to 6 percent slopes, in an idle field; 1,200 feet west and 1,300 feet south of the center of sec. 17, T. 37 N., R. 12 E.

Ap—0 to 9 inches; dark brown (10YR 4/3) loamy sand, pale brown (10YR 6/3) dry; weak coarse granular structure; very friable; many fine roots; neutral; abrupt smooth boundary.

A21—9 to 20 inches; strong brown (7.5YR 5/6) loamy sand; weak coarse subangular blocky structure; very friable; few fine roots; few thin patchy strong brown (7.5YR 5/6) clay films on faces of peds; about 5 percent gravel; neutral; clear wavy boundary.

A22—20 to 31 inches; strong brown (7.5YR 5/6) loamy sand; single grain; loose; few fine roots; some clay bridging between sand grains; about 10 percent gravel; slightly acid; clear wavy boundary.

A23—31 to 39 inches; strong brown (7.5YR 5/6) loamy sand; single grain; loose; few fine roots; common chunks of brown (7.5YR 4/4) sandy loam; about 10 percent gravel; slightly acid; clear wavy boundary.

B21t—39 to 47 inches; brown (7.5YR 5/4) sandy loam; weak coarse subangular blocky structure; friable; few thin patchy dark brown (7.5YR 4/4) clay films on pebbles and faces of peds; about 10 percent gravel; medium acid; clear wavy boundary.

B22t—47 to 55 inches; dark brown (7.5YR 4/4) sandy clay loam; moderate medium subangular blocky structure; friable; medium continuous dark brown (7.5YR 4/4) clay films on pebbles and faces of peds; about 15 percent gravel; medium acid; clear wavy boundary.

B3t—55 to 60 inches; dark brown (7.5YR 4/4) gravelly loamy sand; single grain; loose; thin patchy dark brown (7.5YR 4/4) clay films on pebbles; about 20 percent gravel; slightly alkaline; clear irregular boundary.

IIC—60 to 80 inches; brown (10YR 5/3) gravelly coarse sand; single grain; loose; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 45 to 80 inches. The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. The B2t horizon has hue of 10YR, 7.5YR, or 5YR, value of 4 or 5, and chroma of 3 to 6. It is slightly acid to strongly acid. It is gravelly sandy loam, sandy loam, gravelly sandy clay loam, or sandy clay loam. The content of gravel in this horizon is 10 to 25 percent.

Oshtemo series

The Oshtemo series consists of deep, well drained soils on outwash plains. Permeability is moderately rapid in the solum and very rapid in the substratum. These soils formed in glaciofluvial deposits. Slopes range from 0 to 12 percent.

Oshtemo soils are similar to Boyer soils and commonly are adjacent to Cohoctah soils. Boyer soils are moderately deep over very gravelly coarse sand. Cohoctah soils are lower on the landscape than the Oshtemo soils. Also, they have a darker surface layer.

A typical pedon of Oshtemo loamy sand, in an area of Oshtemo-Ormas loamy sands, 0 to 2 percent slopes, in

a cultivated field; 1,550 feet south and 400 feet west of the northeast corner of sec. 18, T. 38 N., R. 13 E.

Ap—0 to 9 inches; dark brown (10YR 4/3) loamy sand, brown (10YR 5/3) dry; moderate fine and medium granular structure; very friable; many roots; slightly acid; abrupt smooth boundary.
B21t—9 to 13 inches; reddish brown (5YR 4/4) sandy loam; weak medium subangular blocky structure; friable; many roots; patchy clay films on faces of peds; about 10 percent fine gravel; slightly acid; clear smooth boundary.
B22t—13 to 20 inches; yellowish red (5YR 4/6) sandy clay loam; moderate medium subangular blocky structure; friable; common roots; thin continuous reddish brown (5YR 4/3) clay films on faces of peds; about 10 percent fine gravel; medium acid; gradual smooth boundary.
B23t—20 to 31 inches; yellowish red (5YR 4/6) sandy loam; weak coarse subangular blocky structure; friable; few roots; thin discontinuous reddish brown (5YR 4/3) clay films on faces of peds; about 10 percent fine gravel; medium acid; clear wavy boundary.
B24t—31 to 40 inches; reddish brown (5YR 4/3) sandy loam; weak medium subangular blocky structure; friable; few roots; reddish brown (5YR 4/3) clay bridging between sand grains; about 10 percent fine gravel; medium acid; clear wavy boundary.
B25t—40 to 46 inches; dark reddish brown (5YR 3/3) gravelly sandy clay loam; weak coarse subangular blocky structure; firm; few roots; dark brown (7.5YR 3/2) clay bridging between sand grains and coatings on gravel and sand; about 20 percent fine gravel; slightly acid; abrupt irregular boundary.
IIC—46 to 60 inches; brown (10YR 5/3) gravelly coarse sand; single grain; loose; strong effervescence; moderately alkaline.

The solum is 40 to 60 inches thick. The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. The B2t horizon has hue of 10YR, 7.5YR, or 5YR, value of 3 to 5, and chroma of 3 to 6. It is slightly acid to strongly acid. It is sandy loam, gravelly sandy loam, sandy clay loam, or gravelly sandy clay loam. The content of gravel in this horizon is 10 to 20 percent. The IIC horizon is gravelly coarse sand and commonly has thin strata of sand or gravelly sand.

Palms series

The Palms series consists of deep, very poorly drained soils in depressions. These soils formed in organic material over loamy material. Permeability is moderately slow to moderately rapid in the organic layers and moderately slow in the underlying mineral soil. Slopes range from 0 to 2 percent.

The Palms soils in this survey area are more acid in the underlying material than is defined as the range for the Palms series. This difference, however, does not alter the use or behavior of the soils.

Palms soils are similar to Adrian and Edwards soils and commonly are adjacent to Houghton soils. Adrian soils formed in organic material underlain by sand. Edwards soils formed in organic material underlain by marl. Houghton soils have an organic layer that is more than 50 inches thick.

A typical pedon of Palms muck, drained, in an uncultivated field; 700 feet east and 400 feet north of the center of sec. 17, T. 38 N., R. 13 E.

Oa1—0 to 12 inches; black (N 2/0), broken face and rubbed, sapric material, black (N 2/0) dry; about 1 percent fiber, less than 1 percent rubbed; moderate fine granular structure; friable; about 20 percent mineral material; very dark grayish brown (10YR 3/2) sodium pyrophosphate; herbaceous fibers; medium acid; clear smooth boundary.
Oa2—12 to 25 inches; black (N 2/0), broken face and rubbed, sapric material; about 1 percent fiber, less than 1 percent rubbed; weak and moderate medium granular structure; friable; about 25 percent mineral material; very dark grayish brown (10YR 3/2) sodium pyrophosphate; herbaceous fibers; medium acid; clear smooth boundary.
IICg—25 to 60 inches; grayish brown (10YR 5/2) sandy loam; massive; friable; very strongly acid.

The depth to the loamy IIC horizon ranges from 16 to 50 inches. The surface layer is black (10YR 2/1 or N 2/0). It commonly has granular structure, but in some pedons it is massive. The subsurface tier has hue of 10YR, 7.5YR, or 5YR, value of 2 or 3, and chroma of 1 or 2 or has hue of N and value of 2 or 3. The organic layers are strongly acid to neutral. The IIC horizon is loam or sandy loam. It is very strongly acid to medium acid.

Pewamo series

The Pewamo series consists of deep, very poorly drained, moderately slowly permeable soils that formed in loamy and clayey glacial till. These soils are in depressions in till plains. Slopes range from 0 to 2 percent.

Pewamo soils are similar to Milford soils and commonly are adjacent to Blount soils. Milford soils are underlain by stratified lacustrine deposits. Blount soils are slightly higher on the landscape than the Pewamo soils. Also, they have a lighter colored surface layer.

A typical pedon of Pewamo silty clay loam, in a cultivated field; 700 feet north and 1,250 feet east of the southwest corner of sec. 26, T. 36 N., R. 13 E.

Ap—0 to 11 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; moderate medium granular structure; firm; slightly acid; abrupt smooth boundary.

B1g—11 to 18 inches; dark gray (10YR 4/1) silty clay loam; moderate medium subangular blocky structure; firm; neutral; gradual wavy boundary.
B21tg—18 to 25 inches; dark gray (10YR 4/1) silty clay; common medium distinct yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure parting to moderate medium angular blocky; firm; medium discontinuous very dark gray (10YR 3/1) clay films on faces of peds; about 2 percent fine gravel; neutral; gradual wavy boundary.
B22tg—25 to 39 inches; gray (10YR 5/1) silty clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure parting to moderate medium angular blocky; firm; thin discontinuous very dark gray (10YR 3/1) clay films on faces of peds; about 2 percent fine gravel; neutral; gradual smooth boundary.
C1—39 to 44 inches; gray (10YR 5/1) clay loam; many coarse distinct yellowish brown (10YR 5/4) mottles; massive; firm; about 2 percent fine gravel; strong effervescence; moderately alkaline; clear wavy boundary.
C2—44 to 60 inches; grayish brown (10YR 5/2) clay loam; many coarse distinct yellowish brown (10YR 5/4) mottles; massive; firm; about 3 percent fine gravel; strong effervescence; moderately alkaline.

The solum is 32 to 50 inches thick. The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The B horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2. It is silty clay loam or silty clay. It is slightly acid or neutral. The C horizon is clay loam or silty clay loam.

Plainfield series

The Plainfield series consists of deep, excessively drained, rapidly permeable soils on outwash plains. These soils formed in sandy glacial outwash. Slopes range from 0 to 10 percent.

Plainfield soils are similar to Chelsea soils and commonly are adjacent to Brems soils. Chelsea soils have bands of loamy fine sand, fine sandy loam, or sandy loam below a depth of 30 inches. Brems soils are lower on the landscape than the Plainfield soils. Also, they are grayer in the lower part of the subsoil.

A typical pedon of Plainfield fine sand, 2 to 10 percent slopes, in a cultivated field; 2,100 feet north and 400 feet east of the southwest corner of sec. 17, T. 37 N., R. 12 E.

Ap—0 to 9 inches; dark brown (10YR 4/3) fine sand, brown (10YR 5/3) dry; weak fine granular structure; very friable; common fine roots; few fine yellowish brown (10YR 5/6) splotches in the lower part; neutral; abrupt smooth boundary.
B2—9 to 21 inches; strong brown (7.5YR 5/6) sand; weak coarse subangular blocky structure; very friable; common fine roots; dark yellowish brown (10YR 4/4) soil material in root channels and worm holes; medium acid; clear wavy boundary.
C1—21 to 37 inches; brownish yellow (10YR 6/6) sand; single grain; loose; few fine roots; medium acid; gradual wavy boundary.
C2—37 to 52 inches; light yellowish brown (10YR 6/4) sand; single grain; loose; few fine light brownish gray (10YR 6/2) and yellowish brown (10YR 5/6) splotches; medium acid; gradual wavy boundary.
C3—52 to 60 inches; light yellowish brown (10YR 6/4) sand; single grain; loose; few medium yellowish brown (10YR 5/8) splotches; medium acid.

The solum is 18 to 32 inches thick. The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 3. It is fine sand or sand. The B horizon has hue of 10YR or 7.5YR, value of 5 to 7, and chroma of 4 to 6. The B and C horizons are medium acid or strongly acid.

Rawson series

The Rawson series consists of deep, moderately well drained soils on till plains. Permeability is moderate in the solum and slow in the substratum. These soils formed in loamy material and in the underlying moderately fine textured till or lacustrine deposits. Slopes range from 2 to 6 percent.

The Rawson soils in this survey area have lower chroma on the faces of peds in the upper part of the subsoil than is defined as the range for the Rawson series. This difference, however, does not alter the use or behavior of the soils.

Rawson soils are similar to Glynwood soils and commonly are adjacent to Haskins soils. Glynwood soils contain more clay in the upper part of the subsoil than the Rawson soils. Haskins soils are lower on the landscape than the Rawson soils. Also, they have a grayer subsoil.

A typical pedon of Rawson loam, 2 to 6 percent slopes, in a cultivated field; 2,400 feet south and 900 feet east of the northwest corner of sec. 26, T. 37 N., R. 14 E.

Ap—0 to 7 inches; dark brown (10YR 4/3) loam, brown (10YR 5/3) dry; weak fine granular structure; friable; slightly acid; abrupt smooth boundary.
A2—7 to 11 inches; yellowish brown (10YR 5/4) loam, light yellowish brown (10YR 6/4) dry; weak medium subangular blocky structure; friable; about 3 percent fine gravel; slightly acid; clear smooth boundary.
B21t—11 to 17 inches; dark brown (7.5YR 4/4) sandy clay loam; moderate medium subangular blocky structure; friable; discontinuous thin dark brown (7.5YR 3/2) clay films on faces of peds; about 3 percent fine gravel; slightly acid; clear smooth boundary.
B22t—17 to 24 inches; dark brown (10YR 4/3) clay loam; moderate medium subangular blocky

structure; firm; discontinuous thin brown (7.5YR 4/2) clay films on faces of peds; about 5 percent fine gravel; neutral; clear smooth boundary.

IIB23t—24 to 37 inches; yellowish brown (10YR 5/4) clay loam; few fine faint yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; discontinuous medium brown (7.5YR 4/2) clay films on faces of peds; about 5 percent fine gravel; mildly alkaline; gradual wavy boundary.

IIC—37 to 60 inches; brown (10YR 5/3) clay loam; few fine distinct yellowish brown (10YR 5/8) mottles; massive; firm; about 5 percent fine gravel; strong effervescence; moderately alkaline.

The solum is 26 to 42 inches thick. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is loam, sandy loam, or silt loam. The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is neutral to strongly acid in the upper part and neutral to medium acid in the lower part. The IIBt horizon is clay loam, silty clay loam, or silty clay. It is slightly acid to mildly alkaline. The IIC horizon is clay loam, silty clay loam, or silty clay.

Rensselaer series

The Rensselaer series consists of deep, very poorly drained, slowly permeable soils on outwash plains and lake plains. These soils formed in stratified loamy outwash. Slopes range from 0 to 2 percent.

Rensselaer soils are similar to Millgrove soils and commonly are adjacent to Whitaker soils. Millgrove soils are underlain by gravelly sandy loam. Whitaker soils are slightly higher on the landscape than the Rensselaer soils. Also, they have a lighter colored surface layer.

A typical pedon of Rensselaer loam, in a cultivated field; 300 feet east and 2,100 feet north of the southwest corner of sec. 18, T. 36 N., R. 14 E.

Ap—0 to 11 inches; very dark gray (10YR 3/1) loam, dark gray (10YR 4/1) dry; moderate medium granular structure; friable; few fine roots; medium acid; abrupt smooth boundary.

A12—11 to 14 inches; dark gray (10YR 4/1) loam, gray (10YR 5/1) dry; few fine distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; friable; few fine roots; very dark gray (10YR 3/1) soil material in a few root channels and worm holes; medium acid; gradual smooth boundary.

B21tg—14 to 20 inches; dark gray (10YR 4/1) clay loam; few fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; thin discontinuous very dark gray (10YR 3/1) organic clay films on faces of peds; slightly acid; gradual smooth boundary.

B22tg—20 to 25 inches; gray (10YR 5/1) sandy clay loam; common medium distinct yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; medium continuous very dark gray (10YR 3/1) clay films on faces of peds; neutral; gradual wavy boundary.

B23tg—25 to 37 inches; light brownish gray (10YR 6/2) sandy clay loam; few fine faint gray (10YR 5/1) and many medium distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; friable; thin discontinuous dark gray (10YR 4/1) clay films on faces of peds; neutral; clear wavy boundary.

Cg—37 to 60 inches; gray (10YR 5/1) sandy clay loam that has thin strata of sandy loam; many medium distinct yellowish brown (10YR 5/6) mottles; massive; friable; neutral.

The solum is 30 to 48 inches thick. The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is loam or silty clay loam. The Bt horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 or 2. It is clay loam, sandy clay loam, or silty clay loam. The C horizon is neutral to moderately alkaline.

Riddles series

The Riddles series consists of deep, well drained, moderately permeable soils on till plains. These soils formed in loamy glacial till. Slopes range from 0 to 18 percent.

Riddles soils are similar to Miami soils and commonly are adjacent to Crosier soils. Miami soils are shallower to calcareous till than the Riddles soils. Crosier soils are lower on the landscape than the Riddles soils. Also, they have a grayer subsoil.

A typical pedon of Riddles sandy loam, 0 to 2 percent slopes, in an uncultivated field; 1,100 feet east and 2,100 feet north of the southwest corner of sec. 18, T. 38 N., R. 13 E.

Ap—0 to 6 inches; dark brown (10YR 4/3) sandy loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; many roots; about 2 percent fine gravel; neutral; abrupt smooth boundary.

B1—6 to 10 inches; dark yellowish brown (10YR 4/4) loam; moderate fine subangular blocky structure; friable; few roots; about 5 percent fine gravel; neutral; abrupt smooth boundary.

B21t—10 to 18 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; firm; few roots; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; about 5 percent fine gravel; slightly acid; gradual wavy boundary.

B22t—18 to 24 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; firm; few roots; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; about 5 percent gravel; strongly acid; clear smooth boundary.

B23t—24 to 29 inches; yellowish brown (10YR 5/6) clay loam; moderate medium subangular blocky structure; firm; few roots; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds; about 10 percent gravel; strongly acid; clear smooth boundary.
B24t—29 to 34 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; firm; few roots; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds; about 10 percent gravel; medium acid; clear smooth boundary.
B3t—34 to 47 inches; dark yellowish brown (10YR 4/4) clay loam; moderate medium subangular blocky structure; firm; few roots; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds; about 10 percent gravel; mildly alkaline; clear wavy boundary.
C—47 to 60 inches; brown (10YR 5/3) loam; massive; friable; slight effervescence; moderately alkaline.

The thickness of the solum ranges from 40 to 72 inches and corresponds to the depth to carbonates. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is sandy loam or loam. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is clay loam, sandy clay loam, or loam. It is slightly acid to strongly acid in the upper part and medium acid to mildly alkaline in the lower part.

Riverdale series

The Riverdale series consists of deep, somewhat poorly drained soils on outwash plains. Permeability is moderately rapid in the solum and very rapid in the substratum. These soils formed in loamy and sandy glacial outwash. Slopes range from 0 to 2 percent.

The solum of the Riverdale soils in this survey area is thicker than is defined as the range for the Riverdale series. This difference, however, does not alter the use or behavior of the soils.

Riverdale soils are similar to Whitaker soils and commonly are adjacent to Boyer soils. Whitaker soils typically have a loam surface layer, contain more clay in the solum than the Riverdale soils, and are underlain by dominantly loamy material. Boyer soils are higher on the landscape than the Riverdale soils. Also, they have brighter colors throughout the subsoil.

A typical pedon of Riverdale loamy sand, in a cultivated field; 1,000 feet south and 500 feet west of the northeast corner of sec. 13, T. 38 N., R. 13 E.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) loamy sand, grayish brown (10YR 5/2) dry; weak fine granular structure; very friable; neutral; abrupt smooth boundary.
A12—7 to 12 inches; brown (10YR 4/3) loamy sand; weak coarse granular structure; very friable; about 8 percent fine gravel; neutral; clear smooth boundary.
A2—12 to 33 inches; yellowish brown (10YR 5/4) loamy sand; common fine distinct light brownish gray (10YR 6/2) and common fine faint yellowish brown (10YR 5/6) mottles; weak medium granular structure; very friable; about 5 percent fine gravel; medium acid; gradual wavy boundary.
B21t—33 to 37 inches; brown (10YR 4/3) sandy loam; common medium distinct strong brown (7.5YR 5/6) and few fine distinct light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; friable; few patchy clay films; about 5 percent fine gravel; neutral; clear smooth boundary.
B22t—37 to 43 inches; brown (10YR 5/3) loam; common medium faint light brownish gray (10YR 6/2) and common medium distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; few patchy clay films; about 3 percent fine gravel; neutral; abrupt smooth boundary.
B3—43 to 45 inches; yellowish brown (10YR 5/4) sandy loam; common medium distinct light brownish gray (10YR 6/2) and strong brown (7.5YR 5/6) mottles; weak fine subangular blocky structure; friable; mildly alkaline; abrupt irregular boundary.
C—45 to 60 inches; pale brown (10YR 6/3) sand that has thin strata of silt and clay loam; single grain; loose; strong effervescence; moderately alkaline.

The solum is 40 to 50 inches thick. The Ap horizon has hue of 10YR, value of 3, and chroma of 1 or 2. The A2 horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is slightly acid or neutral in the upper part and neutral or mildly alkaline in the lower part. The C horizon is sand or gravelly sand that has thin strata of silt, silt loam, and clay loam.

Shoals series

The Shoals series consists of deep, somewhat poorly drained, moderately permeable soils on bottom land. These soils formed in alluvium. Slopes range from 0 to 2 percent.

Shoals soils commonly are adjacent to Martinsville and Morley soils. These adjacent soils are higher on the landscape than the Shoals soils. Also, they have brighter colors throughout.

A typical pedon of Shoals loam, in a cultivated field; 600 feet south and 1,800 feet east of the northwest corner of sec. 16, T. 36 N., R. 15 E.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; common roots; neutral; abrupt smooth boundary.
C1—7 to 18 inches; brown (10YR 4/3) loam; few fine faint grayish brown (10YR 5/2) and common

medium prominent reddish brown (5YR 4/4) mottles; moderate fine granular structure; friable; few fine roots; neutral; gradual irregular boundary.
C2—18 to 37 inches; dark gray (10YR 4/1) silt loam; common medium prominent reddish brown (5YR 4/4) mottles; moderate medium granular structure; friable; neutral; gradual irregular boundary.
C3—37 to 60 inches; grayish brown (10YR 5/2) loam that has thin strata of silt loam and sandy loam; many medium prominent reddish brown (5YR 4/4) mottles; massive; friable; neutral.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2. It is silt loam or loam. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 1 to 4. It is dominantly loam or silt loam but has thin strata of silt loam, clay loam, sandy loam, or sandy clay loam. It is slightly acid to mildly alkaline.

Wallkill series

The Wallkill series consists of deep, very poorly drained soils in depressions in outwash plains and till plains. These soils formed in local alluvium over organic material. Permeability is moderate in the solum and moderately slow to moderately rapid in the underlying organic material. Slopes range from 0 to 2 percent.

Wallkill soils are similar to Washtenaw soils and commonly are adjacent to Houghton soils. Washtenaw soils are underlain by a buried mineral soil. Houghton soils formed in deep organic material.

A typical pedon of Wallkill silt loam, in an uncultivated field; 2,000 feet east and 600 feet north of the southwest corner of sec. 9, T. 36 N., R. 14 E.

A11—0 to 8 inches; very dark gray (10YR 3/1) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; few fine roots; slightly acid; clear smooth boundary.
A12—8 to 14 inches; dark gray (10YR 4/1) silt loam; weak medium subangular blocky structure; friable; few fine roots; neutral; clear smooth boundary.
Bg—14 to 22 inches; very dark gray (10YR 3/1) silty clay loam; many medium distinct light brownish gray (10YR 6/2) mottles; weak coarse prismatic structure; firm; neutral; abrupt smooth boundary.
IIOa1—22 to 30 inches; black (N 2/0), broken face and rubbed, sapric material; less than 1 percent fiber, none rubbed; massive; friable; about 60 percent mineral material; neutral; clear smooth boundary.
IIOa2—30 to 60 inches; black (5YR 2/1), broken face and rubbed, sapric material; less than 1 percent fiber, none rubbed; massive; friable; about 35 percent mineral material; a thin layer of clay at a depth of 40 inches; neutral.

The recently deposited mineral soil is 20 to 40 inches thick. The A11 horizon has hue of 10YR, value of 3, and chroma of 1 or 2. It is silt loam or silty clay loam. The Bg horizon has hue of 10YR, value of 3 to 5, and chroma of 1. It is silt loam or silty clay loam. The underlying organic layers are mostly sapric material mixed with mineral material.

Washtenaw series

The Washtenaw series consists of deep, poorly drained, slowly permeable soils in depressions. These soils formed in local alluvium over a buried soil. Slopes range from 0 to 2 percent.

Washtenaw soils are similar to Wallkill soils, but they are not underlain by organic material.

A typical pedon of Washtenaw silt loam, in a cultivated field; 2,100 feet south and 300 feet west of the northeast corner of sec. 31, T. 37 N., R. 14 E.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, brown (10YR 5/3) dry; weak fine granular structure; friable; few fine roots; slightly acid; abrupt smooth boundary.
A12—9 to 18 inches; dark grayish brown (10YR 4/2) silt loam; few fine faint grayish brown (10YR 5/2) and very dark gray (10YR 3/1) mottles; weak medium subangular blocky structure; friable; slightly acid; gradual wavy boundary.
C—18 to 28 inches; dark grayish brown (10YR 4/2) silt loam; common fine faint very dark gray (10YR 3/1) and grayish brown (2.5Y 5/2) mottles; massive; friable; slightly acid; gradual wavy boundary.
IIA11b—28 to 39 inches; very dark gray (10YR 3/1) silty clay loam; few fine faint dark grayish brown (10YR 4/2) mottles; moderate medium subangular blocky structure; firm; neutral; clear smooth boundary.
IIA12b—39 to 51 inches; black (N 2/0) clay loam; weak coarse prismatic structure; firm; neutral; clear smooth boundary.
IIBgb—51 to 80 inches; grayish brown (2.5Y 5/2) silty clay loam that has thin strata of sandy loam; few fine distinct yellowish brown (10YR 5/6) and few fine prominent strong brown (7.5YR 5/8) mottles; weak coarse prismatic structure; firm; thin discontinuous very dark gray (10YR 3/1) clay films on faces of peds; neutral.

The overwash is 20 to 40 inches thick. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2. It is silt loam, loam, or silty clay loam. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 1 or 2. It is slightly acid or neutral. The IIAb horizon has hue of 10YR or 2.5Y, value of 2 or 3, and chroma of 1 to 3 or has hue of N and value of 2 or 3. It is silt loam, clay loam, or silty clay loam. It is neutral or slightly acid. The IIBb horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2. It is neutral to medium acid. Some pedons have a IIC horizon.

Wawasee series

The Wawasee series consists of deep, well drained, moderately permeable soils on till plains. These soils formed in loamy glacial till. Slopes range from 2 to 25 percent.

Wawasee soils are similar to Miami and Riddles soils and commonly are adjacent to Crosier soils. Miami soils generally contain more clay in the subsoil and the substratum than the Wawasee soils. Riddles soils typically have a sandy loam surface layer. Their solum is thicker than that of the Wawasee soils. Crosier soils are lower on the landscape than the Wawasee soils. Also, they are grayer throughout the subsoil.

A typical pedon of Wawasee loam, 2 to 6 percent slopes, in a cultivated field; 500 feet south and 550 feet west of the northeast corner of sec. 15, T. 36 N., R. 12 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) loam; light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; about 1 percent fine gravel; neutral; abrupt smooth boundary.

B1—8 to 19 inches; dark yellowish brown (10YR 4/4) fine sandy loam; weak medium subangular blocky structure; friable; about 1 percent gravel; neutral; clear wavy boundary.

B21t—19 to 27 inches; dark yellowish brown (10YR 4/6) fine sandy loam; moderate medium subangular blocky structure; friable; thin discontinuous dark brown (10YR 3/3) clay films on faces of peds; about 2 percent gravel; slightly acid; clear wavy boundary.

B22t—27 to 36 inches; dark yellowish brown (10YR 4/4) sandy clay loam; moderate medium subangular blocky structure; firm; thin continuous dark brown (10YR 3/3) clay films on faces of peds; about 2 percent gravel; neutral; clear wavy boundary.

C—36 to 60 inches; yellowish brown (10YR 5/4) sandy loam; massive; friable; about 3 percent gravel; strong effervescence; moderately alkaline.

The solum is 25 to 40 inches thick. The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. It is loam or sandy loam. The B2t horizon has hue of 10YR, 7.5YR, or 5YR and value and chroma of 4 to 6. It is sandy clay loam, fine sandy loam, or loam. It is medium acid to neutral in the upper part and neutral or mildly alkaline in the lower part.

Whitaker series

The Whitaker series consists of deep, somewhat poorly drained, moderately permeable soils on outwash plains. These soils formed in stratified loamy and sandy outwash. Slopes range from 0 to 2 percent.

Whitaker soils are similar to Del Rey and Haskins soils and commonly are adjacent to Rensselaer soils. The subsoil of the Del Rey soils is more clayey than that of the Whitaker soils. Haskins soils contain more clay in the lower part of the subsoil and in the substratum than the Whitaker soils. Rensselaer soils have a mollic epipedon. They are on the lower parts of the landscape.

A typical pedon of Whitaker loam, in a cultivated field; 2,000 feet north and 800 feet east of the southwest corner of sec. 18, T. 36 N., R. 14 E.

Ap—0 to 11 inches; dark grayish brown (10YR 4/2) loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; few fine roots; strongly acid; abrupt smooth boundary.

B21t—11 to 21 inches; brown (10YR 5/3) sandy clay loam; many medium faint grayish brown (10YR 5/2) and many medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; few fine roots; thin continuous grayish brown (10YR 5/2) clay films on faces of peds; strongly acid; clear smooth boundary.

B22t—21 to 31 inches; grayish brown (10YR 5/2) sandy clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; few black (10YR 2/1) iron and manganese oxide accumulations; strongly acid; clear smooth boundary.

B23t—31 to 42 inches; grayish brown (10YR 5/2) sandy clay loam; few fine faint gray (10YR 5/1) and common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; thin patchy dark grayish brown (10YR 4/2) clay films on faces of peds; few black (10YR 2/1) iron and manganese oxide accumulations; strongly acid; clear smooth boundary.

B3—42 to 49 inches; light brownish gray (10YR 6/2) clay loam that has thin strata of fine sand; common medium faint light gray (10YR 6/1) and common medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; few black (10YR 2/1) iron and manganese oxide accumulations; slightly acid; clear smooth boundary.

C—49 to 60 inches; light brownish gray (10YR 6/2) clay loam that has thin strata of fine sand; common medium faint light gray (10YR 6/1) and common medium distinct yellowish brown (10YR 5/6) mottles; massive; firm; neutral in the upper part and mildly alkaline below a depth of 56 inches.

The solum is 36 to 52 inches thick. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2. It is loam or sandy loam. Some pedons have an A2 horizon. The B2 horizon has hue of 10YR, value of 4 to 6, and chroma of 1 to 4. It is sandy clay loam, clay loam, or silty clay loam. It is strongly acid to neutral. The C horizon is neutral to moderately alkaline.

formation of the soils

This section relates the major factors of soil formation to the soils in the county. It also describes many of the processes of soil formation.

factors of soil formation

Soils form through the physical and chemical weathering of deposited or accumulated geologic material. The characteristics of the soil at any given place are determined by the interaction of five factors of soil formation—the physical and mineral composition of the parent material; the climate during and after the accumulation of the soil material; the plant and animal life on and in the soil; relief; and the length of time that the forces of soil formation have acted on the soil material.

Climate and plant and animal life, chiefly plants, are active factors of soil formation. They act on the parent material that has accumulated through the weathering of rocks and slowly change it to a natural body that has genetically related horizons. The effects of climate and plant and animal life are conditioned by relief. The parent material also affects the kind of soil profile that forms and, in extreme cases, determines it almost entirely. Finally, time is needed for changing the parent material into a soil. Generally, a long period is needed for the development of distinct soil horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effects 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. It determines the limits of the chemical and mineral composition of the soil. The parent materials of the soils in Steuben County were deposited by glaciers or by melt water from the glaciers. Some of these materials were subsequently reworked and redeposited by water and wind. These glaciers covered the county for thousands of years and finally retreated about 10,000 to 12,000 years ago. Although all of the parent materials are of glacial origin, their properties vary greatly, sometimes within small areas, depending on how the materials were deposited. The dominant parent materials in Steuben County were deposited as glacial till, outwash, lacustrine material, alluvium, and organic material.

Glacial till is material laid down directly by glaciers with a minimum of water action. It is a mixture of particles of different sizes. The small pebbles in glacial till have some sharp corners, indicating that they have not been worn by washing water. The glacial till in Steuben County is calcareous and firm. It is loam, silty clay loam, or clay loam. Miami soils are an example of soils formed in glacial till. Typically, they are medium textured and have well developed structure.

Outwash material is deposited by running water from melting glaciers. The particles that make up outwash material vary in size according to the velocity of the water that carried them. When rapidly moving water slows down, the coarser particles are deposited. The finer particles, such as very fine sand, silt, and clay, can be carried by the more slowly moving water. Outwash deposits generally are layers of particles that are similar in size, such as sand, coarse sand, and gravel. Kosciusko and Oshtemo soils are examples of soils formed in outwash material (fig. 11).

Lacustrine material was deposited from still, or ponded, glacial melt water. Because the coarser fragments dropped out of the moving water as outwash, only the finer particles, such as very fine sand, silt, and clay, remained and settled in the still water. Lacustrine deposits are silty or clayey. In Steuben County the soils formed in lacustrine deposits are typically moderately fine textured. Milford soils are an example.

Alluvial material was deposited by floodwater of streams in recent time. The texture of the material varies, depending on the speed of the water from which the material was deposited. The alluvial material deposited along a swift stream, such as Fish Creek, is coarser textured than that deposited along a slow, sluggish stream, such as the Fawn River. Shoals soils are an example of alluvial soils.

Organic material is made up of plant remains. After the glaciers withdrew from the area, water was left standing in lakes and depressions in outwash plains and till plains. Grasses and sedges growing around the edges of these lakes died, and their remains fell to the bottom. Because of the wetness of the areas, the plant remains did not decompose but accumulated around the edge of the lake. Later, white-cedar and other water tolerant trees grew in the areas. As these trees died, their residue became part of the accumulated organic material. The lakes were eventually filled with organic material and

Figure 11.—Profile of Kosciusko sandy loam, 2 to 6 percent slopes, and the underlying outwash material.

developed into areas of muck. Houghton soils are an example of soils formed in organic material.

plant and animal life

Plants are the principal organisms affecting the soils in Steuben County. Bacteria, fungi, and earthworms also are important. The chief contribution of plant and animal life is the addition of organic matter and nitrogen to the soil. The kind of organic material on and in the soil depends on the kinds of plants that grow on the soil. The remains of these plants accumulate on the surface, decay, and eventually become organic matter. The roots of the plants provide channels for the downward movement of water through the soil and also add organic matter as they decay. Bacteria in the soil help to break down the organic matter so that it can be used by growing plants.

The vegetation in Steuben County was mainly deciduous trees. Differences in natural soil drainage and minor changes in parent material affected the composition of the forest species.

In general, the well drained upland soils, such as Miami, Riddles, and Morley soils, supported sugar maple, beech, white oak, walnut, and hickory. The excessively drained Plainfield soils supported scrub oak. The wet soils supported mainly willow, tamarack, and soft maple. A few wet soils also supported sphagnum and other mosses, which contributed substantially to the accumulation of organic matter. Brookston and Pewamo soils, which formed under wet conditions, contain a considerable amount of organic matter. The soils of Steuben County that formed in forested areas generally have accumulated less organic matter than the soils that formed dominantly under grasses.

climate

Climate affects the kind of plant and animal life on and in the soil. It determines the amount of water available for the weathering of minerals, the removal of weathered minerals, and the translocation of soil material. Through its influence on soil temperature, it determines the rate of chemical reaction that occurs in the soil.

The climate in Steuben County is cool and humid. It is presumably similar to the climate that existed when the soils formed. The soils in Steuben County differ from the soils that formed in areas where the climate is dry and warm or hot and moist. Climate is uniform throughout the county, but its effect is modified locally by runoff, position on the landscape, and proximity to large bodies of water. Only minor differences among the soils in the county are the result of differences in climate. Detailed information on the climate is available under the heading "General nature of the county."

relief

Relief or topography has markedly affected the soils in Steuben County through its effect on the depth to the water table, runoff, erosion, plant cover, and soil temperature. Slopes range from nearly level to moderately steep. Runoff is most rapid on the steeper slopes. In low areas water is temporarily ponded.

The depth to the water table largely determines the

natural soil drainage, which ranges from well drained on the ridgetops to very poorly drained in the depressions. Through its effect on aeration, drainage determines the color of the soil. Water and air move freely through well drained soils but slowly through very poorly drained soils. Well aerated soils are brightly colored because the iron compounds that give most soils their color are oxidized. Poorly aerated soils are dull gray and mottled. Riddles soils are an example of well drained, well aerated soils, and Brookston soils are an example of very poorly drained, poorly aerated soils.

time

Time, usually a long time, is needed for the development of distinct horizons. Differences in the length of time that the parent materials have been in place are commonly reflected in the degree of profile development. Some soils form rapidly; others, slowly.

The soils in Steuben County range from young to mature. The glacial deposits in which many of the soils formed have been exposed to soil-forming factors long enough for the development of distinct horizons. In contrast, soils that formed in recent alluvial sediments have not been in place long enough for the development of distinct horizons. The young Shoals soils are an example.

Oshtemo and Millgrove soils are examples of mature soils. A difference between these two soils is related to the length of time that they have been subject to leaching. Oshtemo soils are leached of lime to a depth of about 46 inches, whereas Millgrove soils typically are leached to a depth of only 35 inches. When the glaciers retreated, the parent material of both soils contained about the same amount of lime throughout as the current C horizon. That of the Millgrove soils was submerged under glacial lake water and thus was not subject to leaching. In contrast, that of the Oshtemo soils was above water and thus was subject to leaching. These soils are leached to a greater depth because they have been subject to leaching for a longer period.

processes of soil formation

Several processes were involved in the formation of soils in Steuben County. These processes are the accumulation of organic matter; the solution, transfer, and removal of calcium carbonates and other bases; and the liberation and translocation of silicate clay minerals. In most soils more than one of these processes has been active in the differentiation of horizons.

Some organic matter has accumulated in the surface layer of all the soils in the county. The organic matter content ranges from low to high. Generally, the soils that have the most organic matter, such as Brookston or Rensselaer soils, have a thick black surface horizon.

Carbonates and other bases have been leached from the upper horizons of nearly all the soils. Leaching probably precedes the translocation of silicate clay minerals. Almost all of the carbonates and some of the other bases have been leached from the A and B horizons of well drained soils. Even in the wettest soils, some leaching is indicated by the absence of carbonates and by an acid reaction. Leaching is slow in wet soils because of a high water table or because water moves slowly through such soils.

Leaching of bases and translocation of silicate clays are among the more important processes affecting horizon differentiation in the soils. Clay accumulates in pores and other voids, and clay films form on the surfaces along which water moves. Miami soils are an example of soils in which translocated silicate clays have accumulated in an argillic horizon in the form of clay films.

The reduction and transfer of iron, a process called gleying, has significantly differentiated the horizons in very poorly drained to somewhat poorly drained soils. As a result of this process, the subsoil of these soils generally is grayish. Reduction is commonly accompanied by some transfer of the iron from the upper horizons either to the lower horizons or completely out of the profile. Spots or flecks that differ in color from the matrix indicate the redistribution and segregation of the iron.

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glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Bottom land. The normal flood plain of a stream, subject to flooding.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compact layers to depths 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.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15.2 to 38.1 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

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.

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. The Lco horizon is a limnic layer that contains many fecal pellets.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic

centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Drainage class (natural). Refers to the removal of water from the soil. Drainage classes are determined on the basis of an overall evaluation of water removal as influenced by climate, slope, and position on the landscape. Precipitation, runoff, amount of moisture infiltrating the soil, and rate of water movement through the soil affect the degree and duration of wetness. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. The soils in this class generally are free of mottles throughout. They commonly are shallow, very porous, or steep, or a combination of these.

Somewhat excessively drained.—Water is removed from the soil rapidly. The soils in this class generally are free of mottles throughout. They commonly are shallow or moderately deep, very porous, or steep, or a combination of these.

Well drained.—Water is removed from the soil so readily that the upper 40 inches generally does not have the mottles or dull colors related to wetness.

Moderately well drained.—Water is removed from the soil so slowly that the upper 20 to 40 inches has the mottles or dull colors related to wetness. The soils in this class commonly have a slowly permeable layer, have a water table, or receive runoff or seepage, or they are characterized by a combination of these.

Somewhat poorly drained.—Water is removed from the soil so slowly that the upper 10 to 20 inches has the mottles or dull colors related to wetness. The soils in this class commonly have a slowly permeable layer, have a water table, or receive runoff or seepage, or they are characterized by a combination of these.

Poorly drained.—Water is removed so slowly that either the soil is periodically saturated or the upper 10 inches has the mottles or dull colors related to wetness. The soils in this class commonly have a slowly permeable layer, have a water table, or receive runoff or seepage, or they are characterized by a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water is at or on the surface most of the time. The soils in this class commonly have a slowly permeable layer, have a water table, or receive runoff or seepage, or they are characterized by a combination of these.

Drainage, subsurface. Removal of excess ground water through buried drains installed within the soil profile. The drains collect the water and convey it to a gravity or pump outlet.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

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.

Fine textured soil. Sandy clay, silty clay, and clay.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial melt water.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits (geology). Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in

glacial lakes mainly by glacial melt water. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

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.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-

growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame (geology). An irregular, short ridge or hill of stratified glacial drift.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Leaching. The removal of soluble material from soil or other material by percolating water.

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 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 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.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Muck. Dark colored, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash, glacial. Stratified sand and gravel produced by glaciers and carried, sorted, and deposited by glacial melt water.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.20 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Ponding. Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid permeability or an impermeable layer near the surface, the soil may not adequately filter effluent from a waste disposal system.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

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.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to insure satisfactory performance of the soil for a specific use.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

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).

Subsoil. Technically, the B horizon; roughly, the part of the profile below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A1, A2, or A3) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A horizon. Includes all subdivisions of this horizon (A1, A2, and A3).

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Till plain. An extensive flat to undulating area underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

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
January----	29.7	14.2	21.9	58	-11	0	1.74	.78	2.51	5	7.1
February---	32.8	16.4	24.7	58	-8	0	1.75	.82	2.50	4	7.7
March------	41.6	24.5	33.1	76	5	28	2.36	1.32	3.19	6	5.9
April------	56.9	37.2	47.1	82	19	229	3.90	2.46	5.18	8	1.8
May--------	68.7	47.4	58.1	88	30	561	3.13	2.13	4.03	7	.2
June-------	78.8	57.4	68.1	95	41	843	3.28	2.02	4.40	7	.0
July-------	82.6	61.2	71.9	95	46	989	4.00	2.82	5.07	6	.0
August-----	80.9	59.5	70.2	93	45	936	3.30	1.57	4.69	6	.0
September--	74.3	52.5	63.4	92	34	702	2.76	1.43	3.84	6	.1
October----	62.8	41.8	52.3	84	24	393	2.87	1.25	4.18	6	.4
November---	46.5	30.4	38.5	72	9	78	2.68	1.76	3.51	6	3.1
December---	34.6	20.2	27.4	62	-4	18	2.24	.90	3.32	6	7.1
Year-----	57.5	38.6	48.1	96	-11	4,777	34.01	29.18	38.62	73	33.4

* Recorded in the period 1951-72 at Angola, Indiana.

** 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 (40° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

Probability	Temperature*		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 19	April 29	May 15
2 years in 10 later than--	April 15	April 25	May 11
5 years in 10 later than--	April 7	April 17	May 1
First freezing temperature in fall:			
1 year in 10 earlier than--	October 22	October 10	September 28
2 years in 10 earlier than--	October 27	October 16	October 4
5 years in 10 earlier than--	November 6	October 27	October 14

* Recorded in the period 1951-72 at Angola, Indiana.

TABLE 3.--GROWING SEASON

Probability	Daily minimum temperature during growing season*		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	192	172	151
8 years in 10	199	179	156
5 years in 10	212	192	165
2 years in 10	225	204	175
1 year in 10	232	211	180

* Recorded in the period 1951-72 at Angola, Indiana.

TABLE 4.--POTENTIAL AND LIMITATIONS OF MAP UNITS ON THE GENERAL SOIL MAP

Map unit	Extent of area	Cultivated crops	Specialty crops	Woodland	Urban uses	Intensive recreation areas	Extensive recreation areas
	Pct						
1. Kosciusko-Ormas-Boyer	22	Fair: moderate available water capacity.	Good	Fair: moderate available water capacity.	Good	Good	Good.
2. Plainfield-Chelsea-Granby Variant	4	Poor: droughty.	Poor: droughty.	Fair: droughty.	Good	Fair: droughty.	Fair: droughty.
3. Riddles-Miami-Brookston	30	Good	Good	Good	Fair: slope, shrink-swell.	Good	Good.
4. Glynwood-Morley-Blount	39	Good	Poor: warms up slowly.	Good	Poor: shrink-swell, wetness, percs slowly.	Fair: percs slowly, wetness.	Good.
5. Houghton-Rensselaer-Milford	5	Good	Good	Poor: wetness.	Poor: ponding.	Poor: ponding.	Poor: ponding.

TABLE 5.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
Ad	Adrian muck, drained	915	0.4
Be	Beaches	141	0.1
BnA	Blount silt loam, 0 to 3 percent slopes	10,717	5.2
BoB	Boyer-Ormas loamy sands, 0 to 6 percent slopes	5,468	2.6
BoC	Boyer-Ormas loamy sands, 6 to 12 percent slopes	4,654	2.2
BoD	Boyer-Ormas loamy sands, 12 to 18 percent slopes	2,071	1.0
BtA	Brems loamy sand, 0 to 2 percent slopes	338	0.2
Bz	Brookston loam	4,198	2.0
CaC	Casco gravelly sandy loam, 6 to 12 percent slopes	1,328	0.6
CaD2	Casco gravelly sandy loam, 12 to 18 percent slopes, eroded	1,335	0.6
CcA	Carmi sandy loam, 0 to 2 percent slopes	651	0.3
ChB	Chelsea fine sand, 1 to 6 percent slopes	927	0.4
ChC	Chelsea fine sand, 6 to 12 percent slopes	655	0.3
Co	Cohoctah sandy loam	1,283	0.6
CrA	Crosier loam, 0 to 3 percent slopes	4,010	1.9
Dr	Del Rey silt loam	610	0.3
Ed	Edwards muck, drained	1,411	0.7
GnB	Glynwood silt loam, 2 to 6 percent slopes	23,018	11.1
Gs	Granby Variant loamy sand	1,483	0.7
HaA	Haskins loam, 0 to 3 percent slopes	1,447	0.7
Hn	Histosols, ponded	5,795	2.8
Ht	Houghton muck, undrained	6,558	3.2
Hw	Houghton muck, drained	4,253	2.1
KoA	Kosciusko sandy loam, 0 to 2 percent slopes	3,829	1.8
KoB	Kosciusko sandy loam, 2 to 6 percent slopes	6,633	3.2
KsC	Kosciusko gravelly sandy loam, 6 to 12 percent slopes	5,810	2.8
MbA	Martinsville loam, 0 to 2 percent slopes	284	0.1
MbB	Martinsville loam, 2 to 6 percent slopes	1,565	0.8
MbC	Martinsville loam, 6 to 12 percent slopes	701	0.3
Mc	Martisco muck, undrained	739	0.4
MfB	Metea loamy sand, 1 to 6 percent slopes	1,516	0.7
MfC	Metea loamy sand, 6 to 12 percent slopes	808	0.4
MhB	Miami loam, 2 to 6 percent slopes	6,424	3.1
MhC	Miami loam, 6 to 12 percent slopes	642	0.3
MhD	Miami loam, 12 to 18 percent slopes	843	0.4
MhE	Miami loam, 18 to 25 percent slopes	251	0.1
MkC3	Miami clay loam, 6 to 12 percent slopes, severely eroded	689	0.3
MkD3	Miami clay loam, 12 to 18 percent slopes, severely eroded	374	0.2
Mm	Millgrove loam	1,580	0.8
Mn	Milford silty clay loam	2,311	1.1
MoC2	Morley silt loam, 6 to 12 percent slopes, eroded	11,876	5.7
MoD2	Morley silt loam, 12 to 18 percent slopes, eroded	979	0.5
MoE2	Morley silt loam, 18 to 25 percent slopes, eroded	239	0.1
MrC3	Morley silty clay loam, 6 to 12 percent slopes, severely eroded	2,695	1.3
MrD3	Morley silty clay loam, 12 to 18 percent slopes, severely eroded	946	0.5
Mx	Morocco loamy sand	397	0.2
Mz	Muskego muck, drained	490	0.2
OhA	Oshtemo-Ormas loamy sands, 0 to 2 percent slopes	2,293	1.1
OhB	Oshtemo-Ormas loamy sands, 2 to 6 percent slopes	2,064	1.0
OhC	Oshtemo-Ormas loamy sands, 6 to 12 percent slopes	807	0.4
OsC	Oshtemo-Kosciusko-Riddles complex, 4 to 12 percent slopes	979	0.5
Pa	Palms muck, drained	1,367	0.7
Pe	Pewamo silty clay loam	7,371	3.6
Pg	Pits, gravel	358	0.2
PnA	Plainfield fine sand, 0 to 2 percent slopes	1,213	0.6
PnB	Plainfield fine sand, 2 to 10 percent slopes	1,481	0.7
RaB	Rawson loam, 2 to 6 percent slopes	5,173	2.5
Rb	Rensselaer loam	3,504	1.7
RxA	Riddles sandy loam, 0 to 2 percent slopes	1,659	0.8
RxB	Riddles sandy loam, 2 to 6 percent slopes	8,403	4.1
RxC	Riddles sandy loam, 6 to 12 percent slopes	5,689	2.7
RxD	Riddles sandy loam, 12 to 18 percent slopes	713	0.3
Ry	Riverdale loamy sand	759	0.4
Sh	Shoals loam	1,331	0.6
Ud	Udorthents, loamy	2,500	1.2
Wa	Wallkill silt loam	751	0.4
Wh	Washtenaw silt loam	1,367	0.7
WsB	Wawasee loam, 2 to 6 percent slopes	3,374	1.6
WsC	Wawasee loam, 6 to 12 percent slopes	4,095	2.0
WsD	Wawasee loam, 12 to 18 percent slopes	956	0.5
WsE	Wawasee loam, 18 to 25 percent slopes	369	0.2
WvC3	Wawasee sandy clay loam, 6 to 12 percent slopes, severely eroded	991	0.5

TABLE 5.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
WvD3	Wawasee sandy clay loam, 12 to 18 percent slopes, severely eroded	459	0.2
Wx	Whitaker loam	1,847	0.9
	Water	9,600	4.6
	Total	207,360	100.0

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Only arable soils are listed. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Corn	Soybeans	Winter wheat	Grass-legume hay	Tall fescue
	Bu	Bu	Bu	Ton	AUM*
Ad Adrian	75	23	---	---	---
BnA Blount	106	35	48	4.3	7.2
BoB Boyer-Ormas	70	25	30	2.4	4.8
BoC Boyer-Ormas	65	21	28	2.3	4.6
BoD Boyer-Ormas	50	20	24	1.8	3.6
BtA Brems	70	24	32	2.3	4.6
Bz Brookston	125	46	54	4.8	9.6
CaC Casco	65	24	28	3.5	7.0
CaD2 Casco	---	---	24	3.0	6.0
CcA Carmi	85	33	45	4.3	8.6
ChB Chelsea	57	21	28	2.0	4.0
ChC Chelsea	---	---	---	1.5	3.0
Co Cohoctah	110	40	---	3.5	7.0
CrA Crosier	120	42	54	4.0	8.0
Dr Del Rey	115	37	49	4.5	9.0
Ed Edwards	90	34	---	---	---
GnB Glynwood	95	35	40	4.5	9.0
Gs Granby Variant	75	24	32	2.3	4.6
HaA Haskins	110	44	46	4.4	8.8
Hw Houghton	115	34	---	---	---
KoA Kosciusko	80	28	38	2.6	5.2

See footnote at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Winter wheat	Grass-legume hay	Tall fescue
	Bu	Bu	Bu	Ton	AUM*
KoB---------- Kosciusko	75	26	38	2.5	5.0
KsC---------- Kosciusko	70	24	32	2.4	4.8
MbA---------- Martinsville	120	42	48	4.0	8.0
MbB---------- Martinsville	120	42	48	4.0	8.0
MbC---------- Martinsville	110	38	44	3.6	7.2
Mc---------- Martisco	80	---	---	---	---
MfB---------- Metea	85	30	42	2.8	5.6
MfC---------- Metea	75	26	38	2.5	5.0
MhB---------- Miami	110	38	50	3.6	7.2
MhC---------- Miami	100	37	43	4.0	8.0
MhD---------- Miami	85	30	38	2.8	5.6
MhE---------- Miami	---	---	---	---	4.6
MkC3---------- Miami	90	32	40	3.0	6.0
MkD3---------- Miami	---	---	---	2.5	5.0
Mm---------- Millgrove	120	50	50	4.8	9.6
Mn---------- Milford	125	48	56	4.8	9.6
MoC2---------- Morley	85	30	44	4.0	8.0
MoD2---------- Morley	80	26	41	3.7	7.4
MoE2---------- Morley	---	---	---	3.1	6.2
MrC3---------- Morley	75	26	39	3.6	7.2
MrD3---------- Morley	---	---	---	3.3	6.6
Mx---------- Morocco	80	28	36	2.6	5.2
Mz---------- Muskego	90	35	---	3.5	7.0

See footnote at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Winter wheat	Grass-legume hay	Tall fescue
	Bu	Bu	Bu	Ton	AUM*
OhA---- Oshtemo-Ormas	70	27	30	2.2	4.4
OhB---- Oshtemo-Ormas	66	25	30	2.1	4.2
OhC---- Oshtemo-Ormas	61	22	28	2.0	4.0
OsC---- Oshtemo-Kosciusko-Riddles	70	27	33	2.5	5.0
Pa---- Palms	105	42	---	---	---
Pe---- Pewamo	115	42	60	4.5	9.0
PnA, PnB---- Plainfield	---	---	---	2.0	4.0
RaB---- Rawson	105	38	46	4.2	8.4
Rb---- Rensselaer	130	53	60	5.0	10.0
RxA---- Riddles	120	42	48	4.0	8.0
RxB---- Riddles	115	40	46	3.8	7.6
RxC---- Riddles	105	37	42	3.4	6.8
RxD---- Riddles	90	32	36	3.0	6.0
Ry---- Riverdale	75	30	32	3.5	7.0
Sh---- Shoals	80	32	---	3.0	8.0
Wa---- Wallkill	100	37	---	4.0	8.0
Wh---- Washtenaw	125	46	52	4.3	8.6
WsB---- Wawasee	115	37	47	3.4	6.8
WsC---- Wawasee	105	33	40	3.1	6.2
WsD---- Wawasee	90	30	40	3.1	6.0
WsE---- Wawasee	---	---	---	---	5.0
WvC3---- Wawasee	85	30	40	3.1	6.0

See footnote at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Winter wheat	Grass-legume hay	Tall fescue
	Bu	Bu	Bu	Ton	AUM*
WvD3---------- Wawasee	---	---	---	---	5.0
Wx---------- Whitaker	125	44	50	4.1	8.2

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

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	1,943	---	---	---
II	88,901	47,957	40,293	651
III	67,760	44,210	9,896	13,654
IV	17,137	11,265	3,555	2,317
V	6,558	---	6,558	---
VI	6,667	3,973	---	2,694
VII	---	---	---	---
VIII	5,795	---	5,795	---

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	
Ad Adrian	4w	Slight	Severe	Severe	Severe	White ash Red maple Quaking aspen Black willow Silver maple	51 51 56 --- 76	
BnA Blount	3c	Slight	Slight	Severe	Severe	White oak Northern red oak Green ash Bur oak Pin oak	65 65 --- --- ---	Eastern white pine, red pine, yellow-poplar, white oak, northern red oak.
BoB*, BoC*: Boyer	3s	Slight	Slight	Moderate	Slight	White oak Red pine Eastern white pine Jack pine Northern red oak	70 75 65 68 75	Jack pine, eastern white pine, red pine.
Ormas	3s	Slight	Slight	Moderate	Slight	White oak Yellow-poplar Eastern white pine Red pine	70 --- --- 78	Eastern white pine, red pine, yellow-poplar, black walnut, European alder.
BoD*: Boyer	3s	Moderate	Moderate	Moderate	Slight	White oak Red pine Eastern white pine Jack pine Northern red oak	70 75 65 68 75	Jack pine, eastern white pine, red pine.
Ormas	3s	Slight	Slight	Moderate	Slight	White oak Yellow-poplar Eastern white pine Red pine	70 --- --- 78	Eastern white pine, red pine, yellow-poplar, black walnut, European alder.
BtA Brems	3s	Slight	Slight	Moderate	Slight	Northern red oak Red pine Eastern white pine Jack pine	70 72 65 70	Eastern white pine, red pine, jack pine.
Bz Brookston	2w	Slight	Severe	Severe	Moderate	Pin oak White oak Northern red oak	86 75 78	Red maple, white ash, pin oak.
CaC Casco	3s	Slight	Slight	Moderate	Moderate	White oak Red pine Eastern white pine Jack pine	70 78 85 68	Eastern white pine, red pine, jack pine.
CaD2 Casco	3s	Moderate	Moderate	Moderate	Moderate	White oak Red pine Eastern white pine Jack pine	70 78 85 68	Eastern white pine, red pine, jack pine.
CcA Carmi	---	---	---	---	---	---	---	Black walnut, green ash, American sycamore, red maple.

See footnote 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	
ChB, ChC---------- Chelsea	3s	Slight	Slight	Moderate	Slight	White oak----------	70	Eastern white pine, red pine, jack pine.
						Red pine----------	72	
						Eastern white pine--	83	
						Jack pine----------	70	
						Quaking aspen-------	72	
						Northern red oak----	70	
Co---------- Cohoctah	2w	Slight	Severe	Severe	Severe	Red maple----------	72	Eastern white pine, white ash, green ash, red maple.
						Silver maple--------	95	
						White ash----------	72	
						Green ash----------	70	
						Eastern cottonwood--	---	
CrA---------- Crosier	3o	Slight	Slight	Slight	Slight	White oak----------	75	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.
						Pin oak----------	85	
						Yellow-poplar-------	85	
						Northern red oak----	75	
Dr---------- Del Rey	3c	Slight	Slight	Severe	Severe	White oak----------	70	White oak, northern red oak, green ash, bur oak, eastern white pine.
						Northern red oak----	70	
						Green ash----------	---	
						Bur oak----------	---	
Ed---------- Edwards	4w	Slight	Severe	Severe	Severe	White ash----------	51	
						Red maple----------	51	
						Quaking aspen-------	56	
						Black willow--------	---	
						Silver maple--------	76	
GnB---------- Glynwood	2c	Slight	Slight	Moderate	Slight	Northern red oak----	80	Eastern white pine, yellow-poplar, black walnut, white ash.
						Black oak----------	80	
						White oak----------	80	
						Black walnut--------	---	
Gs---------- Granby Variant	4w	Slight	Severe	Severe	Severe	White ash----------	51	European larch, green ash, white ash.
						Quaking aspen-------	56	
						Red maple----------	51	
						Pin oak----------	---	
						Black willow--------	---	
						Green ash----------	---	
HaA---------- Haskins	2o	Slight	Slight	Slight	Slight	White oak----------	75	Red maple, white ash, eastern white pine, yellow-poplar.
						Northern red oak----	80	
						Pin oak----------	90	
Ht, Hw---------- Houghton	4w	Slight	Severe	Severe	Severe	White ash----------	51	
						Red maple----------	51	
						Quaking aspen-------	56	
						Black willow--------	---	
						Silver maple--------	76	
KoA, KoB, KsC------ Kosciusko	2o	Slight	Slight	Slight	Slight	Northern red oak----	78	Eastern white pine, red pine, white oak.
						White oak----------	76	
						Eastern white pine--	70	
						Black oak----------	---	
						Jack pine----------	---	
MbA, MbB, MbC------ Martinsville	1o	Slight	Slight	Slight	Slight	White oak----------	90	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
						Yellow-poplar-------	98	
Mc---------- Martisco	4w	Slight	Severe	Severe	Severe	Red maple----------	55	

See footnote 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	
MfB, MfC Metea	2s	Slight	Slight	Moderate	Slight	White oak Yellow-poplar Eastern white pine Red pine	80 86 75 75	Eastern white pine, red pine, yellow-poplar, black walnut, European alder.
MhB, MhC, MhD Miami	1o	Slight	Slight	Slight	Slight	White oak Yellow-poplar	90 98	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
MhE Miami	1r	Moderate	Moderate	Slight	Slight	White oak Yellow-poplar	90 98	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
MkC3, MkD3 Miami	1o	Slight	Slight	Slight	Slight	White oak Yellow-poplar	90 98	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
Mm Millgrove	2w	Slight	Severe	Severe	Severe	Pin oak Northern red oak Swamp white oak Red maple Eastern cottonwood Black cherry Green ash	86 80 85 --- --- --- ---	Swamp white oak, eastern cottonwood, green ash, pin oak, red maple, black willow, American sycamore.
Mn Milford	---	---	---	---	---	---	---	Pin oak, green ash, eastern hemlock, Norway spruce, red maple.
MoC2, MoD2 Morley	2o	Slight	Slight	Slight	Slight	White oak Northern red oak Yellow-poplar Black walnut Bur oak Shagbark hickory	80 80 90 --- --- ---	White oak, black walnut, green ash, eastern white pine, red pine.
MoE2 Morley	2r	Moderate	Moderate	Moderate	Slight	White oak Northern red oak Yellow-poplar Black walnut Bur oak Shagbark hickory	80 80 90 --- --- ---	White oak, black walnut, green ash, eastern white pine, red pine.
MrC3, MrD3 Morley	2o	Slight	Slight	Slight	Slight	White oak Northern red oak Yellow-poplar Black walnut Bur oak Shagbark hickory	80 80 90 --- --- ---	White oak, black walnut, green ash, eastern white pine, red pine.
Mx Morocco	3o	Slight	Slight	Slight	Slight	Northern red oak Pin oak Eastern white pine	70 85 65	Eastern white pine, European larch, red maple, American sycamore.

See footnote 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	
Mz---------- Muskego	4w	Slight	Severe	Severe	Severe	Tamarack---------- Red maple---------- White ash---------- Green ash---------- Black willow-------- Quaking aspen------- Silver maple--------	50 51 52 --- --- 56 ---	
OhA*, OhB*, OhC*: Oshtemo----------	3s	Slight	Slight	Moderate	Slight	Northern red oak---- White oak---------- American basswood--- Sugar maple---------	66 --- 66 61	Eastern white pine, red pine, jack pine.
Ormas----------	3s	Slight	Slight	Moderate	Slight	White oak---------- Yellow-poplar------- Eastern white pine-- Red pine----------	70 --- --- 78	Eastern white pine, red pine, yellow-poplar, black walnut.
OsC*: Oshtemo----------	3s	Slight	Slight	Moderate	Slight	Northern red oak---- White oak---------- American basswood--- Sugar maple---------	66 --- 66 61	Eastern white pine, red pine, white spruce, jack pine.
Kosciusko---------	2o	Slight	Slight	Slight	Slight	Northern red oak---- White oak---------- Eastern white pine-- Black oak---------- Jack pine----------	78 76 70 --- ---	Eastern white pine, red pine.
Riddles----------	1o	Slight	Slight	Slight	Slight	White oak---------- Yellow-poplar------- Northern red oak----	90 98 90	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
Pa---------- Palms	4w	Slight	Severe	Severe	Severe	White ash---------- Red maple---------- Quaking aspen------- Black willow-------- Silver maple--------	51 51 56 --- 76	
Pe---------- Pewamo	2w	Slight	Severe	Moderate	Moderate	Pin oak---------- Swamp white oak----- Red maple---------- White ash---------- Eastern cottonwood-- Green ash----------	90 --- 71 71 98 ---	White ash, red maple, green ash, pin oak, eastern cottonwood.
PnA, PnB---------- Plainfield	3s	Slight	Slight	Severe	Slight	Black oak---------- White oak---------- Black cherry-------- Northern red oak----	70 65 --- ---	Red pine, eastern white pine, jack pine.
RaB---------- Rawson	2o	Slight	Slight	Slight	Slight	White oak---------- Northern red oak----	75 80	Eastern white pine, yellow-poplar, black walnut.
Rb---------- Rensselaer	2w	Slight	Severe	Severe	Severe	Pin oak---------- White oak---------- Northern red oak----	86 75 76	Eastern white pine, red maple, white ash.
RxA, RxB, RxC, RxD- Riddles	1o	Slight	Slight	Slight	Slight	White oak---------- Red maple---------- White ash---------- Green ash---------- Black walnut-------- Yellow-poplar------- Northern red oak----	90 --- 80 --- --- 98 90	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.

See footnote 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	
Ry---------- Riverdale	3s	Slight	Slight	Moderate	Slight	Quaking aspen--------- Eastern cottonwood-- Black oak---------- Red maple----------	70 90 --- ---	Eastern white pine, red pine, black oak, white ash.
Sh---------- Shoals	2o	Slight	Slight	Slight	Slight	Pin oak---------- Yellow-poplar-------- Virginia pine-------- Eastern cottonwood-- White ash----------	90 90 90 --- ---	Red maple, swamp chestnut oak, pin oak, yellow-poplar.
Wa---------- Wallkill	4w	Slight	Severe	Severe	Severe	Pin oak---------- Red maple----------	80 65	
Wh---------- Washtenaw	2w	Slight	Severe	Severe	Moderate	Pin oak---------- Northern red oak---- Red maple---------- Silver maple-------- White ash---------- American basswood--- White oak----------	86 75 70 --- --- --- ---	Eastern white pine, red maple, white ash, pin oak, northern red oak.
WsB, WsC, WsD------ Wawasee	1o	Slight	Slight	Slight	Slight	White oak---------- Yellow-poplar--------	90 98	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
WsE---------- Wawasee	1r	Moderate	Moderate	Slight	Slight	White oak---------- Yellow-poplar--------	90 98	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
WvC3, WvD3--------- Wawasee	1o	Slight	Slight	Slight	Slight	White oak---------- Yellow-poplar--------	90 98	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
Wx---------- Whitaker	3o	Slight	Slight	Slight	Slight	White oak---------- Pin oak---------- Yellow-poplar-------- Northern red oak----	70 85 85 75	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.

* 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 heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
Ad---------- Adrian	Gray dogwood------	Amur honeysuckle, redosier dogwood, silky dogwood.	Tall purple willow.	Northern white-cedar.	---
Be*. Beaches					
BnA---------- Blount	Gray dogwood, redosier dogwood, arrowwood.	Autumn-olive, silky dogwood.	Amur maple, eastern redcedar, flowering dogwood.	Norway spruce, eastern white pine, Douglas-fir.	Eastern cottonwood.
BoB*, BoC*, BoD*: Boyer----------	American hazel, European privet.	Tamarisk, late lilac, forsythia, autumn-olive.	---	Eastern white pine, red pine, Austrian pine, jack pine.	---
Ormas----------	American hazel, European privet.	Tamarisk, late lilac, forsythia, autumn-olive.	---	Eastern white pine, red pine, Austrian pine, jack pine.	---
BtA---------- Brems	American hazel, European privet.	Tamarisk, late lilac, forsythia, autumn-olive.	Austrian pine, tall purple willow.	Eastern white pine, red pine, jack pine.	---
Bz---------- Brookston	Gray dogwood------	Redosier dogwood, Amur honeysuckle, silky dogwood.	Northern white-cedar, tall purple willow, Siberian crabapple.	---	Green ash.
CaC, CaD2--------- Casco	American hazel, European privet.	Tamarisk, late lilac, forsythia, autumn-olive.	Austrian pine-----	Eastern white pine, red pine, jack pine.	---
CcA---------- Carmi	Gray dogwood, redosier dogwood.	Amur honeysuckle, autumn-olive, silky dogwood.	Russian-olive, eastern redcedar.	Eastern white pine, Norway spruce, Douglas-fir.	Eastern cottonwood, American sycamore.
ChB, ChC---------- Chelsea	Russian peashrub, gray dogwood, Koster redcedar.	Eastern redcedar, Russian-olive, Siberian crabapple, nannyberry viburnum.	Common hackberry, eastern white pine, red pine.	---	---
Co---------- Cohoctah	---	---	Northern white-cedar, tall purple willow.	---	---
CrA---------- Crosier	Cutleaf staghorn sumac.	Blackhaw, autumn-olive, Amur honeysuckle, mapleleaf viburnum, cornelian cherry dogwood, American cranberrybush, rose-of-sharon.	---	Norway spruce, American basswood, white spruce.	Eastern white pine.

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
Dr---------- Del Rey	Redosier dogwood, gray dogwood, arrowwood.	Silky dogwood, autumn-olive.	Amur maple, eastern redcedar, flowering dogwood.	Eastern white pine, Norway spruce, Douglas-fir.	Eastern cottonwood.
Ed---------- Edwards	Gray dogwood------	Amur honeysuckle, redosier dogwood, silky dogwood.	Northern white-cedar, tall purple willow, medium purple willow.	---	---
GnB---------- Glynwood	---	Silky dogwood, Amur honeysuckle, redosier dogwood, forsythia, nannyberry viburnum.	Northern white-cedar, eastern redcedar, autumn-olive.	Norway spruce-----	Eastern white pine.
Gs---------- Granby Variant	Gray dogwood------	Redosier dogwood, silky dogwood.	Tall purple willow	Pin oak, eastern white pine.	---
HaA---------- Haskins	---	Gray dogwood, medium purple willow, silky dogwood, redosier dogwood, American cranberrybush.	Norway spruce, northern white-cedar.	Eastern white pine, pin oak.	---
Hn*. Histosols					
Ht, Hw---------- Houghton	Gray dogwood------	Amur honeysuckle, redosier dogwood, silky dogwood.	Northern white-cedar, tall purple willow.	---	---
KoA, KoB, KsC----- Kosciusko	American hazel, European privet.	Tamarisk, late lilac, forsythia, autumn-olive.	---	Eastern white pine, red pine, Austrian pine, jack pine.	---
MbA, MbB, MbC----- Martinsville	Mockorange--------	European burningbush, blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, American cranberrybush, autumn-olive.	Eastern hemlock---	Norway spruce-----	Eastern white pine, honeylocust.
Mc. Martisco					
MfB, MfC---------- Metea	American hazel, European privet.	Forsythia, late lilac, tamarisk, autumn-olive.	---	Red pine, eastern white pine, jack pine, Austrian pine.	---

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
MhB, MhC, MhD----- Miami	---	Blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, winged euonymus, American cranberrybush, autumn-olive.	Eastern hemlock, European burningbush.	Norway spruce-----	Eastern white pine, honeylocust.
MhE. Miami					
MkC3, MkD3-------- Miami	---	Blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, winged euonymus, American cranberrybush, autumn-olive.	Eastern hemlock, European burningbush.	Norway spruce-----	Eastern white pine, honeylocust.
Mm---------- Millgrove	---	Gray dogwood, redosier dogwood, silky dogwood.	Northern white-cedar, medium purple willow, black willow.	---	---
Mn---------- Milford	Redosier dogwood, gray dogwood.	Amur maple, silky dogwood.	Russian-olive-----	Green ash, Norway spruce.	Eastern cottonwood, pin oak, American sycamore.
MoC2, MoD2-------- Morley	Gray dogwood, redosier dogwood, arrowwood.	Autumn-olive, silky dogwood.	Eastern redcedar, flowering dogwood, Amur maple.	Eastern white pine, Norway spruce, Douglas-fir.	Eastern cottonwood.
MoE2. Morley					
MrC3, MrD3-------- Morley	Gray dogwood, redosier dogwood, arrowwood.	Autumn-olive, silky dogwood.	Eastern redcedar, flowering dogwood, Amur maple.	Eastern white pine, Norway spruce, Douglas-fir.	Eastern cottonwood.
Mx---------- Morocco	Gray dogwood------	Redosier dogwood, silky dogwood.	Tall purple willow	Eastern white pine, pin oak.	---
Mz---------- Muskego	Gray dogwood------	Redosier dogwood, silky dogwood, Amur honeysuckle.	Northern white-cedar, tall purple willow.	---	---
OhA*, OhB*, OhC*: Oshtemo----------	American hazel, European privet.	Tamarisk, late lilac, forsythia, autumn-olive.	---	Eastern white pine, red pine, Austrian pine, jack pine.	---
Ormas----------	American hazel, European privet.	Tamarisk, late lilac, forsythia, autumn-olive.	---	Eastern white pine, red pine, Austrian pine, jack pine.	---

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
OsC*:					
Oshtemo	American hazel, European privet.	Tamarisk, late lilac, forsythia, autumn-olive.	---	Eastern white pine, red pine, Austrian pine, jack pine.	---
Kosciusko	American hazel, European privet.	Tamarisk, late lilac, forsythia, autumn-olive.	---	Eastern white pine, red pine, Austrian pine, jack pine.	---
Riddles	Mockorange	European burningbush, blackhaw, lilac, Amur honeysuckle, American cranberrybush.	Eastern hemlock	Norway spruce	Eastern white pine, honeylocust.
Pa Palms	Gray dogwood	Amur honeysuckle, redosier dogwood, silky dogwood.	Northern white-cedar, tall purple willow.	---	---
Pe Pewamo	Gray dogwood	Amur honeysuckle, redosier dogwood, silky dogwood.	Northern white-cedar, tall purple willow.	---	---
Pg*. Pits					
PnA, PnB Plainfield	American hazel	Tamarisk, late lilac, forsythia, autumn-olive.	---	Eastern white pine, red pine, Austrian pine, jack pine.	---
RaB Rawson	---	Nannyberry viburnum, silky dogwood, forsythia, Amur honeysuckle, redosier dogwood.	Northern white-cedar, eastern redcedar, autumn-olive.	Norway spruce	Eastern white pine.
Rb Rensselaer	Gray dogwood	Redosier dogwood, Amur honeysuckle, silky dogwood.	Northern white-cedar, tall purple willow.	---	---
RxA, RxB, RxC, RxD Riddles	Mockorange	European burningbush, blackhaw, late lilac, Amur honeysuckle, American cranberrybush.	Eastern hemlock	Norway spruce	Honeylocust, eastern white pine.
Ry Riverdale	Gray dogwood	Redosier dogwood, silky dogwood.	Northern white-cedar, tall purple willow.	Eastern white pine, pin oak.	---
Sh Shoals	Gray dogwood	Redosier dogwood, silky dogwood, Amur honeysuckle.	Northern white-cedar, tall purple willow.	---	---

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
Ud*. Udorthents					
Wa---------- Wallkill	Gray dogwood------	Amur honeysuckle, redosier dogwood, silky dogwood.	Northern white-cedar, tall purple willow.	---	---
Wh---------- Washtenaw	Gray dogwood------	Redosier dogwood, silky dogwood, Amur honeysuckle.	Northern white-cedar, tall purple willow.	---	---
WsB, WsC, WsD, WsE, WvC3, WvD3-- Wawasee	---	Blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, winged euonymus, American cranberrybush, autumn-olive.	Eastern hemlock, European burningbush.	Norway spruce-----	Honeylocust, eastern white pine.
Wx---------- Whitaker	---	Autumn-olive, Amur honeysuckle, American cranberrybush, blackhaw, shadblow serviceberry, arrowwood, cornelian cherry dogwood, rose-of-sharon.	---	Norway spruce, white spruce, American basswood.	Eastern white pine.

* 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	Golf fairways
Ad Adrian	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.
Be*: Beaches					
BnA Blount	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness.
BoB*: Boyer	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight	Moderate: droughty.
Ormas	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
BoC*: Boyer	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Moderate: droughty, slope.
Ormas	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
BoD*: Boyer	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
Ormas	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
BtA Brems	Moderate: wetness.	Moderate: wetness.	Moderate: small stones.	Slight	Moderate: droughty.
Bz Brookston	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
CaC Casco	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: small stones, slope.	Slight	Moderate: slope, droughty.
CaD2 Casco	Severe: slope.	Severe: slope.	Severe: small stones, slope.	Moderate: slope.	Severe: slope.
CcA Carmi	Slight	Slight	Slight	Slight	Slight.
ChB Chelsea	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Moderate: droughty.
ChC Chelsea	Severe: too sandy.	Severe: too sandy.	Severe: too sandy, slope.	Severe: too sandy.	Moderate: slope, droughty.
Co Cohoctah	Severe: floods, wetness.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.	Severe: floods, wetness.
CrA Crosier	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: 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	Golf fairways
Dr Del Rey	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness.
Ed Edwards	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: excess humus, ponding.
GnB Glynwood	Moderate: percs slowly, wetness.	Moderate: wetness, percs slowly.	Moderate: wetness, slope, percs slowly.	Severe: erodes easily.	Slight.
Gs Granby Variant	Severe: floods, wetness.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.
HaA Haskins	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness.
Hn*. Histosols					
Ht, Hw Houghton	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.
KoA Kosciusko	Slight	Slight	Moderate: small stones.	Slight	Moderate: droughty.
KoB Kosciusko	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.
KsC Kosciusko	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Moderate: droughty, slope.
MbA Martinsville	Slight	Slight	Slight	Severe: erodes easily.	Slight.
MbB Martinsville	Slight	Slight	Moderate: slope.	Severe: erodes easily.	Slight.
MbC Martinsville	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Mc Martisco	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
MfB Metea	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
MfC Metea	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
MhB Miami	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
MhC Miami	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: slope.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
MhD, MhE---------- Miami	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
MkC3---------- Miami	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight----------	Moderate: slope.
MkD3---------- Miami	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Mm---------- Millgrove	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Mn---------- Milford	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
MoC2---------- Morley	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
MoD2---------- Morley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
MoE2---------- Morley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
MrC3---------- Morley	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
MrD3---------- Morley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Mx---------- Morocco	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, droughty.
Mz---------- Muskego	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.	Severe: excess humus, ponding.
OhA*: Oshtemo----------	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight----------	Moderate: small stones.
Ormas----------	Slight----------	Slight----------	Slight----------	Slight----------	Moderate: droughty.
OhB*: Oshtemo----------	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Slight----------	Moderate: small stones.
Ormas----------	Slight----------	Slight----------	Moderate: slope.	Slight----------	Moderate: droughty.
OhC*: Oshtemo----------	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight----------	Moderate: small stones, slope.
Ormas----------	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: droughty, slope.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
OsC*: Oshtemo	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Moderate: small stones, slope.
Kosciusko	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
Riddles	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Pa Palms	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
Pe Pewamo	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Pg*. Pits					
PnA, PnB Plainfield	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: too sandy.	Severe: droughty.
RaB Rawson	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Slight	Slight.
Rb Rensselaer	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
RxA Riddles	Slight	Slight	Moderate: small stones.	Slight	Slight.
RxB Riddles	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
RxC Riddles	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
RxD Riddles	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Ry Riverdale	Severe: wetness.	Moderate: wetness, small stones.	Severe: wetness, small stones.	Moderate: wetness.	Severe: droughty.
Sh Shoals	Severe: floods, wetness.	Moderate: floods, wetness.	Severe: wetness, floods.	Moderate: wetness, floods.	Severe: floods.
Ud*. Udorthents					
Wa Wallkill	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding.
Wh Washtenaw	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
WsB Wawasee	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
WsC---------- Wawasee	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope.
WsD, WsE---------- Wawasee	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
WvC3---------- Wawasee	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight----------	Moderate: slope.
WvD3---------- Wawasee	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Wx---------- Whitaker	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--WILDLIFE HABITAT POTENTIALS

[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
Ad---- Adrian	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Be*. Beaches										
BnA---- Blount	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
BoB*:										
Boyer----	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Ormas----	Poor	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
BoC*, BoD*:										
Boyer----	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Ormas----	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
BtA---- Brems	Poor	Fair	Fair	Poor	Poor	Poor	Very poor.	Fair	Poor	Poor.
Bz---- Brookston	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
CaC---- Casco	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
CaD2---- Casco	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
CcA---- Carmi	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
ChB---- Chelsea	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
ChC---- Chelsea	Very poor.	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Co---- Cohoctah	Poor	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
CrA---- Crosier	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Dr---- Del Rey	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Ed---- Edwards	Fair	Fair	Poor	Poor	Poor	Good	Good	Fair	Poor	Good.
GnB---- Glynwood	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Gs---- Granby Variant	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
HaA---- Haskins	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT POTENTIALS--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
Hn*. Histosols										
Ht, Hw---------- Houghton	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
KoA, KoB---------- Kosciusko	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.
KsC---------- Kosciusko	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
MbA, MbB---------- Martinsville	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
MbC---------- Martinsville	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Mc---------- Martisco	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Good	Good	Very poor.	Very poor.	Good.
MfB---------- Metea	Poor	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
MfC---------- Metea	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
MhB---------- Miami	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
MhC---------- Miami	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
MhD, MhE---------- Miami	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
MkC3---------- Miami	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
MkD3---------- Miami	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Mm---------- Millgrove	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Mn---------- Milford	Good	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
MoC2---------- Morley	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
MoD2, MoE2--------- Morley	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
MrC3---------- Morley	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
MrD3---------- Morley	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Mx---------- Morocco	Poor	Fair	Good	Fair	Fair	Fair	Very poor.	Fair	Fair	Poor.
Mz---------- Muskego	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT POTENTIALS--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
OhA*, OhB*:										
Oshtemo	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Ormas	Poor	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
OhC*:										
Oshtemo	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Ormas	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
OsC*:										
Oshtemo	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Kosciusko	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
Riddles	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Pa Palms	Good	Poor	Poor	Poor	Poor	Good	Good	Fair	Poor	Good.
Pe Pewamo	Good	Fair	Fair	Fair	Fair	---	Good	Fair	Fair	Good.
Pg*. Pits										
PnA, PnB Plainfield	Poor	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
RaB Rawson	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Rb Rensselaer	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
RxA, RxB Riddles	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
RxC Riddles	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
RxD Riddles	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Ry Riverdale	Poor	Fair	Good	Fair	Fair	Fair	Poor	Fair	Fair	Poor.
Sh Shoals	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
Ud*. Udorthents										
Wa Wallkill	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Wh Washtenaw	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT POTENTIALS--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
WsB---------- Wawasee	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
WsC---------- Wawasee	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
WsD---------- Wawasee	Poor	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
WsE. Wawasee										
WvC3---------- Wawasee	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
WvD3---------- Wawasee	Poor	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Wx---------- Whitaker	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.

* 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]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Ad Adrian	Severe: ponding, cutbanks cave, excess humus.	Severe: ponding, low strength.	Severe: ponding.	Severe: ponding, low strength.	Severe: ponding, low strength, frost action.	Severe: excess humus, ponding.
Be*. Beaches						
BnA Blount	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
BoB*: Boyer	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Moderate: droughty.
Ormas	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Moderate: droughty.
BoC*: Boyer	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
Ormas	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: droughty, slope.
BoD*: Boyer	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Ormas	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
BtA Brems	Severe: cutbanks cave, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: droughty.
Bz Brookston	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
CaC Casco	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope, droughty.
CaD2 Casco	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
CcA Carmi	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Slight.
ChB Chelsea	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
ChC Chelsea	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope, droughty.
Co Cohoctah	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, frost action, wetness.	Severe: floods, 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
CrA---------- Crosier	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, low strength.	Moderate: wetness.
Dr---------- Del Rey	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Ed---------- Edwards	Severe: ponding, excess humus.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, frost action, low strength.	Severe: excess humus, ponding.
GnB---------- Glynwood	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: slope, shrink-swell, wetness.	Severe: frost action, low strength.	Slight.
Gs---------- Granby Variant	Severe: cutbanks cave, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: wetness, floods.	Severe: wetness, floods.
HaA---------- Haskins	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
Hn*. Histosols						
Ht, Hw---------- Houghton	Severe: ponding, excess humus.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength, frost action.	Severe: excess humus, ponding.
KoA---------- Kosciusko	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight---------	Moderate: shrink-swell.	Moderate: frost action, shrink-swell.	Moderate: droughty.
KoB---------- Kosciusko	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight---------	Moderate: shrink-swell, slope.	Moderate: frost action, shrink-swell.	Moderate: droughty.
KsC---------- Kosciusko	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action, shrink-swell.	Moderate: droughty, slope.
MbA---------- Martinsville	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, frost action.	Slight.
MbB---------- Martinsville	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: low strength, frost action.	Slight.
MbC---------- Martinsville	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: slope.
Mc---------- Martisco	Severe: ponding, excess humus.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: low strength, ponding, frost action.	Severe: ponding, excess humus.
MfB---------- Metea	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Moderate: frost action.	Moderate: droughty.
MfC---------- Metea	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: droughty, slope.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
MhB---------- Miami	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Moderate: frost action, low strength.	Slight.
MhC---------- Miami	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: slope, frost action, low strength.	Moderate: slope.
MhD, MhE---------- Miami	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
MkC3---------- Miami	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: slope, frost action, low strength.	Moderate: slope.
MkD3---------- Miami	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Mm---------- Millgrove	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
Mn---------- Milford	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
MoC2---------- Morley	Moderate: too clayey, dense layer, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
MoD2, MoE2-------- Morley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
MrC3---------- Morley	Moderate: too clayey, dense layer, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
MrD3---------- Morley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Mx---------- Morocco	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, frost action.	Moderate: wetness, droughty.
Mz---------- Muskego	Severe: excess humus, ponding.	Severe: low strength, ponding.	Severe: low strength, ponding.	Severe: low strength, ponding.	Severe: frost action, low strength, ponding.	Severe: excess humus, ponding.
OhA*:						
Oshtemo----------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Moderate: small stones.
Ormas----------	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Moderate: droughty.
OhB*:						
Oshtemo----------	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Moderate: frost action.	Moderate: small stones.
Ormas----------	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Moderate: frost action.	Moderate: 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
OhC*:						
Oshtemo	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: small stones, slope.
Ormas	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: droughty, slope.
OsC*:						
Oshtemo	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: small stones, slope.
Kosciusko	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action, shrink-swell.	Moderate: droughty, slope.
Riddles	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: slope.
Pa Palms	Severe: excess humus, ponding.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, frost action, low strength.	Severe: ponding, excess humus.
Pe Pewamo	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Pg*. Pits						
PnA Plainfield	Severe: cutbanks cave.	Slight	Slight	Slight	Slight	Severe: droughty.
PnB Plainfield	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Severe: droughty.
RaB Rawson	Moderate: too clayey, dense layer, wetness.	Slight	Severe: shrink-swell.	Moderate: slope.	Moderate: frost action.	Slight.
Rb Rensselaer	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
RxA Riddles	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, frost action.	Slight.
RxB Riddles	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: low strength, frost action.	Slight.
RxC Riddles	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: slope.
RxD Riddles	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Ry---------- Riverdale	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, frost action.	Severe: droughty.
Sh---------- Shoals	Severe: wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, frost action.	Severe: floods.
Ud*. Udorthents						
Wa---------- Wallkill	Severe: ponding, excess humus.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, frost action.	Severe: ponding.
Wh---------- Washtenaw	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
WsB---------- Wawasee	Slight---------	Slight---------	Slight---------	Moderate: slope.	Moderate: frost action.	Slight.
WsC---------- Wawasee	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
WsD, WsE---------- Wawasee	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
WvC3---------- Wawasee	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
WvD3---------- Wawasee	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Wx---------- Whitaker	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.

* 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," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Ad Adrian	Severe: ponding.	Severe: seepage, ponding, excess humus.	Severe: ponding, seepage.	Severe: ponding, seepage.	Poor: ponding, excess humus.
Be*. Beaches					
BnA Blount	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
BoB*: Boyer	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Ormas	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
BoC*: Boyer	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Ormas	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
BoD*: Boyer	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
Ormas	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: thin layer, slope.
BtA Brems	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy.
Bz Brookston	Severe: percs slowly, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding, hard to pack.
CaC Casco	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy, seepage, small stones.
CaD2 Casco	Severe: slope, poor filter.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: slope, seepage.	Poor: too sandy, seepage, small stones.
CcA Carmi	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
ChB Chelsea	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy, seepage.
ChC Chelsea	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy, seepage.
Co Cohoctah	Severe: wetness, floods.	Severe: floods, seepage, wetness.	Severe: seepage, floods, wetness.	Severe: seepage, floods, wetness.	Poor: wetness.
CrA Crosier	Severe: percs slowly, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Dr Del Rey	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Ed Edwards	Severe: ponding, percs slowly.	Severe: ponding, seepage, excess humus.	Severe: ponding.	Severe: ponding, seepage.	Poor: ponding, excess humus.
GnB Glynwood	Severe: percs slowly, wetness.	Moderate: slope.	Moderate: wetness, too clayey.	Moderate: wetness.	Fair: too clayey, wetness.
Gs Granby Variant	Severe: floods, wetness, poor filter.	Severe: seepage, floods, wetness.	Severe: floods, seepage, wetness.	Severe: floods, seepage, wetness.	Poor: seepage, too sandy, wetness.
HaA Haskins	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Hn*. Histosols					
Ht, Hw Houghton	Severe: ponding, percs slowly.	Severe: seepage, ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, seepage.	Poor: ponding, excess humus.
KoA, KoB Kosciusko	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
KsC Kosciusko	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
MbA Martinsville	Slight	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey, thin layer.
MbB Martinsville	Slight	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey, thin layer.

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
MbC---------- Martinsville	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope, thin layer.
Mc---------- Martisco	Severe: ponding, percs slowly.	Severe: seepage, ponding, excess humus.	Severe: ponding.	Severe: seepage, ponding.	Poor: ponding, excess humus.
MfB---------- Metea	Moderate: percs slowly.	Severe: seepage.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy.
MfC---------- Metea	Moderate: slope, percs slowly.	Severe: seepage, slope.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy.
MhB---------- Miami	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight----------	Fair: too clayey.
MhC---------- Miami	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
MhD, MhE---------- Miami	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
MkC3---------- Miami	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
MkD3---------- Miami	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Mm---------- Millgrove	Severe: ponding.	Severe: seepage, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: too sandy, small stones, ponding.
Mn---------- Milford	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
MoC2---------- Morley	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
MoD2, MoE2---------- Morley	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
MrC3---------- Morley	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
MrD3---------- Morley	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Mx---------- Morocco	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, too sandy, wetness.	Severe: seepage, wetness.	Poor: too sandy, wetness, seepage.
Mz---------- Muskego	Severe: percs slowly, ponding.	Severe: seepage, excess humus, ponding.	Severe: excess humus, ponding.	Severe: seepage, ponding.	Poor: hard to pack, ponding.
OhA*, OhB*: Oshtemo----------	Slight----------	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: seepage.
Ormas----------	Slight----------	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
OhC*: Oshtemo----------	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: seepage.
Ormas----------	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
OsC*: Oshtemo----------	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: seepage.
Kosciusko----------	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Riddles----------	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: slope, too clayey.
Pa---------- Palms	Severe: subsides, ponding.	Severe: seepage, excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, seepage.	Poor: ponding, excess humus.
Pe---------- Pewamo	Severe: percs slowly, ponding.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, ponding, hard to pack.
Pg*. Pits					
PnA, PnB---------- Plainfield	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy, seepage.
RaB---------- Rawson	Severe: wetness, percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
Rb---------- Rensselaer	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too sandy.	Severe: ponding.	Poor: too sandy, ponding.
RxA---------- Riddles	Slight----------	Moderate: seepage.	Moderate: too clayey.	Slight----------	Fair: too clayey.

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
RxB---------- Riddles	Slight----------	Moderate: seepage, slope.	Moderate: too clayey.	Slight----------	Fair: too clayey.
RxC---------- Riddles	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
RxD---------- Riddles	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Ry---------- Riverdale	Severe: wetness.	Severe: wetness, seepage.	Severe: wetness, too sandy, seepage.	Severe: wetness, seepage.	Poor: small stones, too sandy, seepage.
Sh---------- Shoals	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
Ud*. Udorthents					
Wa---------- Wallkill	Severe: ponding.	Severe: ponding, seepage, excess humus.	Severe: ponding seepage.	Severe: ponding, seepage.	Poor: ponding, excess humus.
Wh---------- Washtenaw	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
WsB---------- Wawasee	Slight----------	Moderate: seepage, slope.	Slight----------	Slight----------	Good.
WsC---------- Wawasee	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
WsD, WsE---------- Wawasee	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
WvC3---------- Wawasee	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
WvD3---------- Wawasee	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Wx---------- Whitaker	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Poor: wetness.

* 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," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Ad Adrian	Poor: wetness, low strength.	Probable	Improbable: too sandy.	Poor: wetness, excess humus.
Be*. Beaches				
BnA Blount	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
BoB*: Boyer	Good	Probable	Probable	Poor: small stones, area reclaim.
Ormas	Good	Probable	Probable	Fair: too sandy, small stones.
BoC*: Boyer	Good	Probable	Probable	Poor: small stones, area reclaim.
Ormas	Good	Probable	Probable	Fair: too sandy, small stones.
BoD*: Boyer	Fair: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
Ormas	Fair: slope.	Probable	Probable	Poor: slope.
BtA Brems	Fair: wetness.	Probable	Improbable: too sandy.	Fair: too sandy, small stones.
Bz Brookston	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
CaC Casco	Good	Probable	Probable	Poor: area reclaim, small stones.
CaD2 Casco	Fair: slope.	Probable	Probable	Poor: slope, area reclaim, small stones.
CcA Carmi	Good	Probable	Probable	Poor: small stones, area reclaim.
ChB, ChC Chelsea	Good	Probable	Improbable: too sandy.	Poor: too sandy.
Co Cohoctah	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
CrA Crosier	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Dr Del Rey	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Ed Edwards	Poor: wetness, low strength.	Improbable: excess humus.	Improbable: excess humus.	Poor: wetness, excess humus.
GnB Glynwood	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Gs Granby Variant	Poor: wetness.	Probable	Improbable: too sandy.	Poor: thin layer, wetness.
HaA Haskins	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, thin layer.
Hn*. Histosols				
Ht, Hw Houghton	Poor: wetness, low strength.	Improbable: excess humus.	Improbable: excess humus.	Poor: wetness, excess humus.
KoA, KoB, KsC Kosciusko	Good	Probable	Probable	Poor: small stones, area reclaim.
MbA, MbB Martinsville	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
MbC Martinsville	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
Mc Martisco	Poor: ponding, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, excess humus.
MfB Metea	Poor: thin layer.	Improbable: thin layer.	Improbable: too sandy.	Fair: too sandy.
MfC Metea	Poor: thin layer.	Improbable: thin layer.	Improbable: too sandy.	Fair: too sandy, slope.
MhB Miami	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim.
MhC Miami	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, slope.
MhD, MhE Miami	Fair: slope, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
MkC3 Miami	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, slope.
MkD3 Miami	Fair: slope, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Mm---------- Millgrove	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, wetness.
Mn---------- Milford	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
MoC2---------- Morley	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
MoD2---------- Morley	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.
MoE2---------- Morley	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.
MrC3---------- Morley	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
MrD3---------- Morley	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.
Mx---------- Morocco	Fair: wetness.	Probable----------	Improbable: too sandy.	Fair: too sandy.
Mz---------- Muskego	Poor: wetness.	Improbable: excess humus.	Improbable: excess humus.	Poor: wetness, excess humus.
OhA*, OhB*: Oshtemo----------	Good----------	Probable----------	Probable----------	Poor: small stones.
Ormas----------	Good----------	Probable----------	Probable----------	Fair: too sandy, small stones.
OhC*: Oshtemo----------	Good----------	Probable----------	Probable----------	Poor: small stones.
Ormas----------	Good----------	Probable----------	Probable----------	Fair: too sandy, small stones.
OsC*: Oshtemo----------	Good----------	Probable----------	Probable----------	Poor: small stones.
Kosciusko----------	Good----------	Probable----------	Probable----------	Poor: small stones, area reclaim.
Riddles----------	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, small stones.
Pa---------- Palms	Poor: wetness.	Improbable: excess humus, excess fines.	Improbable: excess humus, excess fines.	Poor: wetness, excess humus.
Pe---------- Pewamo	Poor: low strength, 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
Pg*. Pits				
PnA, PnB---------- Plainfield	Good----------	Probable----------	Improbable: too sandy.	Poor: too sandy.
RaB---------- Rawson	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones, thin layer.
Rb---------- Rensselaer	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
RxA, RxB---------- Riddles	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
RxC---------- Riddles	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
RxD---------- Riddles	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Ry---------- Riverdale	Fair: wetness.	Probable----------	Probable----------	Poor: small stones, area reclaim.
Sh---------- Shoals	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Ud*. Udorthents				
Wa---------- Wallkill	Poor: low strength, wetness, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, excess humus.
Wh---------- Washtenaw	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
WsB---------- Wawasee	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
WsC---------- Wawasee	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
WsD, WsE---------- Wawasee	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
WvC3---------- Wawasee	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
WvD3---------- Wawasee	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Wx---------- Whitaker	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.

* 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]

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
Ad---------- Adrian	Severe: seepage.	Severe: seepage, ponding, excess humus.	Severe: slow refill, cutbanks cave.	Ponding, frost action, subsides.	Ponding, soil blowing, too sandy.	Wetness.
Be*. Beaches						
BnA---------- Blount	Slight---------	Moderate: piping, wetness.	Severe: no water.	Percs slowly, frost action.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily.
BoB*: Boyer----------	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Droughty.
Ormas----------	Severe: seepage.	Severe: thin layer.	Severe: no water.	Deep to water	Soil blowing---	Droughty.
BoC*, BoD*: Boyer----------	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, too sandy, soil blowing.	Slope, droughty.
Ormas----------	Severe: seepage, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, soil blowing.	Slope, droughty.
BtA---------- Brems	Severe: seepage.	Severe: seepage, piping.	Severe: cutbanks cave.	Cutbanks cave	Wetness, too sandy, soil blowing.	Droughty.
Bz---------- Brookston	Moderate: seepage.	Severe: ponding.	Severe: slow refill.	Ponding, frost action.	Ponding--------	Wetness.
CaC, CaD2--------- Casco	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, too sandy.	Droughty, slope.
CcA---------- Carmi	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Favorable.
ChB---------- Chelsea	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Droughty.
ChC---------- Chelsea	Severe: slope, seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Slope, too sandy, soil blowing.	Slope, droughty.
Co---------- Cohoctah	Severe: seepage.	Severe: piping, wetness.	Slight---------	Floods, frost action.	Wetness, soil blowing.	Wetness.
CrA---------- Crosier	Slight---------	Severe: piping, wetness.	Severe: slow refill.	Frost action---	Wetness--------	Wetness.
Dr---------- Del Rey	Slight---------	Severe: wetness.	Severe: slow refill.	Percs slowly, frost action.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Ed---------- Edwards	Severe: seepage.	Severe: ponding.	Severe: slow refill.	Frost action, ponding, subsides.	Ponding, soil blowing.	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	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
GnB---------- Glynwood	Moderate: slope.	Moderate: wetness, piping.	Severe: no water.	Slope, percs slowly, frost action.	Erodes easily, wetness.	Erodes easily.
Gs---------- Granby Variant	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Floods, cutbanks cave.	Wetness, too sandy, soil blowing.	Wetness, droughty.
HaA---------- Haskins	Moderate: seepage.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, frost action.	Erodes easily, wetness.	Wetness, erodes easily.
Hn*. Histosols						
Ht, Hw---------- Houghton	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Frost action, subsides, ponding.	Ponding, soil blowing.	Wetness.
KoA, KoB---------- Kosciusko	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Too sandy------	Droughty.
KsC---------- Kosciusko	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, too sandy.	Slope, droughty.
MbA---------- Martinsville	Moderate: seepage.	Severe: thin layer.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
MbB---------- Martinsville	Moderate: seepage, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
MbC---------- Martinsville	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
Mc---------- Martisco	Severe: seepage.	Severe: ponding.	Severe: slow refill.	Percs slowly, floods, frost action.	Ponding, percs slowly.	Wetness, percs slowly.
MfB---------- Metea	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Droughty.
MfC---------- Metea	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, too sandy, soil blowing.	Slope, droughty.
MhB---------- Miami	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
MhC, MhD, MhE, MkC3, MkD3------- Miami	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
Mm---------- Millgrove	Severe: seepage.	Severe: piping, ponding.	Severe: cutbanks cave.	Ponding, frost action, cutbanks cave.	Ponding, too sandy.	Wetness.
Mn---------- Milford	Slight---------	Severe: ponding.	Severe: slow refill.	Ponding, percs slowly, frost action.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
MoC2, MoD2, MoE2, MrC3, MrD3------- Morley	Severe: slope.	Moderate: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, 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	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
Mx---------- Morocco	Severe: seepage.	Severe: seepage, piping, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, too sandy, soil blowing.	Wetness, droughty.
Mz---------- Muskego	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Percs slowly, subsides, ponding.	Ponding, soil blowing, percs slowly.	Wetness, percs slowly.
OhA*, OhB*: Oshtemo----------	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Favorable.
Ormas----------	Severe: seepage.	Severe: thin layer.	Severe: no water.	Deep to water	Soil blowing---	Droughty.
OhC*: Oshtemo----------	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, too sandy, soil blowing.	Slope.
Ormas----------	Severe: seepage, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, soil blowing.	Slope, droughty.
OsC*: Oshtemo----------	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, too sandy, soil blowing.	Slope.
Kosciusko--------	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, too sandy.	Slope, droughty.
Riddles----------	Severe: slope.	Slight---------	Severe: no water.	Deep to water	Slope, soil blowing.	Slope.
Pa---------- Palms	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Floods, ponding, subsides.	Ponding, soil blowing.	Wetness.
Pe---------- Pewamo	Slight---------	Severe: ponding.	Severe: slow refill.	Ponding, frost action.	Ponding--------	Wetness.
Pg*. Pits						
PnA, PnB---------- Plainfield	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Droughty.
RaB---------- Rawson	Moderate: seepage, slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, slope.	Wetness--------	Percs slowly.
Rb---------- Rensselaer	Moderate: seepage.	Severe: piping, ponding.	Severe: slow refill, cutbanks cave.	Ponding, percs slowly, frost action.	Ponding, too sandy.	Wetness, percs slowly.
RxA---------- Riddles	Moderate: seepage.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Soil blowing---	Favorable.
RxB---------- Riddles	Moderate: seepage, slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Soil blowing---	Favorable.

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	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
RxC, RxD---------- Riddles	Severe: slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope, soil blowing.	Slope.
Ry---------- Riverdale	Severe: seepage.	Severe: seepage, wetness.	Severe: cutbanks cave.	Cutbanks cave	Wetness, too sandy, soil blowing.	Droughty, wetness.
Sh---------- Shoals	Moderate: seepage.	Severe: wetness, piping.	Moderate: slow refill.	Floods, frost action.	Erodes easily, wetness.	Wetness, erodes easily.
Ud*. Udorthents						
Wa---------- Wallkill	Severe: seepage.	Severe: excess humus, ponding, piping.	Moderate: slow refill.	Ponding, frost action.	Ponding--------	Wetness.
Wh---------- Washtenaw	Moderate: seepage.	Severe: piping, ponding.	Severe: slow refill.	Percs slowly, frost action, ponding.	Ponding, erodes easily.	Wetness, percs slowly, erodes easily.
WsB---------- Wawasee	Moderate: seepage, slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Favorable------	Favorable.
WsC, WsD, WsE, WvC3, WvD3------- Wawasee	Severe: slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope----------	Slope.
Wx---------- Whitaker	Moderate: seepage.	Severe: wetness.	Moderate: slow refill, cutbanks cave.	Frost action---	Erodes easily, wetness.	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 > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Ad----------	0-28	Sapric material	Pt	A-8	---	---	---	---	---	---	---
Adrian	28-60	Sand, loamy sand, fine sand.	SP, SM	A-2, A-3, A-1	0	80-100	60-100	35-75	0-30	---	NP
Be*. Beaches											
BnA----------	0-8	Silt loam--------	CL	A-6, A-4	0-5	95-100	95-100	90-100	80-95	25-40	8-20
Blount	8-30	Silty clay loam, silty clay, clay loam.	CH, CL	A-7, A-6	0-5	95-100	90-100	90-100	80-95	35-60	15-35
	30-60	Silty clay loam, clay loam.	CL	A-6	0-10	90-100	90-100	80-100	70-90	25-40	10-25
BoB*, BoC*, BoD*:											
Boyer----------	0-17	Loamy sand-------	SM, SM-SC	A-2, A-1	0-5	95-100	65-95	45-75	15-30	<20	NP-6
	17-27	Sandy loam, loam, gravelly sandy loam.	SM, SC, SM-SC, SP-SM	A-2, A-4, A-6	0-5	80-100	65-95	55-85	10-45	10-35	NP-16
	27-60	Very gravelly coarse sand.	SP, SP-SM, GP, GP-GM	A-1, A-3, A-2-4	0-10	40-100	35-100	30-70	0-10	---	NP
Ormas----------	0-39	Loamy sand-------	SM	A-2-4	0	98-100	95-100	50-75	15-30	---	NP
	39-47	Sandy loam, loamy sand.	SM-SC, SM	A-2-4, A-4	0	90-100	85-100	50-70	25-40	<15	NP-5
	47-55	Gravelly sandy clay loam, gravelly loamy sand.	SM-SC, SC, GC, GM-GC	A-4, A-6, A-2-4, A-2-6	0	60-80	55-80	35-70	20-45	20-40	6-20
	55-80	Very gravelly coarse sand.	SP, SP-SM	A-3, A-1-b, A-2-4	0	60-80	55-80	30-55	3-12	---	NP
BtA----------	0-8	Loamy sand-------	SM, SP-SM	A-2-4	0	100	85-100	50-85	10-30	---	NP
Brems	8-45	Sand, fine sand, loamy sand.	SM, SP-SM	A-3, A-2-4	0	100	80-100	50-85	5-25	---	NP
	45-60	Sand, fine sand, loamy sand.	SP-SM	A-3, A-2-4	0	100	80-100	50-85	5-10	---	NP
Bz----------	0-10	Loam----------	CL	A-4, A-6	0	98-100	98-100	85-100	60-90	22-40	8-18
Brookston	10-44	Clay loam, sandy clay loam.	CL, CH	A-6, A-7	0	98-100	85-100	75-95	60-85	36-52	18-30
	44-60	Loam, sandy loam, clay loam.	CL	A-4, A-6	0-3	90-100	85-95	78-90	55-70	22-30	7-15
CaC, CaD2--------	0-7	Gravelly sandy loam.	SM-SC, SC, CL, CL-ML	A-4, A-2, A-1, A-6	0	60-75	50-75	40-75	20-65	<25	5-15
Casco	7-16	Gravelly clay loam, sandy clay loam, gravelly loam.	SC, CL, GC	A-6, A-7, A-2	0-5	60-100	55-100	55-90	25-70	25-45	11-25
	16-60	Very gravelly coarse sand.	GP, SP, GP-GM, SP-SM	A-1, A-3, A-2	0-10	30-100	30-100	10-70	3-10	---	NP
CcA----------	0-22	Sandy loam-------	SM-SC, SC	A-6, A-4	0-5	90-100	90-100	55-70	35-45	15-35	5-15
Carmi	22-36	Gravelly sandy clay loam, gravelly sandy loam.	SM-SC, SC, GC, GM-GC	A-2, A-4, A-6	0-5	65-95	60-90	50-65	20-40	15-35	5-15
	36-60	Very gravelly coarse sand.	SP-SM, GP-GM, SM, GM	A-1	0-15	40-65	35-65	20-50	5-25	<20	NP-5
ChB, ChC----------	0-8	Fine sand--------	SM, SP-SM	A-2-4	0	100	100	65-80	10-35	---	NP
Chelsea	8-80	Fine sand, sand, loamy sand.	SP, SM, SP-SM	A-3, A-2-4	0	100	100	65-80	3-15	---	NP

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Co---------- Cohoctah	0-11 11-60	Sandy loam------- Sandy loam, loamy sand, sandy clay loam.	ML, SM ML, SM, SC, CL	A-4, A-2 A-4, A-2	0 0	100 95-100	100 80-100	65-95 70-90	30-75 30-70	<30 <30	NP-6 NP-10
CrA---------- Crosier	0-8 8-32 32-60	Loam---------- Clay loam, loam, sandy clay loam. Loam, sandy loam	CL CL CL, ML	A-4, A-6 A-6, A-7 A-4, A-6	0 0 0-3	100 90-95 85-90	95-100 85-95 80-90	85-95 75-90 70-85	60-80 60-70 50-60	22-33 33-47 25-35	8-15 15-26 2-12
Dr---------- Del Rey	0-8 8-40 40-60	Silt loam-------- Silty clay loam, silty clay. Silt loam, silty clay loam.	CL, ML, CL-ML CH, CL CL	A-6, A-4, A-7 A-7, A-6 A-6, A-7	0 0 0	95-100 95-100 95-100	95-100 95-100 95-100	90-98 90-100 90-100	75-95 70-95 70-95	25-50 35-55 30-50	5-20 15-30 10-25
Ed---------- Edwards	0-32 32-60	Sapric material Marl----------	Pt ---	A-8 ---	0 0	--- 100	--- 95-100	--- 80-90	--- 60-80	--- ---	--- ---
GnB---------- Glynwood	0-6 6-33 33-60	Silt loam-------- Clay, clay loam, silty clay loam. Clay loam, silty clay loam.	CL-ML, CL CL, CH CL	A-4, A-6 A-7, A-6 A-6, A-4	0 0-5 0-5	95-100 95-100 95-100	90-100 85-100 80-100	80-100 75-100 75-95	55-90 65-95 65-90	23-40 35-55 25-40	4-15 15-30 7-18
Gs---------- Granby Variant	0-12 12-30 30-60	Loamy sand------- Loamy sand, sand Sand----------	SM, SP-SM SP, SP-SM, SM SP, SP-SM, SM	A-1, A-2 A-1, A-3, A-2 A-1, A-3, A-2	0 0 0	95-100 95-100 95-100	95-100 95-100 90-100	45-75 45-75 45-70	12-30 3-25 3-15	--- --- ---	NP NP NP
HaA---------- Haskins	0-9 9-34 34-60	Loam---------- Sandy loam, clay loam, sandy clay loam. Clay, silty clay loam.	CL-ML, CL SC, CL CH, CL	A-4, A-6 A-6, A-4, A-2 A-7, A-6	0 0 0	95-100 85-100 100	85-100 70-100 85-100	70-100 55-85 80-100	55-90 30-65 70-95	25-40 20-40 35-65	5-20 7-20 15-40
Hn*. Histosols											
Ht, Hw---------- Houghton	0-60	Sapric material	Pt	A-8	0	---	---	---	---	---	---
KoA, KoB---------- Kosciusko	0-8 8-30 30-34 34-60	Sandy loam------- Gravelly sandy clay loam, gravelly sandy loam. Gravelly loamy sand, very gravelly sandy loam, gravelly sandy loam. Very gravelly coarse sand.	SM, SM-SC, ML, CL-ML SM-SC, SC, GC, GM-GC SM, GM, GP-GM, SP-SM SP, SP-SM, GP, GP-GM	A-4, A-2-4 A-4, A-6, A-2, A-1 A-1, A-2-4 A-1	0 0-3 0-5 1-8	85-100 55-80 45-75 30-60	80-100 55-75 40-70 30-55	50-90 35-65 20-50 15-40	30-70 15-40 10-30 2-10	<25 20-40 <20 <20	NP-6 5-20 NP NP

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
KsC---------- Kosciusko	0-8	Gravelly sandy loam.	SM, SM-SC, ML, CL-ML	A-4, A-2-4	0-3	70-85	70-80	40-70	25-55	<25	NP-6
	8-30	Gravelly sandy clay loam, gravelly sandy loam.	SM-SC, SC, GC, GM-GC	A-4, A-6, A-2, A-1	0-3	55-80	55-75	35-65	15-40	20-40	5-20
	30-60	Very gravelly coarse sand.	SP, SP-SM, GP, GP-GM	A-1	1-8	30-60	30-55	15-40	2-10	<20	NP
MbA, MbB, MbC---- Martinsville	0-14	Loam----------	CL, CL-ML	A-4, A-6	0	100	90-100	80-100	60-90	22-33	4-12
	14-38	Clay loam, silty clay loam, sandy clay loam.	CL, SC	A-4, A-6	0	100	90-100	65-90	40-90	20-35	8-20
	38-60	Stratified sand to sandy clay loam.	CL, SC, CL-ML, SM-SC	A-4	0	95-100	85-100	80-95	40-60	<25	4-9
Mc---------- Martisco	0-14	Sapric material	Pt	A-8	0	---	---	---	---	---	---
	14-60	Marl----------	---	---	0	---	---	---	---	---	---
MfB, MfC--------- Metea	0-10	Loamy sand-------	SM	A-2-4	0	100	100	50-80	15-35	---	NP
	10-35	Loamy sand, loamy fine sand, sand.	SP-SM, SM	A-2-4	0	100	100	50-80	10-35	---	NP
	35-60	Clay loam, sandy clay loam, silty clay loam.	CL, SC	A-6, A-7	0	90-100	90-95	75-95	40-75	25-50	12-30
	60-65	Loam, silty clay loam, clay loam.	CL, CL-ML	A-4, A-6	0-3	85-95	80-90	75-90	50-75	25-40	5-18
MhB, MhC, MhD, MhE---------- Miami	0-11	Loam----------	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	50-90	22-34	6-15
	11-32	Clay loam, silty clay loam, loam.	CL	A-6, A-7	0	92-99	89-97	78-95	64-95	35-50	17-31
	32-60	Loam, clay loam, sandy loam.	CL, CL-ML, ML	A-4, A-6	0-3	88-94	83-89	74-87	50-64	20-40	2-20
MkC3, MkD3------- Miami	0-7	Clay loam--------	CL	A-6, A-7	0	100	90-100	75-95	65-95	30-45	15-25
	7-25	Clay loam, silty clay loam, loam.	CL	A-6, A-7	0	92-99	89-97	78-95	64-95	35-50	17-31
	25-60	Loam, clay loam, sandy loam.	CL, CL-ML, ML	A-4, A-6	0-3	88-94	83-89	74-87	50-64	20-40	2-20
Mm---------- Millgrove	0-13	Loam----------	ML, CL, CL-ML	A-4, A-6	0	95-100	90-100	75-100	55-85	22-40	3-16
	13-35	Clay loam, gravelly sandy clay loam, loam.	CL, SC	A-6	0	90-100	85-100	70-95	40-75	25-40	11-26
	35-60	Gravelly sandy loam, gravelly loam, fine sand.	SM, ML, GM, GM-GC	A-2, A-4	0-5	65-90	45-85	40-70	30-55	16-36	NP-10
Mn---------- Milford	0-20	Silty clay loam	CL, CH	A-7	0	100	95-100	90-100	80-95	40-60	20-35
	20-55	Silty clay, silty clay loam, clay loam.	CH, CL	A-7	0	100	95-100	90-100	75-100	40-60	20-40
	55-60	Stratified clay to sandy loam.	CL	A-6, A-7	0	97-100	95-100	90-100	70-100	30-50	15-30

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
MoC2, MoD2, MoE2-Morley	0-7	Silt loam--------	CL	A-6	0-5	95-100	95-100	90-100	85-95	25-40	10-20
	7-11	Silty clay loam, clay loam.	CL	A-6	0-10	95-100	90-100	85-95	80-90	27-40	15-25
	11-29	Silty clay, clay loam, clay.	CL, CH	A-6, A-7	0-10	95-100	90-100	85-95	80-90	35-55	15-30
	29-60	Silty clay loam, clay loam.	CL	A-6, A-7	0-10	95-100	90-100	85-95	80-90	30-45	10-25
MrC3, MrD3-------Morley	0-6	Silty clay loam	CL	A-6	0-5	95-100	90-100	85-95	80-90	27-40	15-25
	6-18	Silty clay loam, clay loam.	CL	A-6	0-10	95-100	90-100	85-95	80-90	27-40	15-25
	18-26	Silty clay, clay loam, clay.	CL, CH	A-6, A-7	0-10	95-100	90-100	85-95	80-90	35-55	15-30
	26-60	Silty clay loam, clay loam.	CL	A-6, A-7	0-10	95-100	90-100	85-95	80-90	30-45	10-25
Mx---------------Morocco	0-6	Loamy sand-------	SM, SM-SC	A-2-4	0	100	100	50-85	15-35	<20	NP-5
	6-60	Fine sand, sand	SM, SP-SM	A-3, A-2-4	0	100	80-100	50-85	5-25	---	NP
Mz---------------Muskego	0-29	Sapric material	Pt	A-8	0	---	---	---	---	---	---
	29-60	Coprogenous earth	OH, OL	A-8	0	---	---	---	---	---	---
OhA*, OhB*, OhC*:											
Oshtemo----------	0-9	Loamy sand-------	SM	A-2, A-1	0	95-100	60-95	40-70	15-30	---	NP
	9-40	Sandy loam, sandy clay loam.	SM, SC, SM-SC	A-2, A-4, A-6	0	95-100	60-95	60-85	25-45	12-30	2-16
	40-46	Gravelly sandy clay loam.	SM, SP-SM	A-2	0	85-95	60-95	55-70	10-15	---	NP
	46-60	Gravelly coarse sand.	SP-SM, GP, SP, GP-GM	A-1, A-2, A-3	0-5	40-90	35-85	20-60	0-10	---	NP
Ormas------------	0-39	Loamy sand-------	SM	A-2-4	0	98-100	95-100	50-75	15-30	---	NP
	39-55	Sandy loam, sandy clay loam.	SM-SC, SM	A-2-4, A-4	0	90-100	85-100	50-70	25-40	<15	NP-5
	55-60	Gravelly loamy sand, gravelly sandy loam.	SM-SC, SC, GC, GM-GC	A-4, A-6, A-2-4, A-2-6	0	60-80	55-80	35-70	20-45	20-40	6-20
	60-80	Gravelly coarse sand.	SP, SP-SM	A-3, A-1-B, A-2-4	0	60-80	55-80	30-55	3-12	---	NP
OsC*:											
Oshtemo----------	0-9	Loamy sand-------	SM	A-2, A-1	0	95-100	60-95	40-70	15-30	---	NP
	9-46	Sandy loam, sandy clay loam.	SM, SC, SM-SC	A-2, A-4, A-6	0	95-100	60-95	60-85	25-45	12-30	2-16
	46-60	Gravelly coarse sand.	SP-SM, GP, SP, GP-GM	A-1, A-2, A-3	0-5	40-90	35-85	20-60	0-10	---	NP
Kosciusko--------	0-8	Sandy loam-------	SM, SM-SC, ML, CL-ML	A-4, A-2-4	0	85-100	80-100	50-90	30-70	<25	NP-6
	8-30	Gravelly sandy clay loam, gravelly sandy loam.	SM-SC, SC, GC, GM-GC	A-4, A-6, A-2, A-1	0-3	55-80	55-75	35-65	15-40	20-40	5-20
	30-34	Gravelly loamy sand, very gravelly sandy loam, gravelly sandy loam.	SM, GM, GP-GM, SP-SM	A-1, A-2-4	0-5	45-75	40-70	20-50	10-30	<20	NP
	34-60	Very gravelly coarse sand.	SP, SP-SM, GP, GP-GM	A-1	1-8	30-60	30-55	15-40	2-10	<20	NP
Riddles----------	0-10	Sandy loam-------	SM, SC, SM-SC	A-2-4, A-4	0	95-100	85-95	50-70	25-40	20-30	2-10
	10-45	Clay loam, sandy clay loam.	CL	A-6, A-7	0	90-100	80-95	75-95	65-75	35-50	15-30
	45-60	Sandy loam, loam	CL, SM, SC, ML	A-4, A-6, A-2	0-3	85-95	80-90	50-90	30-70	15-30	2-15

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Pa	0-25	Sapric material	Pt	---	---	---	---	---	---	---	---
Palms	25-60	Clay loam, silty clay loam, sandy loam.	CL-ML, CL	A-4, A-6	0	85-100	80-100	70-95	50-90	25-40	5-20
Pe	0-11	Silty clay loam	CL	A-6	0-5	90-100	80-100	80-100	70-90	35-50	15-25
Pewamo	11-39	Clay loam, silty clay loam, silty clay.	CL, CH	A-7, A-6	0-5	95-100	90-100	90-100	75-95	35-55	15-30
	39-60	Clay loam, silty clay loam.	CL	A-7	0-5	95-100	90-100	90-100	70-90	40-50	15-25
Pg*. Pits											
PnA, PnB	0-9	Fine sand	SP-SM, SM, SP	A-3, A-2, A-1	0	75-100	75-100	40-80	3-35	---	NP
Plainfield	9-60	Sand	SP	A-3, A-1, A-2	0	75-100	75-100	40-70	1-4	---	NP
RaB	0-11	Loam	CL-ML, CL	A-4, A-6	0	95-100	85-100	70-100	55-90	25-40	4-16
Rawson	11-37	Clay loam, sandy clay loam, gravelly sandy clay loam.	SC, CL	A-4, A-6	0	85-100	75-100	60-85	35-65	20-40	7-20
	37-60	Clay, silty clay, clay loam.	CH, CL	A-7, A-6	0	100	90-100	90-100	80-95	35-65	15-40
Rb	0-14	Loam	CL, ML	A-4, A-6	0	100	100	90-100	70-90	27-36	4-12
Rensselaer	14-20	Clay loam, silty clay loam.	CL	A-6, A-7	0	95-100	90-100	80-100	60-80	33-47	15-26
	20-37	Sandy clay loam	CL, SC	A-6	0	95-100	90-100	75-95	35-55	25-35	11-16
	37-60	Stratified fine sand to clay loam.	CL, SC, CL-ML, SM-SC	A-4, A-2	0	95-100	90-100	60-95	20-70	<30	4-9
RxA, RxB, RxC, RxD	0-6	Sandy loam	SM, SM-SC, SC	A-4, A-2-4	0	90-100	85-95	55-70	25-45	20-30	2-10
Riddles	6-47	Loam, clay loam	CL	A-6, A-7	0	85-100	80-95	65-95	50-75	30-45	10-20
	47-60	Loam	ML, CL-ML, CL	A-6, A-4	0-3	85-100	80-90	70-85	50-70	20-32	2-12
Ry	0-7	Loamy sand	SM, SP-SM	A-1, A-2, A-3	0-5	80-100	65-95	45-70	5-30	<20	NP-4
Riverdale	7-33	Sand, loamy sand, gravelly sand.	SM, SP-SM	A-1, A-2, A-3	0-5	80-100	65-95	45-70	5-30	<20	NP-4
	33-45	Loam, sandy loam	SM, SC, SM-SC	A-2	0-5	85-100	65-90	55-75	15-35	12-35	NP-16
	45-60	Stratified sand to gravel.	SP, GP, SP-SM, GP-GM	A-1	0-10	40-80	35-70	20-45	0-10	---	NP
Sh	0-7	Loam	CL, CL-ML	A-4, A-6	0	100	100	90-100	65-90	22-36	6-15
Shoals	7-37	Silt loam, loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	75-85	25-40	4-15
	37-60	Stratified silt loam to sandy loam.	ML	A-4	0-3	90-100	85-100	60-80	50-70	32-40	3-8
Ud*. Udorthents											
Wa	0-14	Silt loam	ML, SM, OL	A-5, A-7	0	95-100	90-100	70-100	40-90	40-50	5-15
Wallkill	14-22	Silt loam, loam, silty clay loam.	CL, CL-ML, SM-SC, SC	A-4	0	75-100	70-100	60-100	40-90	15-25	5-10
	22-60	Sapric material, hemic material.	Pt	A-8	0	---	---	---	---	---	---

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Wh	0-9	Silt loam	ML, CL	A-4, A-6	0	100	100	90-100	70-90	27-36	4-12
Washtenaw	9-28	Silt loam, silty clay loam.	CL, ML	A-6, A-4	0	100	100	90-100	70-90	27-36	4-12
	28-51	Silty clay loam, clay loam.	CL	A-6, A-7	0	95-100	95-100	90-100	75-95	36-50	15-28
	51-80	Loam, silty clay loam.	CL	A-4, A-6	0-3	90-100	85-95	80-95	60-75	22-33	8-15
WsB, WsC, WsD, WsE	0-8	Loam	CL, CL-ML	A-4, A-6	0	90-95	85-95	80-95	50-70	20-30	4-12
Wawasee	8-36	Loam, sandy clay loam, fine sandy loam.	CL, SC	A-4, A-6	0	90-95	85-95	80-95	45-70	25-35	7-15
	36-60	Loam, sandy loam	SM-SC, SC, CL-ML, CL	A-4, A-6, A-2	0	75-95	70-95	50-90	25-66	20-30	4-12
WvC3, WvD3	0-7	Sandy clay loam	SC, CL	A-4, A-6	0	90-95	85-95	70-85	35-55	25-35	7-15
Wawasee	7-27	Loam, sandy clay loam.	CL, SC	A-4, A-6	0	90-95	85-95	80-95	45-70	25-35	7-15
	27-60	Loam, sandy loam	SM-SC, SC, CL-ML, CL	A-4, A-6, A-2	0	75-95	70-95	50-90	25-66	20-30	4-12
Wx	0-11	Loam	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	60-90	22-33	4-12
Whitaker	11-49	Sandy clay loam, loam, clay loam.	CL	A-6, A-7	0	100	95-100	90-100	70-80	30-47	12-26
	49-60	Stratified coarse sand to clay.	CL, SC, ML, SM	A-4	0	98-100	98-100	60-85	40-60	15-25	3-9

* 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		Wind erodibility group	Organic matter
								K	T		
	In	Pct	G/cm³	In/hr	In/in	pH					Pct
Ad	0-28	---	0.30-0.55	0.2-6.0	0.35-0.45	5.1-7.8					
Adrian	28-60	2-10	1.40-1.75	6.0-20	0.03-0.08	5.6-8.4	Low			3	55-75
Be*.											
Beaches											
BnA	0-8	22-27	1.35-1.55	0.6-2.0	0.20-0.24	5.1-6.5	Low	0.43	3	6	2-3
Blount	8-30	35-50	1.40-1.70	0.06-0.2	0.12-0.19	4.5-6.5	Moderate	0.43			
	30-60	30-35	1.60-1.85	0.06-0.2	0.07-0.10	7.4-8.4	Moderate	0.43			
BoB*, BoC*, BoD*:											
Boyer	0-17	0-10	1.14-1.60	6.0-20	0.10-0.12	5.6-7.3	Low	0.17	4	2	.5-3
	17-27	10-18	1.26-1.59	2.0-6.0	0.12-0.18	5.6-7.8	Low	0.24			
	27-60	0-10	1.20-1.47	>20	0.02-0.04	7.4-8.4	Low	0.10			
Ormas	0-39	5-12	1.40-1.60	6.0-20	0.10-0.12	5.6-7.3	Low	0.17	5	2	1-3
	39-47	10-20	1.50-1.70	2.0-6.0	0.12-0.14	5.1-6.5	Low	0.17			
	47-55	18-25	1.50-1.60	2.0-6.0	0.11-0.14	5.6-7.8	Low	0.32			
	55-80	1-8	1.55-1.70	>20	0.03-0.05	7.4-8.4	Low	0.15			
BtA	0-8	3-7	1.50-1.65	6.0-20	0.10-0.12	5.1-6.5	Low	0.17	5	2	.5-1
Brems	8-45	2-6	1.60-1.75	6.0-20	0.05-0.08	4.5-6.0	Low	0.17			
	45-60	2-6	1.60-1.75	6.0-20	0.05-0.07	5.1-6.5	Low	0.17			
Bz	0-10	18-27	1.35-1.50	0.6-2.0	0.21-0.24	6.6-7.3	Moderate	0.28	5	6	3-5
Brookston	10-44	27-35	1.40-1.60	0.6-2.0	0.15-0.19	6.6-7.3	Moderate	0.28			
	44-60	15-32	1.45-1.70	0.2-0.6	0.05-0.19	7.4-8.4	Moderate	0.28			
CaC, CaD2	0-7	10-25	1.40-1.70	0.6-2.0	0.10-0.17	5.6-7.3	Low	0.24	3	6	.5-1
Casco	7-16	18-30	1.55-1.65	0.6-2.0	0.12-0.19	5.6-7.8	Moderate	0.32			
	16-60	0-2	1.30-2.20	>20	0.02-0.04	7.4-8.4	Low	0.10			
CcA	0-22	10-20	1.40-1.55	2.0-6.0	0.13-0.20	5.1-7.8	Low	0.20	4	3	2-3
Carmi	22-36	15-22	1.45-1.65	2.0-6.0	0.12-0.19	4.5-6.0	Low	0.20			
	36-60	5-15	1.60-1.80	6.0-20	0.02-0.07	7.4-8.4	Low	0.15			
ChB, ChC	0-8	8-15	1.50-1.55	6.0-20	0.10-0.15	5.6-7.3	Low	0.17	5	2	.5-1
Chelsea	8-80	5-10	1.55-1.70	6.0-20	0.06-0.08	5.1-5.5	Low	0.17			
Co	0-11	5-20	1.12-1.59	2.0-6.0	0.13-0.22	6.1-7.8	Low	0.28	5	3	4-8
Cohoctah	11-60	5-27	1.48-1.80	2.0-6.0	0.12-0.20	6.1-8.4	Low	0.28			
CrA	0-8	7-18	1.30-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low	0.32	5	5	1-3
Crosier	8-32	20-33	1.40-1.60	0.2-0.6	0.15-0.19	5.1-7.3	Moderate	0.32			
	32-60	10-20	1.40-1.60	0.2-0.6	0.10-0.19	6.1-8.4	Low	0.32			
Dr	0-8	20-30	1.30-1.50	0.6-2.0	0.22-0.24	5.1-6.5	Low	0.43	3	6	2-3
Del Rey	8-40	35-45	1.35-1.55	0.06-0.2	0.12-0.20	6.1-8.4	Moderate	0.43			
	40-60	25-35	1.45-1.65	0.06-0.2	0.09-0.11	7.9-8.4	Moderate	0.43			
Ed	0-32	---	0.30-0.55	0.2-6.0	0.35-0.45	5.6-7.8					
Edwards	32-60	---	---	0.06-0.2	---	7.4-8.4				3	55-75
GnB	0-6	16-27	1.25-1.50	0.6-2.0	0.20-0.24	5.6-7.3	Low	0.43	3	6	1-3
Glynwood	6-33	35-55	1.45-1.75	0.06-0.2	0.11-0.18	4.5-8.4	Moderate	0.32			
	33-60	27-36	1.65-1.82	0.06-0.2	0.06-0.10	7.4-8.4	Moderate	0.32			
Gs	0-12	4-10	1.45-1.60	6.0-20	0.11-0.14	5.6-6.5	Low	0.17	5	2	3-6
Granby Variant	12-30	4-10	1.50-1.75	6.0-20	0.09-0.11	5.6-6.5	Low	0.17			
	30-60	2-8	1.65-1.80	6.0-20	0.05-0.07	6.6-8.4	Low	0.17			
HaA	0-9	12-20	1.30-1.45	0.6-2.0	0.18-0.22	5.1-7.3	Low	0.37	4	5	1-4
Haskins	9-34	18-35	1.45-1.70	0.6-2.0	0.12-0.16	5.1-7.3	Low	0.37			
	34-60	35-55	1.60-1.80	0.06-0.2	0.08-0.12	6.1-8.4	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/cm³	In/hr	In/in	pH					Pct
Hn*. Histosols											
Ht, Hw---------- Houghton	0-60	---	0.15-0.45	0.2-6.0	0.35-0.45	5.6-7.8	----------	----	---	3	>70
KoA, KoB--------- Kosciusko	0-8	7-17	1.30-1.45	0.6-2.0	0.13-0.20	5.1-6.5	Low----------	0.28	4	3	.5-2
	8-30	18-27	1.40-1.60	0.6-2.0	0.07-0.14	5.1-6.5	Moderate-----	0.28			
	30-34	4-12	1.50-1.70	0.6-2.0	0.05-0.11	5.1-7.8	Low----------	0.28			
	34-60	1-5	1.70-1.90	>20	0.02-0.04	7.4-8.4	Low----------	0.10			
KsC---------- Kosciusko	0-8	7-17	1.40-1.60	0.6-2.0	0.10-0.17	5.1-6.5	Low----------	0.20	4	8	.5-2
	8-30	18-27	1.40-1.60	0.6-2.0	0.07-0.14	5.1-6.5	Moderate-----	0.28			
	30-60	1-5	1.70-1.90	>20	0.02-0.04	7.4-8.4	Low----------	0.10			
MbA, MbB, MbC---- Martinsville	0-14	8-17	1.30-1.45	0.6-2.0	0.20-0.24	5.6-7.3	Low----------	0.37	5	5	1-3
	14-38	18-30	1.40-1.60	0.6-2.0	0.17-0.20	5.1-6.0	Moderate-----	0.37			
	38-60	3-23	1.50-1.70	0.6-2.0	0.19-0.21	7.4-8.4	Low----------	0.24			
Mc---------- Martisco	0-14	---	0.13-0.23	0.2-6.0	0.35-0.45	6.1-8.4	----------	----	---	2	>25
	14-60	---	---	0.06-0.2	---	7.9-8.4	Low----------	----			
MfB, MfC--------- Metea	0-10	3-8	1.45-1.60	>20	0.10-0.12	5.6-7.3	Low----------	0.17	5	2	.5-2
	10-35	2-10	1.50-1.70	>20	0.06-0.11	5.1-7.3	Low----------	0.17			
	35-60	25-35	1.50-1.70	0.6-2.0	0.15-0.19	5.6-7.3	Moderate-----	0.32			
	60-65	20-30	1.40-1.65	0.6-2.0	0.05-0.19	7.4-8.4	Low----------	0.32			
MhB, MhC, MhD, MhE---------- Miami	0-11	11-22	1.40-1.55	0.6-2.0	0.20-0.24	5.6-7.3	Low----------	0.37	5	5	.5-3
	11-32	25-35	1.45-1.65	0.6-2.0	0.15-0.20	5.6-6.0	Moderate-----	0.37			
	32-60	15-28	1.55-1.90	0.2-0.6	0.05-0.19	6.6-8.4	Moderate-----	0.37			
MkC3, MkD3------- Miami	0-7	27-35	1.45-1.60	0.6-2.0	0.18-0.20	5.6-7.3	Moderate-----	0.37	4	6	.5-3
	7-25	25-35	1.45-1.65	0.6-2.0	0.15-0.20	5.6-6.0	Moderate-----	0.37			
	25-60	15-28	1.55-1.90	0.2-0.6	0.05-0.19	6.6-8.4	Moderate-----	0.37			
Mm---------- Millgrove	0-13	18-27	1.30-1.50	0.6-2.0	0.19-0.24	5.6-7.3	Low----------	0.28	5	6	3-8
	13-35	18-35	1.45-1.70	0.6-2.0	0.12-0.16	6.1-7.8	Moderate-----	0.28			
	35-60	5-18	1.40-1.65	2.0-6.0	0.08-0.12	7.4-8.4	Low----------	0.28			
Mn---------- Milford	0-20	35-42	1.35-1.55	0.6-2.0	0.12-0.23	5.6-7.3	High---------	0.28	5	4	5-6
	20-55	35-42	1.45-1.65	0.06-0.2	0.18-0.20	5.1-6.5	Moderate-----	0.43			
	55-60	20-30	1.50-1.70	0.2-0.6	0.20-0.22	7.4-8.4	Moderate-----	0.43			
MoC2, MoD2, MoE2- Morley	0-7	22-27	1.35-1.60	0.6-2.0	0.20-0.24	5.1-6.5	Low----------	0.43	3	6	2-3
	7-11	27-40	1.50-1.70	0.2-0.6	0.18-0.20	5.1-6.5	Moderate-----	0.43			
	11-29	35-50	1.60-1.80	0.06-0.2	0.11-0.15	5.6-6.5	Moderate-----	0.43			
	29-60	27-40	1.60-1.90	0.2-0.6	0.07-0.12	6.6-8.4	Moderate-----	0.43			
MrC3, MrD3------- Morley	0-6	27-35	1.40-1.60	0.2-0.6	0.18-0.22	5.1-6.5	Moderate-----	0.43	2	7	.5-3
	6-18	27-40	1.50-1.70	0.2-0.6	0.18-0.20	5.1-6.5	Moderate-----	0.43			
	18-26	35-50	1.60-1.80	0.06-0.2	0.11-0.15	5.6-6.5	Moderate-----	0.43			
	26-60	27-40	1.60-1.90	0.2-0.6	0.07-0.12	6.6-8.4	Moderate-----	0.43			
Mx---------- Morocco	0-6	1-6	1.40-1.60	6.0-20	0.10-0.12	5.1-6.5	Low----------	0.17	5	2	.5-2
	6-60	1-6	1.50-1.70	6.0-20	0.05-0.07	4.5-6.0	Low----------	0.17			
Mz---------- Muskego	0-29	2-4	0.10-0.21	0.2-6.0	0.35-0.45	5.6-7.3	----------	----	---	3	50-77
	29-60	---	0.10-0.40	0.06-0.2	0.18-0.24	6.6-8.4	----------	----			
OhA*, OhB*, OhC*: Oshtemo---------	0-9	2-12	1.14-1.60	6.0-20	0.10-0.12	5.1-6.5	Low----------	0.24	5	2	.5-3
	9-40	10-22	1.20-1.59	2.0-6.0	0.12-0.19	5.1-6.5	Low----------	0.24			
	40-46	5-15	1.20-1.59	2.0-6.0	0.06-0.08	5.1-7.3	Low----------	0.17			
	46-60	0-15	1.20-1.47	>20	0.02-0.04	7.4-8.4	Low----------	0.10			

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/cm³	In/hr	In/in	pH					Pct
OhA*, OhB*, OhC*:											
Ormas	0-39	5-12	1.40-1.60	6.0-20	0.10-0.12	5.6-7.3	Low	0.17	5	2	1-3
	39-55	10-20	1.50-1.70	2.0-6.0	0.12-0.14	5.1-6.5	Low	0.17			
	55-60	18-25	1.50-1.60	2.0-6.0	0.11-0.14	5.6-7.8	Low	0.32			
	60-80	1-8	1.55-1.70	>20	0.03-0.05	7.4-8.4	Low	0.15			
OsC*:											
Oshtemo	0-9	2-12	1.14-1.60	6.0-20	0.10-0.12	5.1-6.5	Low	0.24	5	2	.5-3
	9-46	10-22	1.20-1.59	2.0-6.0	0.12-0.19	5.1-6.5	Low	0.24			
	46-60	0-15	1.20-1.47	>20	0.02-0.04	7.4-8.4	Low	0.10			
Kosciusko	0-8	7-17	1.30-1.45	0.6-2.0	0.13-0.20	5.1-6.5	Low	0.28	4	3	.5-2
	8-30	18-27	1.40-1.60	0.6-2.0	0.07-0.14	5.1-6.5	Moderate	0.28			
	30-34	4-12	1.50-1.70	0.6-2.0	0.05-0.11	5.1-7.8	Low	0.28			
	34-60	1-5	1.70-1.90	>20	0.02-0.04	7.4-8.4	Low	0.10			
Riddles	0-10	4-14	1.35-1.55	2.0-6.0	0.13-0.15	6.1-7.3	Low	0.24	5	3	.5-2
	10-45	20-35	1.40-1.60	0.6-2.0	0.15-0.19	5.1-7.3	Moderate	0.32			
	45-60	8-25	1.40-1.60	0.6-2.0	0.05-0.19	6.6-8.4	Low	0.32			
Pa	0-25	---	0.25-0.45	0.2-6.0	0.35-0.45	5.1-7.8	---	---	---	3	>75
Palms	25-60	7-35	1.45-1.75	0.2-0.6	0.14-0.22	4.5-6.0	Low	---			
Pe	0-11	27-40	1.35-1.55	0.6-2.0	0.17-0.22	6.1-7.3	Moderate	0.24	5	6	3-5
Pewamo	11-39	35-50	1.40-1.70	0.2-0.6	0.12-0.20	5.6-7.8	Moderate	0.24			
	39-60	30-40	1.50-1.75	0.2-0.6	0.14-0.18	7.4-8.4	Moderate	0.24			
Pg*.											
Pits											
PnA, PnB	0-9	4-9	1.35-1.65	6.0-20	0.04-0.09	4.5-7.3	Low	0.17	5	1	<1
Plainfield	9-60	1-4	1.50-1.65	6.0-20	0.04-0.07	4.5-6.5	Low	0.17			
RaB	0-11	12-20	1.35-1.50	0.6-2.0	0.18-0.22	4.5-7.3	Low	0.32	4	5	1-3
Rawson	11-37	18-35	1.50-1.69	0.6-2.0	0.12-0.16	4.5-7.8	Low	0.32			
	37-60	35-55	1.60-1.82	<0.2	0.08-0.12	7.4-7.8	High	0.32			
Rb	0-14	18-27	1.30-1.45	0.2-0.6	0.20-0.24	6.6-7.3	Low	0.28	5	5	2-6
Rensselaer	14-20	27-35	1.40-1.60	0.06-0.2	0.15-0.19	6.1-7.3	Moderate	0.28			
	20-37	25-35	1.40-1.60	0.06-0.2	0.16-0.18	7.4-7.8	Moderate	0.28			
	37-60	2-30	1.50-1.70	0.6-2.0	0.19-0.21	7.9-8.4	Low	0.28			
RxA, RxB, RxC, RxD	0-6	10-17	1.30-1.50	0.6-2.0	0.13-0.15	6.1-7.3	Low	0.24	5	3	1-3
Riddles	6-47	20-32	1.30-1.45	0.6-2.0	0.15-0.19	5.1-7.8	Moderate	0.32			
	47-60	15-25	1.30-1.45	0.6-2.0	0.15-0.19	7.4-8.4	Low	0.32			
Ry	0-7	2-10	1.25-1.41	6.0-20	0.06-0.12	6.1-7.8	Low	0.17	4	2	1-4
Riverdale	7-33	2-12	1.35-1.45	6.0-20	0.05-0.11	6.1-7.8	Low	0.17			
	33-45	5-15	1.35-1.45	2.0-6.0	0.05-0.13	6.1-7.8	Low	0.17			
	45-60	0-5	1.25-1.50	>20	0.02-0.04	7.9-8.4	Low	0.10			
Sh	0-7	18-27	1.30-1.50	0.6-2.0	0.22-0.24	6.1-7.8	Low	0.37	5	5	2-5
Shoals	7-37	18-32	1.35-1.55	0.6-2.0	0.17-0.22	6.1-7.8	Low	0.37			
	37-60	12-25	1.35-1.60	0.6-2.0	0.12-0.21	6.6-7.3	Low	0.37			
Ud*.											
Udorthents											
Wa	0-14	10-27	1.15-1.40	0.6-2.0	0.16-0.21	5.1-7.8	Low	0.32	5	---	4-12
Wallkill	14-22	15-27	1.15-1.45	0.6-2.0	0.15-0.20	5.1-7.8	Low	0.32			
	22-60	---	0.25-0.45	0.2-6.0	0.35-0.45	5.6-7.8	---	---			
Wh	0-9	15-27	1.30-1.45	0.6-2.0	0.22-0.24	6.1-7.3	Low	0.37	5	5	3-7
Washtenaw	9-28	15-27	1.30-1.50	0.6-2.0	0.20-0.22	6.1-7.3	Low	0.37			
	28-51	28-35	1.40-1.60	0.06-0.2	0.15-0.20	6.1-7.3	Moderate	0.37			
	51-80	15-25	1.45-1.65	0.06-0.2	0.05-0.19	7.4-8.4	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/cm³	In/hr	In/in	pH					Pct
WsB, WsC, WsD, WsE	0-8	10-18	1.20-1.40	0.6-2.0	0.16-0.20	6.1-7.3	Low	0.28	4	5	1-3
Wawasee	8-36	18-27	1.50-1.70	0.6-2.0	0.12-0.18	6.1-7.3	Low	0.28			
	36-60	12-18	1.50-1.70	0.6-2.0	0.11-0.18	6.6-8.4	Low	0.28			
WvC3, WvD3	0-7	20-27	1.35-1.50	0.6-2.0	0.16-0.19	6.1-7.3	Low	0.28	4	5	.5-2
Wawasee	7-27	18-27	1.50-1.70	0.6-2.0	0.12-0.18	6.1-7.3	Low	0.28			
	27-60	12-18	1.50-1.70	0.6-2.0	0.11-0.18	6.6-8.4	Low	0.28			
Wx	0-11	8-17	1.30-1.45	0.6-2.0	0.20-0.24	5.6-7.3	Low	0.37	5	5	1-3
Whitaker	11-49	18-30	1.40-1.60	0.6-2.0	0.15-0.19	5.1-6.0	Moderate	0.37			
	49-60	3-18	1.50-1.70	0.6-6.0	0.19-0.21	6.6-8.4	Low	0.37			

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--SOIL AND WATER FEATURES

[The definitions of "flooding" and "water table" in the text explain terms such as "rare," "brief," "apparent," and "perched." The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
Ad---------- Adrian	A/D	None--------	---	---	+1-1.0	Apparent	Nov-May	>60	---	High-----	High-----	Moderate.
Be*. Beaches												
BnA---------- Blount	C	None--------	---	---	1.0-3.0	Perched	Jan-May	>60	---	High-----	High-----	High.
BoB*, BoC*, BoD*: Boyer----------	B	None--------	---	---	>6.0	---	---	>60	---	Low------	Low------	Moderate.
Ormas----------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Moderate.
BtA---------- Brems	A	None--------	---	---	2.0-3.0	Apparent	Jan-Apr	>60	---	Low------	Low------	High.
Bz---------- Brookston	B/D	None--------	---	---	+.5-1.0	Apparent	Dec-May	>60	---	High-----	High-----	Low.
CaC, CaD2--------- Casco	B	None--------	---	---	>6.0	---	---	>60	---	Low------	Low------	Low.
CcA---------- Carmi	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	High.
ChB, ChC---------- Chelsea	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Low------	Low.
Co---------- Cohoctah	B/D	Frequent----	Brief to long.	Jan-Dec	0-1.0	Apparent	Sep-May	>60	---	High-----	High-----	Low.
CrA---------- Crosier	C	None--------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Low.
Dr---------- Del Rey	C	None--------	---	---	1.0-3.0	Apparent	Jan-May	>60	---	High-----	High-----	Low.
Ed---------- Edwards	B/D	None--------	---	---	+1-0.5	Apparent	Sep-Jun	>60	---	High-----	High-----	Low.
GnB---------- Glynwood	C	None--------	---	---	2.0-3.5	Perched	Jan-Apr	>60	---	High-----	High-----	Moderate.
Gs---------- Granby Variant	A/D	Frequent----	Brief-----	Mar-Apr	0-1.0	Apparent	Nov-Jun	>60	---	Moderate	High-----	Low.
HaA---------- Haskins	C	None--------	---	---	1.0-2.5	Perched	Jan-Apr	>60	---	High-----	High-----	Moderate.
Hn*. Histosols												

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
Ht, Hw---------- Houghton	A/D	None--------	---	---	+1-1.0	Apparent	Sep-Jun	>60	---	High-----	High-----	Low.
KoA, KoB, KsC----- Kosciusko	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Moderate.
MbA, MbB, MbC----- Martinsville	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Mc---------- Martisco	D	None--------	---	---	+1-0.5	Apparent	Oct-Jun	>60	---	High-----	High-----	Low.
MfB, MfC---------- Metea	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
MhB, MhC, MhD, MhE, MkC3, MkD3-- Miami	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Mm---------- Millgrove	B/D	None--------	---	---	+1-1.0	Apparent	Nov-May	>60	---	High-----	High-----	Low.
Mn---------- Milford	B/D	None--------	---	---	+.5-2.0	Apparent	Mar-Jun	>60	---	High-----	High-----	Low.
MoC2, MoD2, MoE2, MrC3, MrD3------- Morley	C	None--------	---	---	>6.0	Perched	Mar-May	>60	---	Moderate	High-----	Moderate.
Mx---------- Morocco	B	None--------	---	---	1.0-2.0	Apparent	Jan-Apr	>60	---	Moderate	Low------	High.
Mz---------- Muskego	A/D	None--------	---	---	+1-1.0	Apparent	Nov-Aug	>60	---	High-----	Moderate	Moderate.
OhA*, OhB*, OhC*: Oshtemo----------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	High.
Ormas----------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Moderate.
OsC*: Oshtemo----------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	High.
Kosciusko--------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Moderate.
Riddles----------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Pa---------- Palms	A/D	None--------	---	---	+1-1.0	Apparent	Nov-May	>60	---	High-----	High-----	Moderate.
Pe---------- Pewamo	C/D	None--------	---	---	+1-1.0	Apparent	Dec-May	>60	---	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			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
Pg*. Pits												
PnA, PnB---------- Plainfield	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Low------	High.
RaB---------- Rawson	B	None--------	---	---	2.5-4.0	Perched	Jan-Apr	>60	---	Moderate	High-----	High.
Rb---------- Rensselaer	B/D	None--------	---	---	+.5-1.0	Apparent	Dec-May	>60	---	High-----	High-----	Low.
RxA, RxB, RxC, RxD---------- Riddles	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Ry---------- Riverdale	A	None--------	---	---	1.0-2.0	Apparent	Nov-May	>60	---	Moderate	Low------	Low.
Sh---------- Shoals	C	Frequent----	Brief-----	Oct-Jun	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Low.
Ud*. Udorthents												
Wa---------- Wallkill	D	None--------	---	---	+.5-0.5	Apparent	Sep-Jun	>60	---	High-----	Moderate	Moderate.
Wh---------- Washtenaw	C/D	None--------	---	---	+.5-1.0	Apparent	Dec-May	>60	---	High-----	High-----	Low.
WsB, WsC, WsD, WsE, WvC3, WvD3-- Wawasee	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Low.
Wx---------- Whitaker	C	None--------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Moderate.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 19.--CLASSIFICATION OF THE SOILS

[An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series]

Soil name	Family or higher taxonomic class
Adrian	Sandy or sandy-skeletal, mixed, euic, mesic Terric Medisaprists
Blount	Fine, illitic, mesic Aeric Ochraqualfs
Boyer	Coarse-loamy, mixed, mesic Typic Hapludalfs
Brems	Mixed, mesic Aquic Udipsamments
Brookston	Fine-loamy, mixed, mesic Typic Argiaquolls
Carmi	Coarse-loamy, mixed, mesic Typic Hapludolls
Casco	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Typic Hapludalfs
Chelsea	Mixed, mesic Alfic Udipsamments
Cohoctah	Coarse-loamy, mixed, mesic Fluvaquentic Haplaquolls
Crosier	Fine-loamy, mixed, mesic Aeric Ochraqualfs
Del Rey	Fine, illitic, mesic Aeric Ochraqualfs
Edwards	Marly, euic, mesic Limnic Medisaprists
Glynwood	Fine, illitic, mesic Aquic Hapludalfs
Granby Variant	Sandy, mixed, mesic Typic Haplaquolls
Haskins	Fine-loamy, mixed, mesic Aeric Ochraqualfs
Histosols	Euic, mesic Medisaprists
Houghton	Euic, mesic Typic Medisaprists
Kosciusko	Fine-loamy, mixed, mesic Typic Hapludalfs
Martinsville	Fine-loamy, mixed, mesic Typic Hapludalfs
Martisco	Fine-silty, carbonatic, mesic Histic Humaquepts
*Metea	Loamy, mixed, mesic Arenic Hapludalfs
Miami	Fine-loamy, mixed, mesic Typic Hapludalfs
Milford	Fine, mixed, mesic Typic Haplaquolls
Millgrove	Fine-loamy, mixed, mesic Typic Argiaquolls
Morley	Fine, illitic, mesic Typic Hapludalfs
Morocco	Mixed, mesic Aquic Udipsamments
Muskego	Coprogenous, euic, mesic Limnic Medisaprists
Ormas	Loamy, mixed, mesic Arenic Hapludalfs
Oshtemo	Coarse-loamy, mixed, mesic Typic Hapludalfs
*Palms	Loamy, mixed, euic, mesic Terric Medisaprists
Pewamo	Fine, mixed, mesic Typic Argiaquolls
Plainfield	Mixed, mesic Typic Udipsamments
*Rawson	Fine-loamy, mixed, mesic Typic Hapludalfs
Rensselaer	Fine-loamy, mixed, mesic Typic Argiaquolls
Riddles	Fine-loamy, mixed, mesic Typic Hapludalfs
*Riverdale	Loamy, mixed, mesic Aquic Arenic Hapludalfs
Shoals	Fine-loamy, mixed, nonacid, mesic Aeric Fluvaquents
Udorthents	Loamy, mixed, nonacid, mesic Typic Udorthents
Wallkill	Fine-loamy, mixed, nonacid, mesic Thapto-Histic Fluvaquents
Washtenaw	Fine-loamy, mixed, nonacid, mesic Aeric Fluvaquents
Wawasee	Fine-loamy, mixed, mesic Typic Hapludalfs
Whitaker	Fine-loamy, mixed, mesic Aeric Ochraqualfs

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