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

Soil Survey of Wabash County Indiana

HOW TO USE

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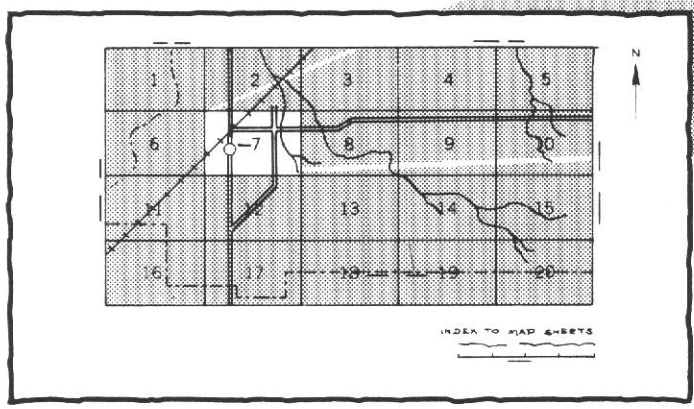

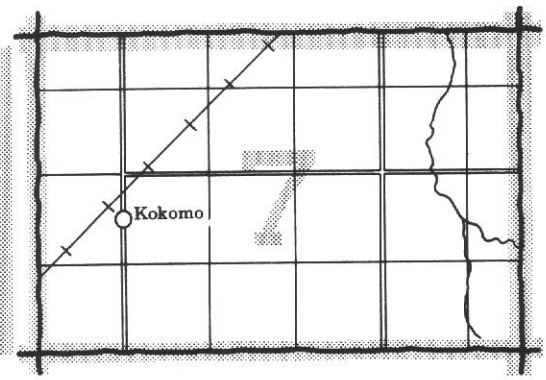

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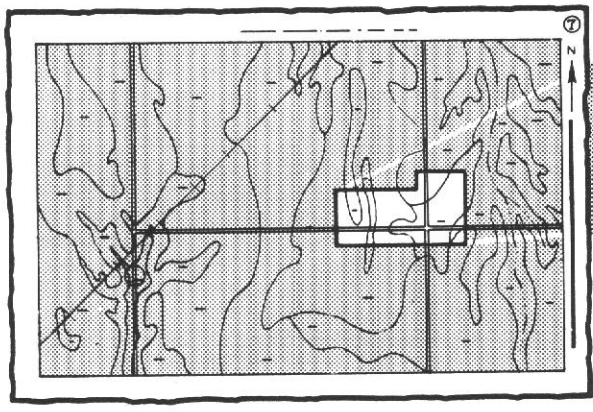

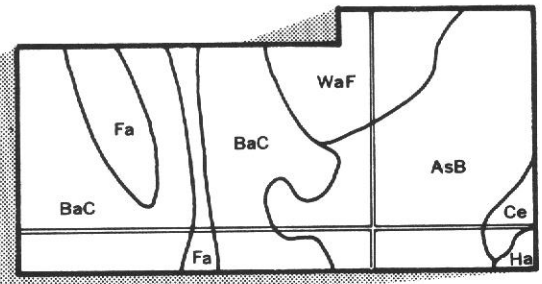

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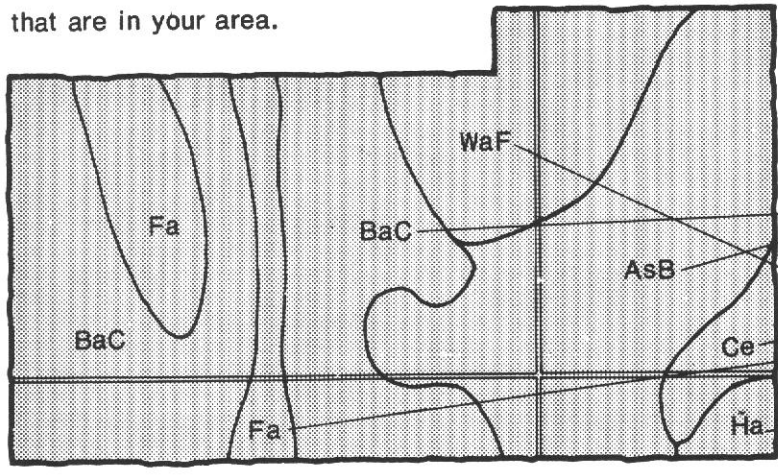

Symbols

AsB
BaC
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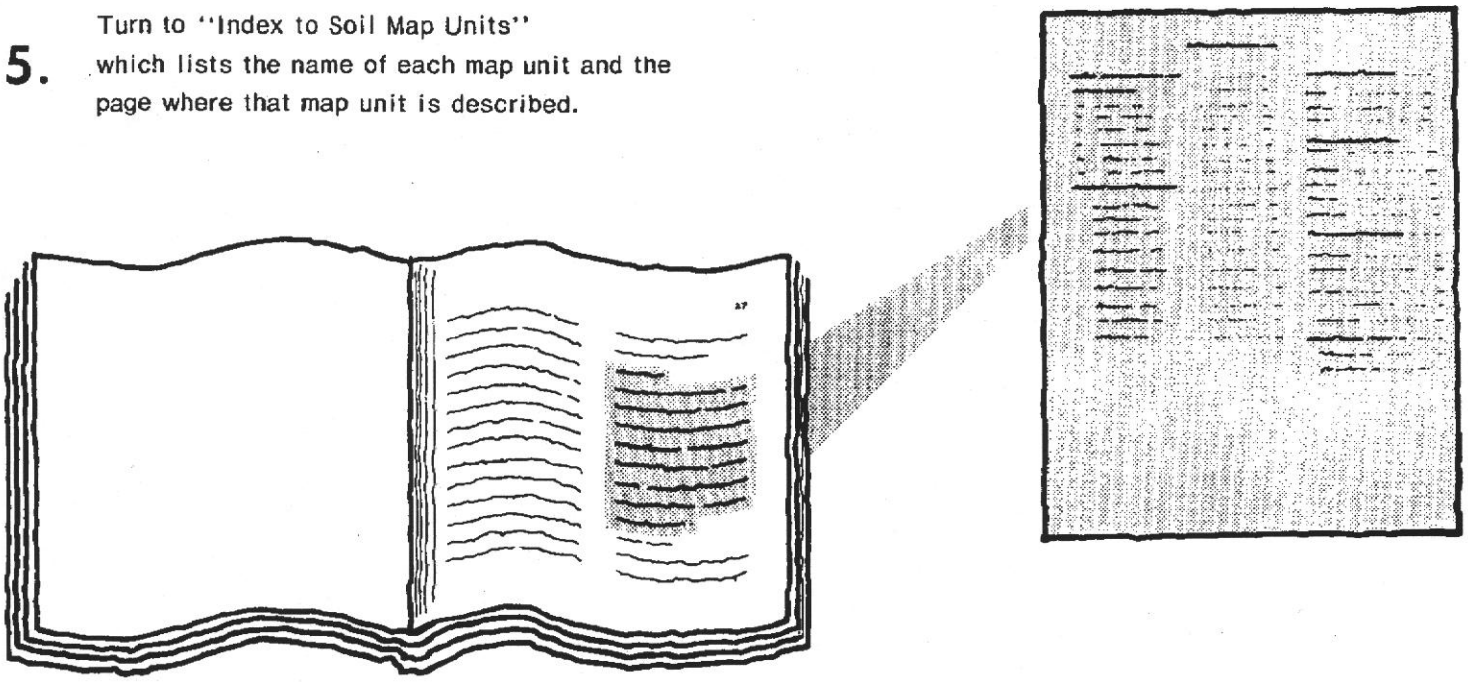
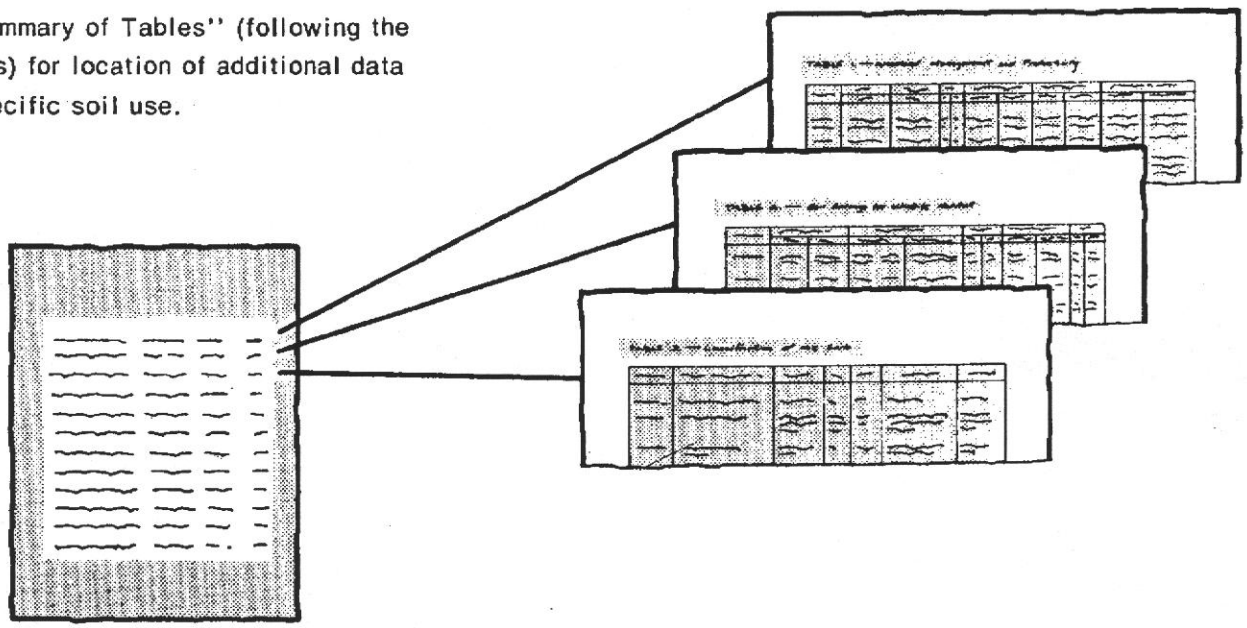
THIS SOIL SURVEY

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, handicap, or age.

Major fieldwork for this soil survey was performed in the period 1973 to 1983. Soil names and descriptions were approved in 1985. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1983. This survey was made cooperatively by the Soil Conservation Service and the Purdue University Agricultural Experiment Station. It is part of the technical assistance furnished to the Kosciusko County Soil and Water Conservation District. Financial assistance was made available by Kosciusko County and the State of Indiana.

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: Windbreaks on Riddles fine sandy loam, 6 to 12 percent slopes. The crop in the foreground is soybeans.

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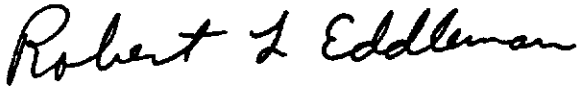
foreword

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

This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to 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.



Robert L. Eddleman
State Conservationist
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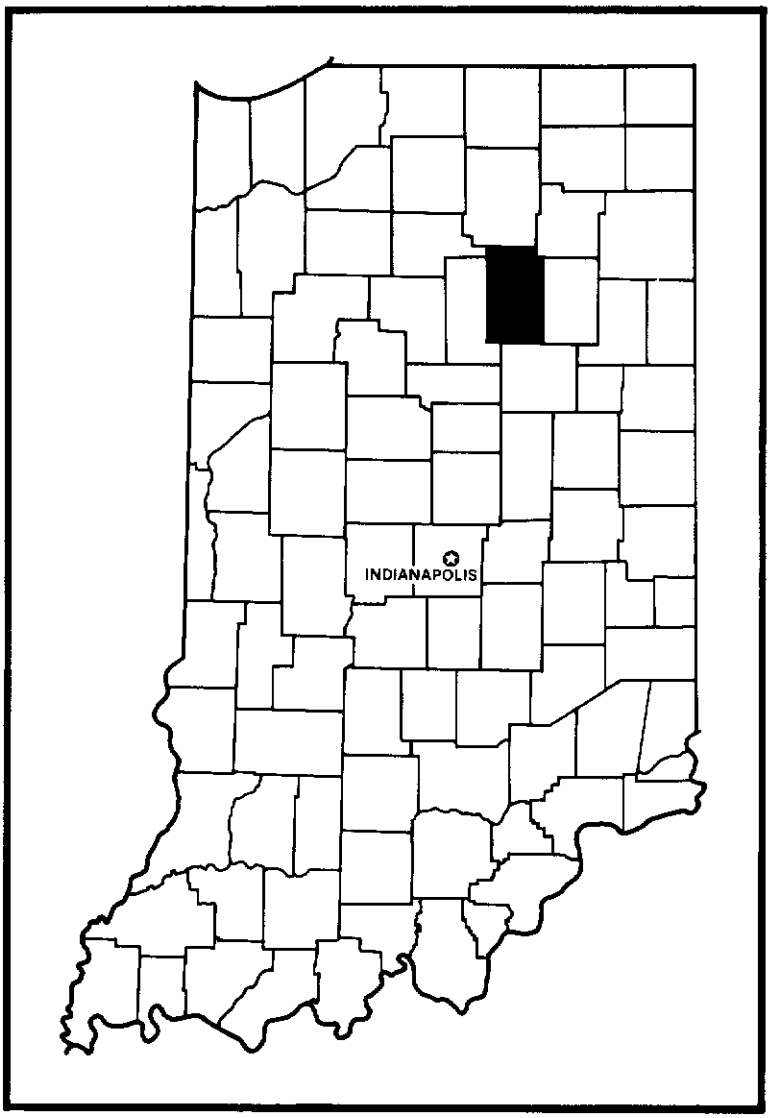

Location of Wabash County in Indiana.

soil survey of
Wabash County, Indiana

By Donald R. Ruesch, Soil Conservation Service

Fieldwork by Donald R. Ruesch, Soil Conservation Service, and Eric R. Langer, Indiana Department of Natural Resources, Soil and Water Conservation Committee, Assisted by Robert C. Jones, Richard W. Landrum, David K. Lefforge, William K. Schumacher, and Carl F. Walker

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

WABASH COUNTY is in the north-central part of Indiana. The county extends about 27 miles north to south and about 16 miles east to west. It takes in an area of about 421 square miles, or 269,440 acres. The city of Wabash is the county seat and is centrally located in the county.

Most of the land is used for farming. Cash-grain and livestock operations are the major types of farming. Corn, soybeans, and wheat are the main crops. Hogs and cattle are the major kinds of livestock raised. Very few specialty crops are grown in the county.

Most of the industry in the county is in Wabash and North Manchester. There is good potential for growth in these areas.

There are several facilities in the county for fishing, boating, swimming, camping, and horseback riding. Most of these facilities are centered around the Mississinewa and Salamonie Reservoirs. Some natural lakes in the northwestern part of the county also support these activities.

general nature of the county

This section gives general information concerning the county. It briefly discusses history and development; climate; physiography, relief, and drainage; water supply; trends in population and land use; and transportation.

history and development

Wabash County is named after the Wabash River, which runs through it. The Miami Indians called the river Wah-bah-shik-ki, meaning "clear, bright water over white rocks." The Miami Indians fought their last battle against the white man in southeastern Wabash County in December 1812.

On October 23, 1826, the Paradise Springs Treaty was signed by the Miami Indians and the United States Government. Shortly thereafter the first settlers arrived from Shelby County, Ohio. County boundaries were laid out, and on January 30, 1833, Wabash County was established. The town of Wabash was founded in 1834.

Transportation routes played an important part in the development of the county and particularly of the city of Wabash. A good road network, the Lake Erie and Wabash Canal, and later the railroads all helped to establish Wabash as a thriving grain-shipping center for Wabash County and the surrounding counties. The first passenger train arrived in Wabash on January 26, 1856. By 1874 commerce had shifted from the canal to railroads, and the old canal was abandoned (*6*).

climate

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

Wabash County is cold in winter but quite 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. Normal annual precipitation is adequate for all crops that are adapted to the temperature and the length of the growing season in the area.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Wabash, Indiana in the period 1951 to 1974. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 27 degrees F, and the average daily minimum temperature is 18 degrees. The lowest temperature on record, which occurred at Wabash, Indiana, on January 2, 1969, is -23 degrees. In summer the average temperature is 70 degrees, and the average daily maximum temperature is 83 degrees. The highest recorded temperature, which occurred at Wabash, Indiana on July 15, 1954, is 101 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 37 inches. Of this, 23 inches, or 60 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 19 inches. The heaviest 1-day rainfall during the period of record was 4.78 inches at Wabash on July 8, 1964. Thunderstorms occur on about 40 days each year, and most occur in summer.

The average seasonal snowfall is 29 inches. The greatest snow depth at any one time during the period of record was 15 inches. On an average of 19 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 65 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 March.

Tornadoes and severe thunderstorms occur occasionally. These storms are usually local and of short duration and cause damage in a variable pattern.

physiography, relief, and drainage

The relief in Wabash County ranges from flat plains in the western part to gently rolling areas in the eastern part and to rolling knobs and ridges and potholes north of the Eel River (fig. 1). Three major drainage systems dissect the county in a general east to west direction. They are the Eel River in the northern part of the county, the Wabash River through the middle of the county, and the Mississinewa River in the southern part. The highest elevations are slightly more than 920 feet above sea level and are near the northwest corner and the southeast corner of the county. The lowest point is less than 650 feet above sea level and is on the west side where the Wabash River leaves the county.

Wabash County has five physiographic subdivisions. They are the upland till plains, the moraines, the outwash terraces, the limestone terraces, and the bottom lands.

The most extensive physiographic area is the upland till plains in the western half of the county. The plains are nearly level except for the breaks along stream valleys. The soils are dominantly somewhat poorly drained and very poorly drained. Surface drainage is poorly defined, and there are few natural drainageways. Excess water is removed from the soils by an elaborate system of open ditches and subsurface drains.

There are two major moraines in Wabash County. The Packerton Moraine is in the northwestern part of the county. It consists of rolling knobs, ridges, and depressions. Slopes are variable in length, size, and shape and range from nearly level to moderately steep within a short distance. The soils on knobs and ridges are dominantly well drained, and the soils in depressions are very poorly drained. Surface drainage is poorly defined, and there are few natural drainageways. Many of the depressions are difficult to drain because adequate outlets are not available. An elaborate system of open ditches, subsurface drains, and pump drainage commonly is needed to drain the soils sufficiently for crop production. Many areas that were once used for crops are reverting to marsh.

The Mississinewa Moraine is in the eastern half of the county. It extends from the northeast corner of the county southwest to the city of Wabash and then southeast to La Fontaine. It consists of small, gently rolling knobs and ridges. The soils on the knobs and ridges are somewhat poorly drained and moderately well drained; those in the shallow depressions and drainageways are very poorly drained. Surface drainage is fairly well defined, and there are many waterways and small streams. Subsurface drains are used to remove excess water from the shallow depressions and drainageways. In most areas there is easy access to drainage outlets.

The outwash terraces are mainly in two areas. The larger of the two is along the Eel River, and the other is east of Somerset along the Mississinewa Reservoir and River. The terraces are nearly level and gently sloping and have steeper breaks along old water channels and around potholes. The soils are dominantly well drained, but the soils in the old water channels and potholes are very poorly drained. Surface drainage is poorly defined. Subsurface drains are used to remove excess water

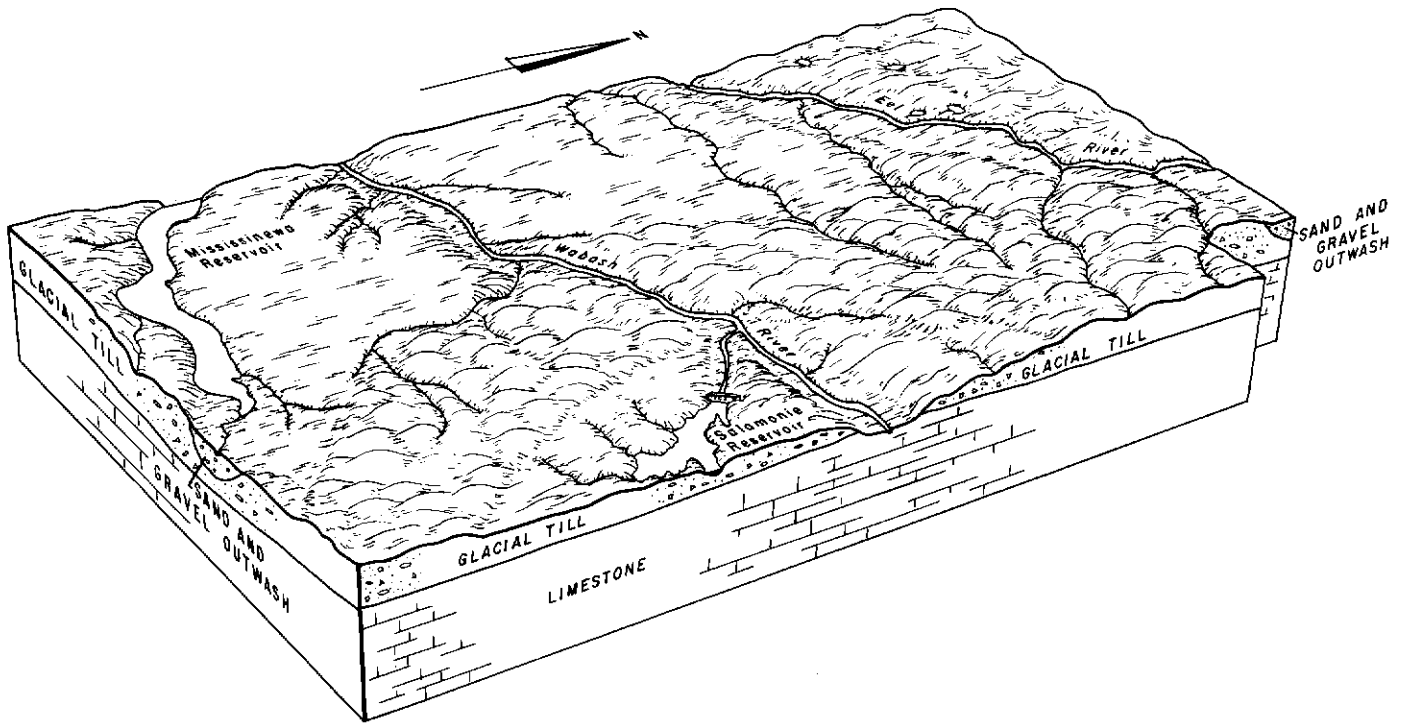

Figure 1.—Landforms in Wabash County, Indiana.

from the very poorly drained soils. A few areas are difficult to drain because of the rapid recharge rate from the surrounding areas. Many of the well drained soils are droughty.

The limestone terraces are along the Wabash River. They are nearly level to gently sloping and have sharp breaks between different levels. The soils are mainly well drained. Surface drainage is good. The installation of subsurface drains is difficult because of the shallow depth to bedrock.

The bottom lands are nearly level and are along the rivers and creeks. Most of the soils in the larger bottoms, for example, those along the Wabash River, are well drained, and most of the soils in the smaller bottoms are somewhat poorly drained or very poorly drained. Drainage ditches are common on bottom lands and mainly carry runoff from the uplands to the river or creek. The prairie in the Wabash River bottom south of Richvalley is an old, very poorly drained slough that has been drained.

water supply

The main source of water for Wabash County is ground water. The major aquifers are sand and gravel deposits overlying bedrock and limestone bedrock of the early and middle Silurian period. In most parts of the county the supply of water is adequate for rural residential use. The sand and gravel deposits along the Eel River and a deep underground valley in the limestone bedrock, which extends from Richvalley southeast to La Fontaine and out of the county by way of the southeast corner, are sources of water for municipal water systems.

The county has good sources of surface water. The Eel, Wabash, Salamonie, and Mississinewa Rivers are perennial streams that dissect the county in a general east to west direction. Flow in the Wabash River is augmented by water stored in the Huntington, Salamonie, and Mississinewa Reservoirs. The Salamonie and Mississinewa Reservoirs are partly within the county.

There are a few natural lakes in the northwestern part of the county. The largest lakes are Lukens Lake, McColley Lake, Round Lake, and Long Lake.

trends in population and land use

Wabash County has a population of about 35,500 (*5*). The population density is 89.3 people per square mile. Population trends for Wabash County have fluctuated since 1900, ranging from a decrease of 7.6 percent in the 1920's to a 12.2 percent increase in the 1950's. The

largest city in the county is Wabash, which has a population of about 13,400.

About 230,000 acres of the county is used for farming or woodland. Of this, 166,000 acres is harvested cropland, 41,000 acres is other farmland, and 23,000 acres is woodland. Most of the farms are grain farms; however, the county produces a substantial number of livestock. Cattle and hogs are the main livestock raised. There are several dairy, veal, and poultry operations in the county.

About 7 percent of the work force in Wabash County makes a living from farming or forestry. The number of farmers is decreasing, but the average size of the farms is increasing. Recent trends have been toward confined feeding of livestock and using the land for grain crops.

About 40,000 acres in Wabash County is used for purposes other than agriculture or forestry. Of the 40,000 acres, 14,800 acres, owned by the United States Government, is taken up by the Mississinewa and Salamonie Reservoirs.

transportation

Wabash County has a good network of roads and highways. U.S. 24, which parallels the Wabash River, is the main east-west highway. The main north-south highways are S.R. 15 and S.R. 13. Other state routes that provide access are 16, 114, 115, 124, 218, and 524. U.S. 24 is being rerouted and made a dual-lane divided highway.

The county is served by Conrail and by the Norfolk and Western Railway.

Wabash County has two main airports: the Wabash Municipal Airport and a privately owned facility near Servia.

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, woodland, urban uses,* and *intensive recreation areas*. Cultivated crops are those grown extensively in the survey area. 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.

Some of the boundaries on the general soil map of Wabash County do not match those on the soil maps of adjacent counties, and some of the soil names and descriptions do not fully agree. The differences are a result of improvements in the classification of soils, particularly modification or refinements in soil series concepts. Also, there may be differences in the intensity of mapping or in the extent of the soils within the survey area.

The general soil map units in Wabash County are described on the following pages.

Areas dominated by deep, nearly level to moderately sloping, somewhat poorly drained, very poorly drained, and moderately well drained soils on uplands

These areas have gently rolling topography and fairly well defined drainageways. Water in some depressions ponds during wet periods. The soils are used mainly for cultivated crops. Wetness and erosion are the main concerns in management.

1. Blount-Pewamo-Glynwood

Nearly level to moderately sloping, somewhat poorly drained, very poorly drained, and moderately well drained soils that formed in clay loam glacial till

The areas of this map unit are characterized by gently rolling topography (fig. 2). Surface drainage is fairly well defined, but water ponds in depressions during wet periods.

This map unit makes up about 29 percent of the county. It is about 40 percent Blount soils, 18 percent Pewamo soils, 16 percent Glynwood soils, and 26 percent soils of minor extent.

Blount soils are nearly level and gently sloping and are somewhat poorly drained. They are on convex swells and on foot slopes. The surface layer is dark grayish brown silt loam, and the subsoil is dark yellowish brown and brown, mottled clay loam.

Pewamo soils are nearly level and are very poorly drained. They are in depressions and along drainageways. The surface layer is very dark gray silty clay loam. The subsoil is dark gray, mottled silty clay, silty clay loam, and clay loam.

Glynwood soils are gently sloping and moderately sloping and are moderately well drained. They are on convex parts of the landscape. The surface layer is dark grayish brown silt loam in eroded areas and dark brown clay loam in severely eroded areas. The subsoil is dark yellowish brown, mottled clay.

The minor soils are the well drained Morley soils on knobs and side slopes; the moderately well drained Rawson soils on low ridges and knolls; the nearly level, somewhat poorly drained Haskins soils on flats; the very poorly drained Milford and Pella soils in deep

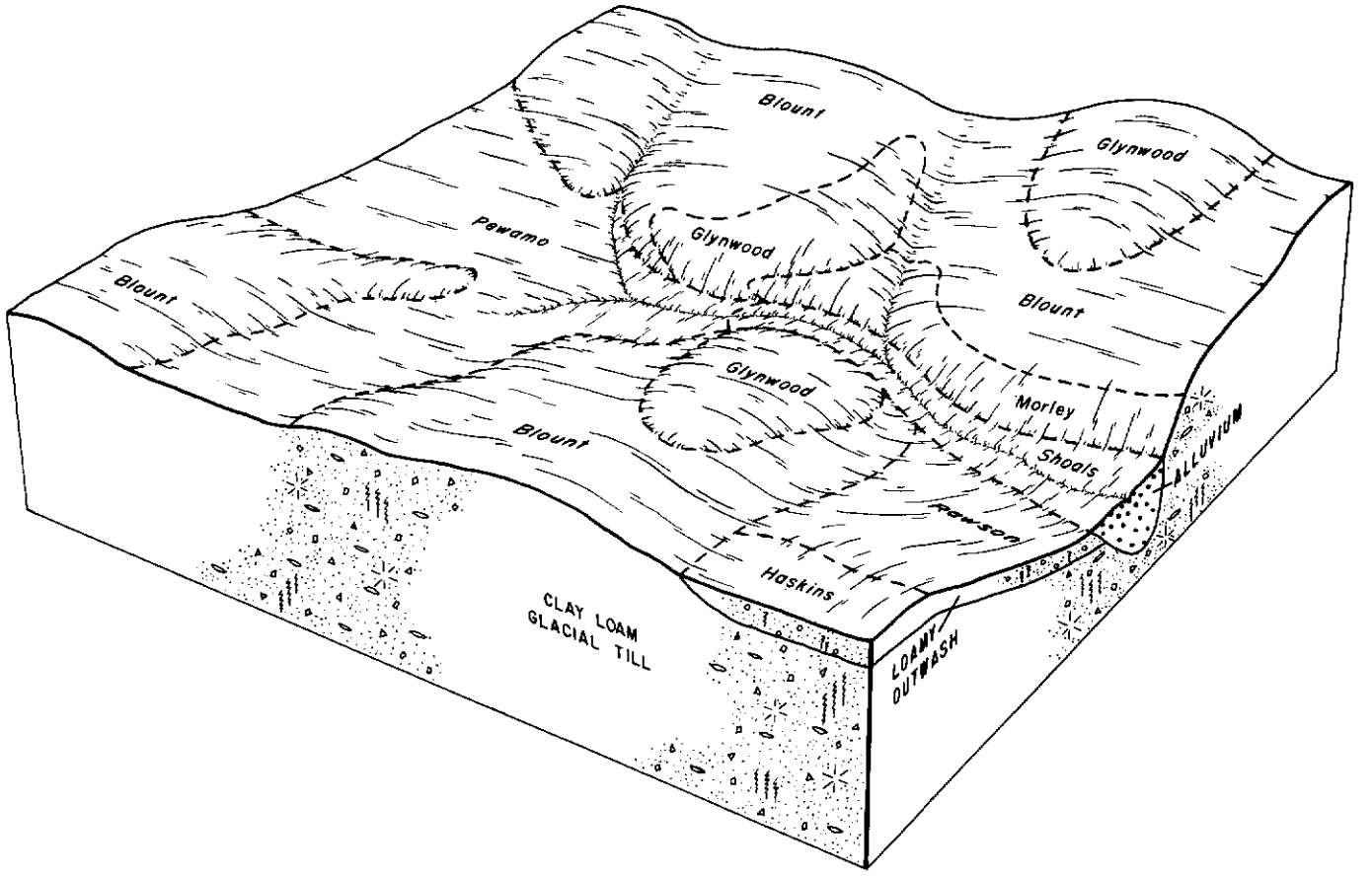

Figure 2.—Pattern of soils and underlying material in the Blount-Pewamo-Glynwood map unit.

depressions; and the very poorly drained Sloan soils and the somewhat poorly drained Shoals soils on narrow bottom lands. Rawson, Sloan, and Shoals soils are less clayey than the major soils in this map unit, and Haskins soils are sandier. Milford and Pella soils are stratified in the lower part of the subsoil.

The soils making up this map unit are used mainly for cultivated crops. Wetness is the major limitation and erosion is the major hazard if these soils are used for cultivated crops. The soils in depressions and drainageways, for the most part, have subsurface drains. Practices that control erosion are needed if row crops are grown.

The soils making up this map unit are suitable for trees. Woodlots are small, and most of them are on the steeper slopes or in deep depressions. Many are being cleared for cultivation. Wetness limits the use of equipment in the depressions during wet periods.

These soils have poor potential for residential development. Wetness and slow permeability severely limit the use of the soils for septic tank absorption systems. Dwellings need reinforcement of footings and basement walls, and subsurface drainage should be installed because of wetness and the moderate shrinking and swelling of the soils.

The soils have fair potential for intensive recreation uses. Wetness and the slow permeability are the major limitations. A subsurface drainage system is needed to remove excess water.

Areas dominated by deep, nearly level, somewhat poorly drained and very poorly drained soils on uplands, terraces, and outwash plains

These areas have relatively flat topography that has slight swells and depressions and a few narrow drainageways. Surface drainage is poorly defined. Ponding is common in the depressions. Most of the soils

are drained and are used for cultivated crops. Wetness is the main concern in management.

2. Fincastle-Cyclone

Nearly level, somewhat poorly drained and very poorly drained soils that formed in loess and loam glacial till

The areas of this map unit are characterized by relatively flat topography and slight swells and depressions (fig. 3). Surface drainage is poorly defined. Water ponds in the depressions in wet periods.

This map unit makes up about 13 percent of the county. About 45 percent is Fincastle soils, 44 percent is Cyclone soils, and 11 percent is minor soils.

Fincastle soils are nearly level and somewhat poorly drained. They are on slightly convex swells. The surface layer is dark grayish brown silt loam. The upper part of the subsoil is dark grayish brown, grayish brown, and yellowish brown, mottled silty clay loam; the lower part is yellowish brown, mottled clay loam and loam.

Cyclone soils are nearly level and very poorly drained. They are in depressions. The surface layer is very dark gray silt loam. The upper part of the subsoil is dark gray and gray, mottled silty clay loam, and the lower part is gray, mottled clay loam.

The minor soils are Miami, Milford, Pella, Sloan, and Shoals soils. Miami soils are well drained, are steeper than the major soils, and are on side slopes and breaks along drainageways. Milford and Pella soils are very poorly drained, are more clayey than the major soils, and are stratified in the lower part of the subsoil. They are in deep depressions. Sloan soils are very poorly drained, and Shoals soils are somewhat poorly drained. Sloan and Shoals soils are sandier than the major soils, and they are on narrow bottom lands.

The soils in this map unit are extensively used for cultivated crops. Wetness is the major limitation if these soils are used for cultivated crops. In most areas, the soils have subsurface drains.

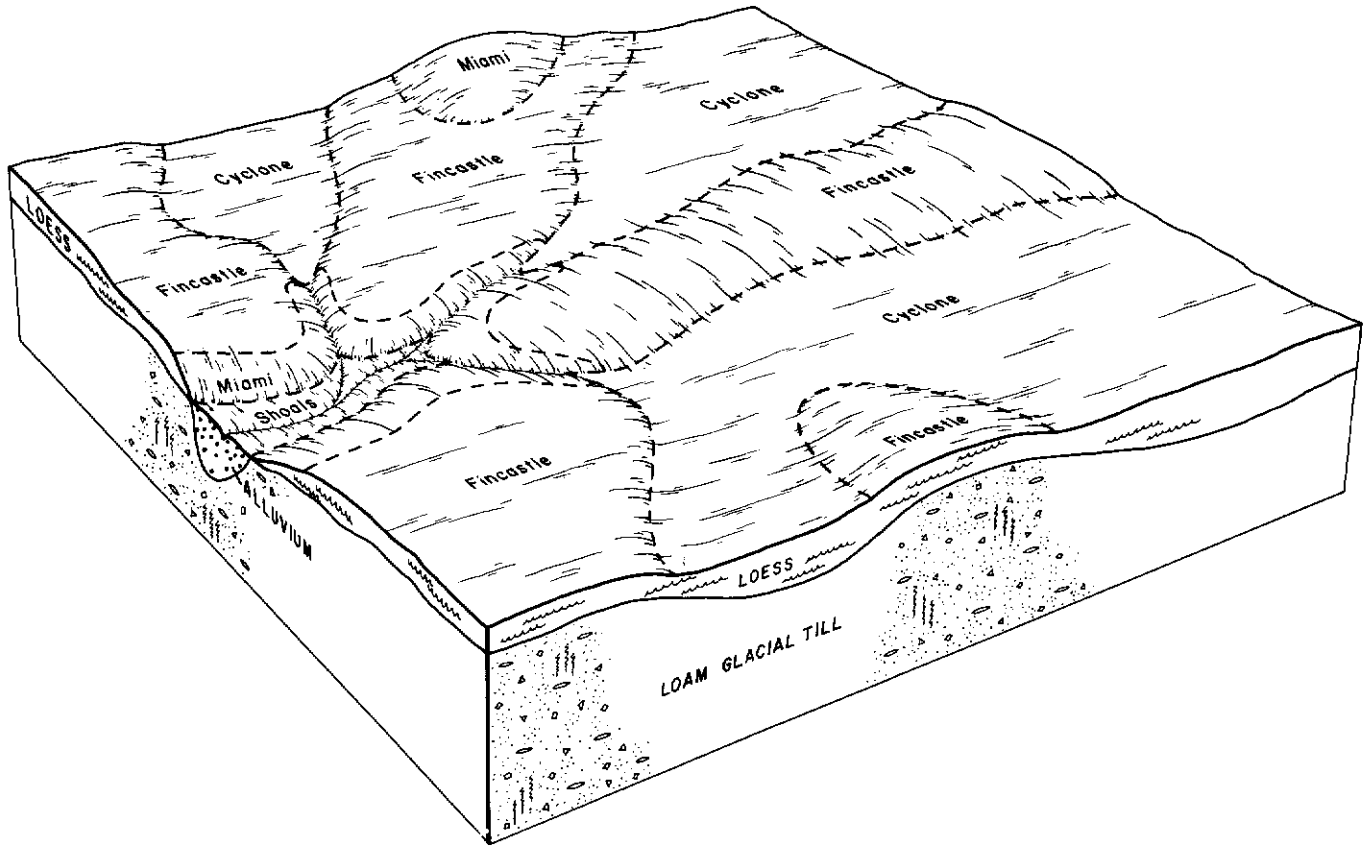

Figure 3.—Pattern of soils and underlying material in the Fincastle-Cyclone map unit.

The soils are suited to trees. Woodlots are few and small and have not been drained, and many of them are being cleared for cultivation. Water-tolerant tree species should be favored in managing the woodlots. Wetness limits the use of logging equipment during wet periods.

The soils have poor potential for residential development. Wetness, ponding, and the moderately slow permeability are the major limitations. Surface and subsurface drainage are needed to remove excess water. Wetness and the moderately slow permeability severely limit the use of the soils as septic tank absorption fields.

The soils have fair potential for intensive recreation uses. Wetness, ponding, and the moderately slow permeability are the major limitations. Surface and subsurface drainage systems are needed to remove excess water.

3. Crosby-Brookston-Crosier

Nearly level, somewhat poorly drained and very poorly drained soils that formed in loam glacial till and silty and loamy glacial material

The areas of this map unit are characterized by relatively flat topography that has slight swells and depressions (fig. 4). Surface drainage is poorly defined. Water ponds in the depressions during wet periods.

This map unit makes up about 8 percent of the county. About 32 percent of the map unit is Crosby soils, 31 percent is Brookston soils, 15 percent is Crosier soils, and 22 percent is soils of minor extent.

Crosby soils are nearly level and are somewhat poorly drained. They are on convex swells. The surface layer is dark grayish brown silt loam, and the subsoil is brown, mottled clay loam.

Brookston soils are nearly level and are very poorly drained. They are in slight concave depressions and in drainageways. The surface layer is very dark grayish brown loam, and the subsoil is gray or grayish brown, mottled clay loam.

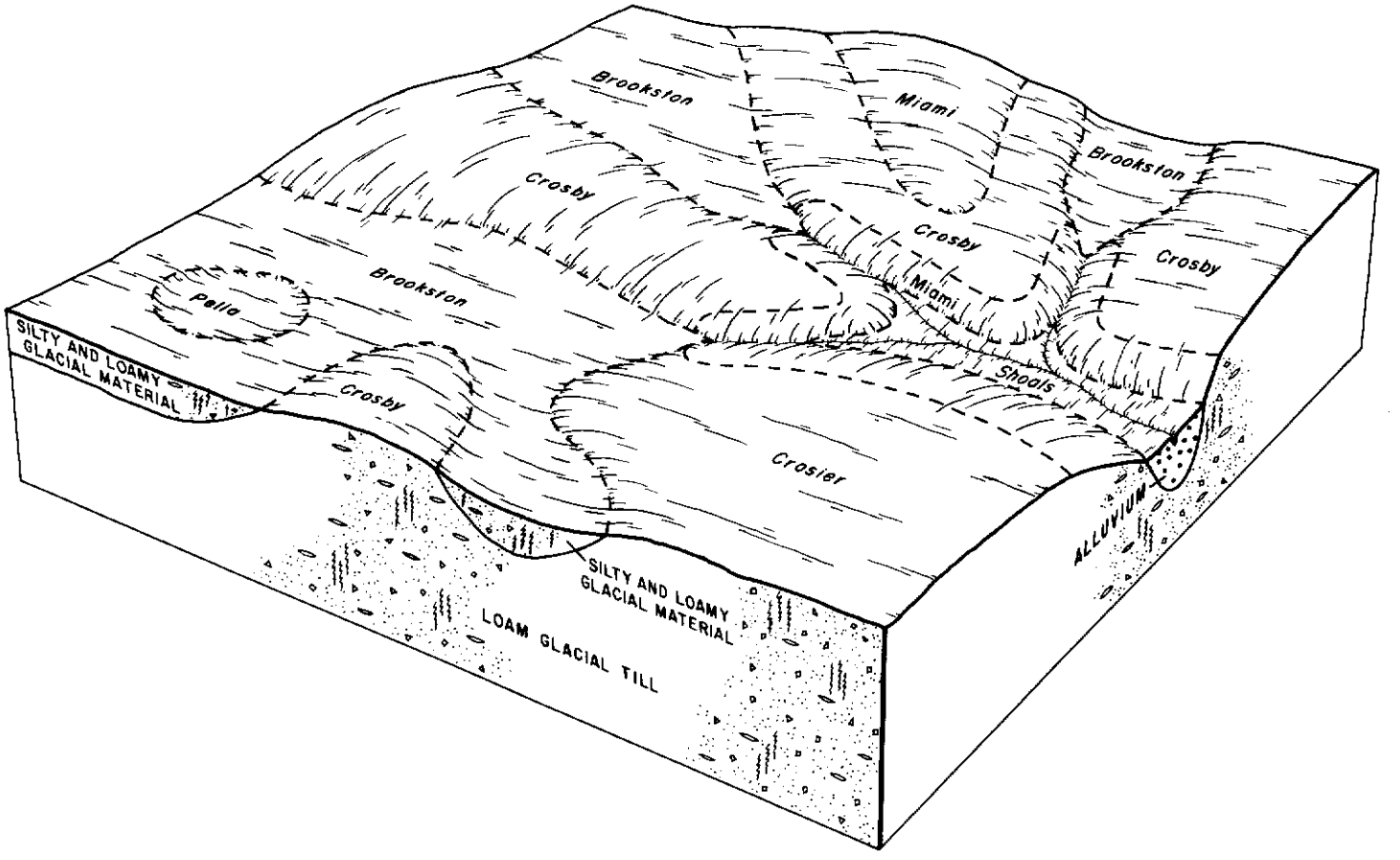

Figure 4.—Pattern of soils and underlying material in the Crosby-Brookston-Crosier map unit.

Crosier soils are nearly level and are somewhat poorly drained. They are on convex swells. The surface layer is dark grayish brown loam, and the subsoil is yellowish brown and dark yellowish brown, mottled clay loam and loam.

The minor soils are Miami, Milford, Pella, Sloan, and Shoals soils. Miami soils are well drained and are on side slopes and breaks along drainageways. Milford and Pella soils are very poorly drained, are more clayey than the major soils, and are stratified in the lower part of the subsoil. They are in deep depressions. Sloan soils are very poorly drained, and Shoals soils are somewhat poorly drained. Sloan and Shoals soils are sandier than the major soils, and they are on narrow bottom lands.

The soils making up this map unit are used extensively for cultivated crops. Wetness is the major limitation. In most areas, the soils have subsurface drains.

The soils are suited to trees. Woodlots are few and small and have not been drained, and many of them are being cleared for cultivation. Water-tolerant tree species should be favored in managing these woodlots. Wetness limits the use of logging equipment during wet periods.

These soils have poor potential for residential development. Surface and subsurface drainage are needed to remove excess water. Wetness, ponding, and slow permeability severely limit the use of the soils for septic tank absorption systems.

The soils in this map unit have fair potential for intensive recreation uses. Wetness, ponding, and the slow permeability are the major limitations. Surface and subsurface drainage are needed to remove excess water.

4. Rensselaer-Whitaker

Nearly level, very poorly drained and somewhat poorly drained soils that formed in sandy, loamy, and silty glacial sediments

The areas of this map unit are characterized by relatively flat topography that has slight swells and depressions (fig. 5). Surface drainage is poorly defined. Water ponds in the depressions during wet periods.

This map unit makes up about 3 percent of the county. About 54 percent is Rensselaer soils, 38 percent is Whitaker soils, and 8 percent is minor soils.

Rensselaer soils are nearly level and very poorly drained. They are in depressions. The surface layer is black loam. The subsoil is dark gray and gray, mottled clay loam and sandy clay loam in the upper part and stratified silty clay loam, silt loam, and sandy loam in the lower part.

Whitaker soils are nearly level and somewhat poorly drained. They are on swells. The surface layer is dark grayish brown loam, and the subsoil is dark yellowish brown, mottled loam and sandy clay loam.

The minor soils are Fox, Martinsville, Milford, Ormas, Pella, Shoals, and Sloan soils. Fox, Martinsville, and Ormas soils are well drained and are on small rises. Milford and Pella soils are very poorly drained and are in deep depressions. Milford soils are more clayey and Pella soils are more silty than the major soils. Shoals soils are somewhat poorly drained, and Sloan soils are very poorly drained. Shoals and Sloan soils do not have an abrupt increase in clay content in the subsoil. They are on narrow bottom lands.

The soils in this map unit are used extensively for cultivated crops. Wetness is the major limitation and ponding is a hazard where the soils are used for cultivated crops. In most areas the soils have subsurface drains. The soils have thin layers of fine sand below a depth of 3 feet. The sand can flow into subsurface drains and plug them.

The soils are suited to trees. Woodlots are few and small and have not been drained. Many are being cleared for cultivation. Water-tolerant tree species should be favored in managing these woodlots. Wetness limits the use of logging equipment during wet periods.

The soils have poor potential for residential development. Surface and subsurface drainage are needed to remove excess water. Wetness and ponding severely limit the use of the soils for septic tank absorption systems.

The soils have poor potential for intensive recreation uses. Wetness is the major limitation, and ponding is a hazard. Surface and subsurface drainage are needed to remove excess water.

Areas dominated by deep, nearly level to moderately steep, well drained, moderately well drained, and somewhat poorly drained soils on uplands

These areas have rolling topography. The areas south of the Eel River are on breaks between the uplands and the rivers or streams and have well defined drainageways, but the areas north of the Eel River are made up mainly of knobs, ridges, and potholes and have poorly defined drainageways. Most of the acreage is used for cultivated crops, but some of it is used for hay or pasture. Erosion is the main concern in management. Some woodlots are on the steeper slopes and small bottom lands.

5. Glynwood-Morley

Gently sloping to moderately steep, moderately well drained and well drained soils that formed in clay loam glacial till

The areas of this map unit are characterized by rolling topography made up of knobs, ridges, and ravines (fig. 6). Surface drainageways are well defined.

This map unit makes up about 16 percent of the county. About 50 percent is Glynwood soils, 15 percent is Morley soils, and 35 percent is soils of minor extent.

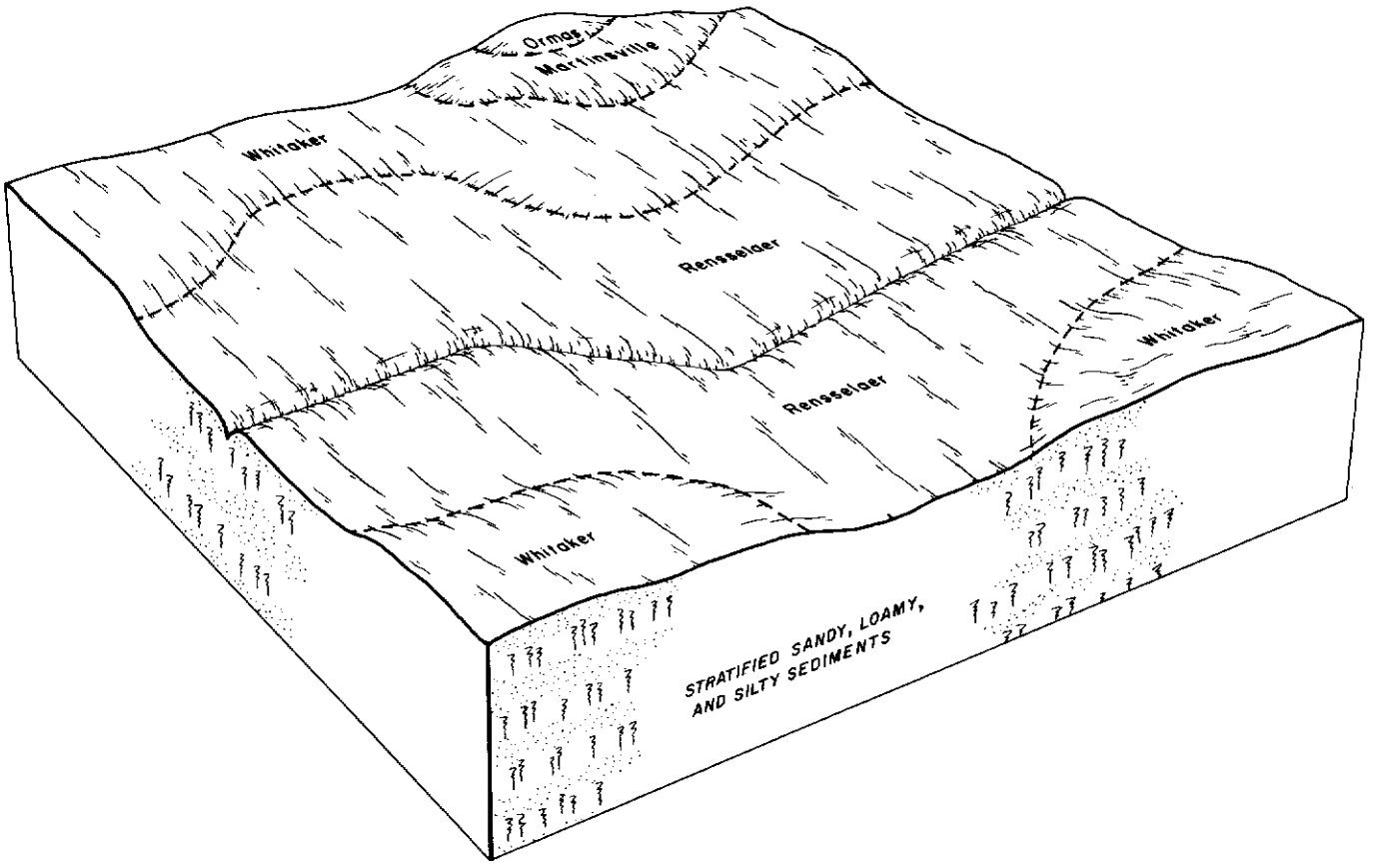

Figure 5.—Pattern of soils and underlying material in the Rensselaer-Whitaker map unit.

Glynwood soils are gently sloping and moderately sloping. They are moderately well drained. They are on the lower part of foot slopes and on low knobs. The surface layer is dark grayish brown silt loam in eroded areas and dark brown clay loam in severely eroded areas. The subsoil is dark yellowish brown and yellowish brown, mottled clay.

Morley soils are moderately sloping to moderately steep. They are well drained. They are on upland knobs, ridges and side slopes. The surface layer is dark grayish brown silt loam in eroded areas and dark yellowish brown clay loam in severely eroded areas. The subsoil is dark yellowish brown clay loam.

The minor soils are Rawson, Hennepin, Blount, and Shoals soils. Rawson and Hennepin soils are well drained and less clayey than the major soils. Rawson soils are on low knobs and ridges, and Hennepin soils are on steep side slopes and in ravines. Blount soils are somewhat poorly drained and are nearly level and gently sloping; they are on the less sloping parts of the landscape. Shoals soils are somewhat poorly drained and are on narrow bottom lands.

The soils in this map unit are mainly used for hay and pasture. In some areas they are used for cultivated crops. Erosion is the major hazard. Practices that control erosion are needed if cultivated crops are grown.

There are several woodlots in areas of this map unit. The soils are well suited to trees, and if properly managed they produce excellent hardwood timber. The woodlots provide good habitat for wildlife.

The soils have fair potential for residential development. Most of the gently sloping and moderately sloping soils have moderate limitations for use as building sites because of the shrinking and swelling. Wetness is a limitation on Glynwood soils. In most areas the soils are severely limited for use as septic tank absorption fields because of slope, slow permeability, or wetness.

The soils have fair potential for intensive recreation uses. Slope and slow permeability are the major limitations. Land leveling is needed in most areas for recreational development.

6. Miami-Riddles

Nearly level to moderately steep, well drained soils that formed in loam glacial till

The areas of this map unit are characterized by rolling topography made up of knobs, ridges, and deep depressions (fig. 7). Surface drainage is poorly defined. Small lakes and marshes are in the deeper depressions.

This map unit makes up about 9 percent of the county. About 38 percent of the map unit is Miami soils, 18 percent is Riddles soils, and 44 percent is minor soils.

Miami soils are gently sloping to moderately steep. They are well drained. They are on knobs, ridges, and side slopes. The surface layer is dark brown loam in eroded areas and dark brown clay loam in severely eroded areas. The subsoil is yellowish brown and dark yellowish brown clay loam and loam.

Riddles soils are nearly level to moderately sloping. They are well drained. They are on knobs, ridges, and side slopes. The surface layer is dark brown loam. The subsoil is dark yellowish brown and brown sandy clay loam in the upper part and dark brown and yellowish brown clay loam in the lower part.

The minor soils include the well drained Fox, Kalamazoo, Kosciusko, Martinsville, Ockley, Chelsea, and Metea soils. Fox, Kalamazoo, Kosciusko,

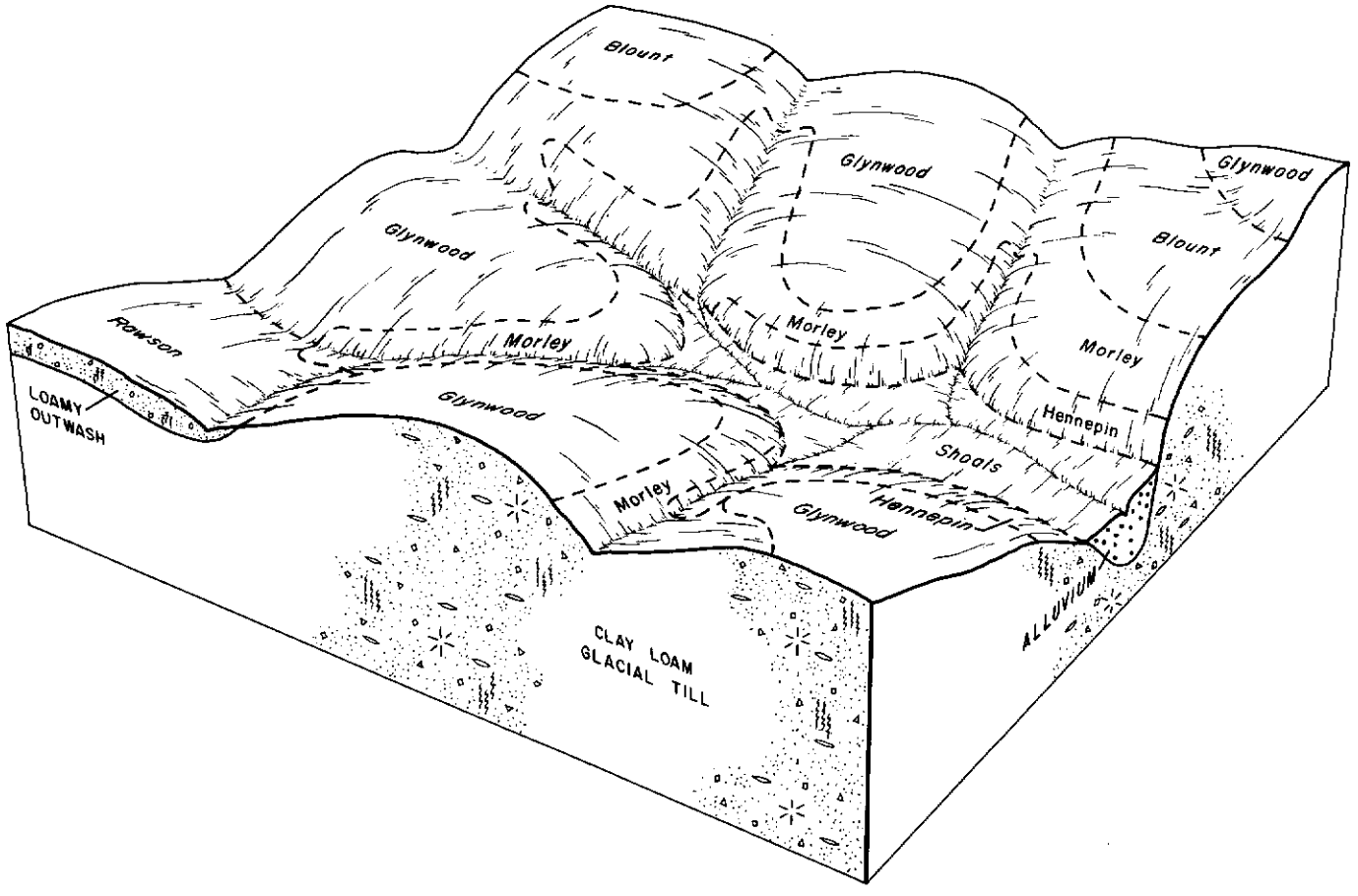

Figure 6.—Pattern of soils and underlying material in the Glynwood-Morley map unit.

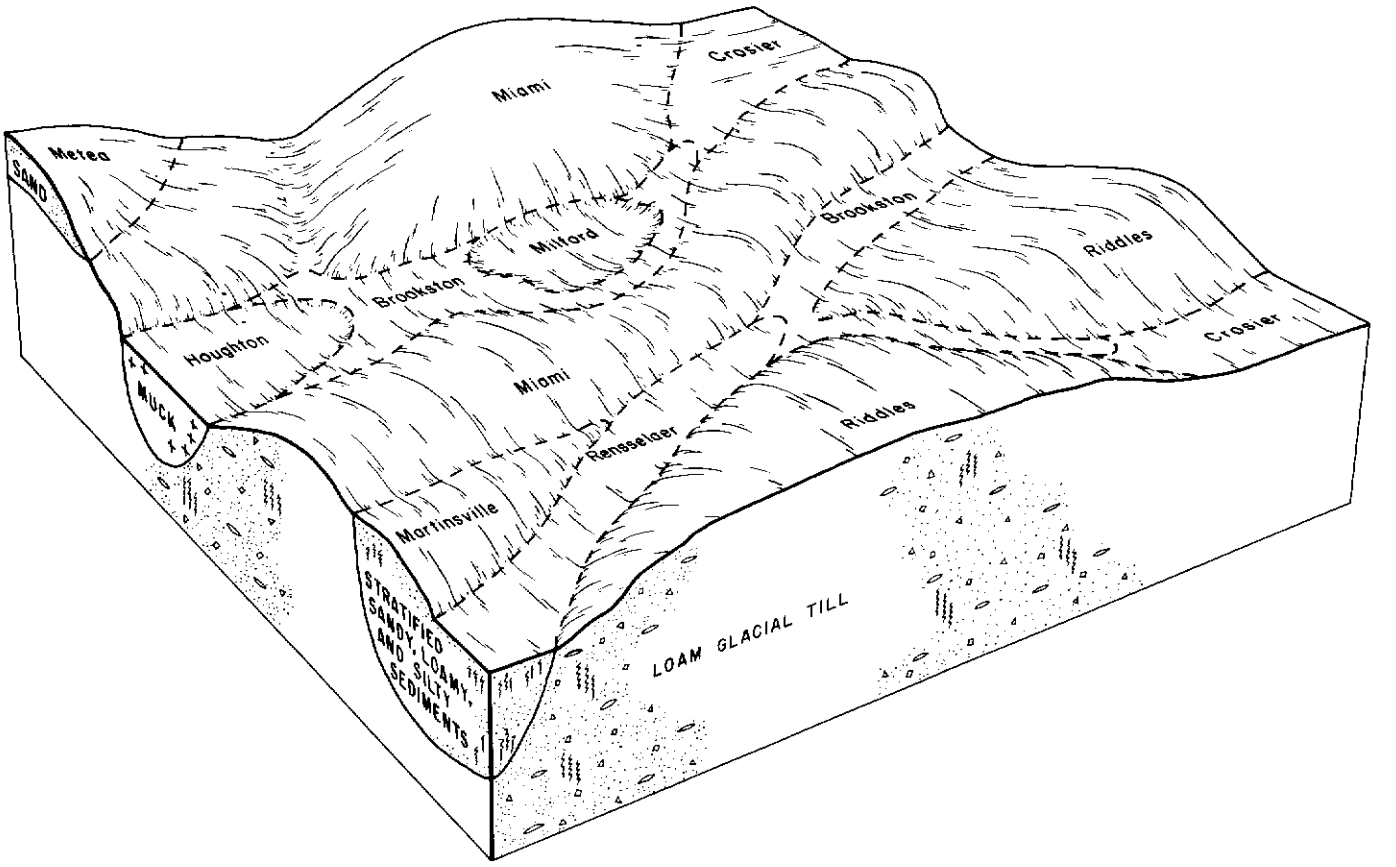

Figure 7.—Pattern of soils and underlying material in the Miami-Riddles map unit.

Martinsville, and Ockley soils are on outwash terraces, knobs, and ridges and along breaks around some of the deep depressions. Chelsea and Metea soils are sandy and are on ridges. Other minor soils are the somewhat poorly drained Crosier soils on upland flats, the very poorly drained Brookston soils in shallow depressions, and the very poorly drained Houghton, Milford, Palms, Rensselaer, Wallkill, and Washtenaw soils in depressions.

The soils in this map unit are used mainly for cultivated crops. In some areas they are used for hay, pasture, or woodland. Erosion is the major hazard on the sloping soils. Practices that control erosion are needed if cultivated crops are grown. The soils in many of the deep depressions are difficult to drain.

There are several woodlots in areas of this map unit. The well drained soils are well suited to trees, and if properly managed they produce excellent hardwood timber. The very poorly drained soils in deep depressions are suited to water-tolerant species, but wetness limits the use of logging equipment in these areas. The woodlots provide good habitat for wildlife.

The soils have fair potential for residential development. Most of the gently sloping and moderately sloping, well drained soils on the uplands are suited to use as a site for buildings and to septic systems. They have only moderate limitations because of the shrinking and swelling of the soil. In some areas they are limited by slope. The very poorly drained soils in depressions are not suited to residential development because of wetness and ponding.

The soils have fair potential for intensive recreation uses. Slope is the major limitation. Land leveling may be needed in most areas.

7. Miami-Crosby

Nearly level to moderately steep, well drained and somewhat poorly drained soils that formed in loam glacial till

The areas of this map unit are characterized by gently rolling uplands interspersed with knobs, ridges, and ravines (fig. 8). Surface drainageways are well defined.

This map unit makes up about 8 percent of the county. About 68 percent is Miami soils, 11 percent is Crosby soils, and 21 percent is soils of minor extent.

Miami soils are gently sloping to moderately steep. They are well drained. They are on knobs, ridges, and side slopes. The surface layer is brown silt loam in eroded areas and dark yellowish brown clay loam in severely eroded areas. The subsoil is dark yellowish brown clay loam.

Crosby soils are nearly level and somewhat poorly drained. They are on slight swells. The surface layer is dark grayish brown silt loam. The subsoil is brown, mottled clay loam.

The minor soils are Martinsville, Riddles, Hennepin, Brookston, and Shoals soils. Martinsville, Riddles, and Hennepin soils are well drained. Martinsville and Riddles soils are on some of the knobs, ridges, and side slopes, and Hennepin soils are on steep side slopes and in ravines. In comparison with the major soils, Martinsville soils have more sand in the lower part of the subsoil, Riddles soils are deeper to carbonates, and Hennepin soils are shallower to carbonates. Brookston soils are very poorly drained and are in shallow depressions. Shoals soils are somewhat poorly drained and are stratified. They are on narrow bottom lands.

The soils making up this map unit are used mainly for cultivated crops. In some areas they are used for hay and pasture. Erosion is a major hazard on the sloping soils. Practices that control erosion are needed if cultivated crops are grown. In most areas the Crosby and Brookston soils have subsurface drains.

Several woodlots are in areas of this map unit. The well drained soils are well suited to trees. If properly managed they produce excellent hardwood timber. The somewhat poorly drained soils are suited to trees that

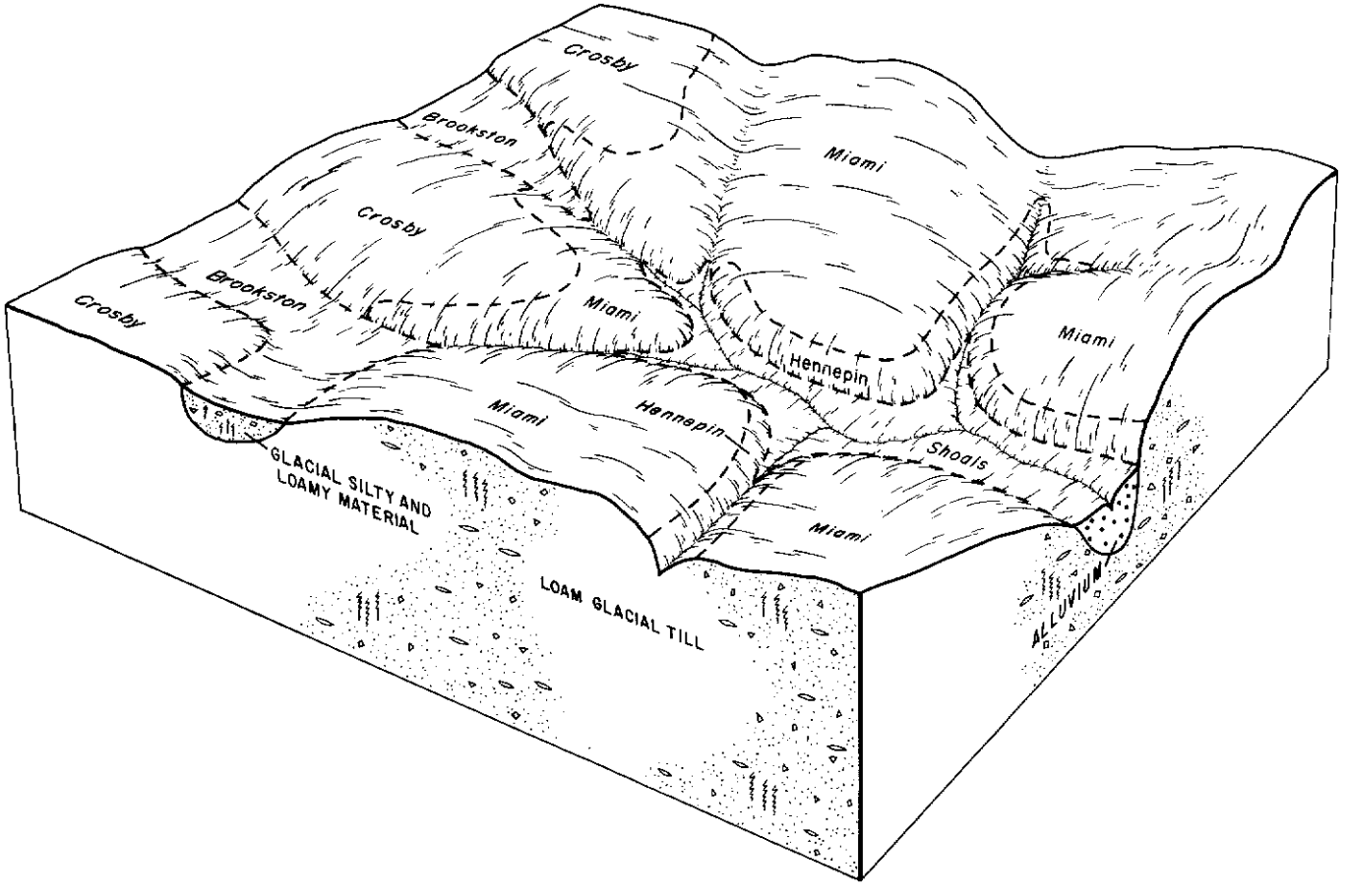

Figure 8.—Pattern of soils and underlying material in the Miami-Crosby map unit.

tolerate wetness. The woodlots provide good habitat for wildlife.

The soils in this map unit have fair potential for residential development. Most of the soils that are well drained and gently sloping or moderately sloping have few limitations for use as a site for buildings. The Crosby and Brookston soils have severe limitations for use as building sites because of wetness. Wetness or slow permeability severely limits the use of most of the soils for septic tank absorption systems.

The soils have fair potential for intensive recreation uses. The major limitations are the slope and the slow permeability. Land leveling may be needed in many areas.

Areas dominated by nearly level to strongly sloping, well drained soils that are deep and moderately deep over sand and gravel on outwash plains and river terraces

These areas consist of outwash plains, terraces, and deep depressions. Drainageways are poorly defined. In most areas the soils are used for cultivated crops. Erosion is the main concern in management. The soils in these areas tend to be droughty.

8. Fox-Ockley-Kosciusko

Nearly level to strongly sloping, well drained soils that formed in loamy outwash and underlying sand and gravel

This map unit consists of soils on outwash plains, on terraces, and in deep depressions in areas of old glacial river channels (fig. 9). Most of the soils are droughty. Surface drainage is poorly defined. Water ponds in the depressions during wet periods.

This map unit makes up about 10 percent of the county. About 20 percent is Fox soils, 19 percent is Ockley soils, 12 percent is Kosciusko soils, and 49 percent is soils of minor extent.

Fox soils are nearly level to strongly sloping, and they

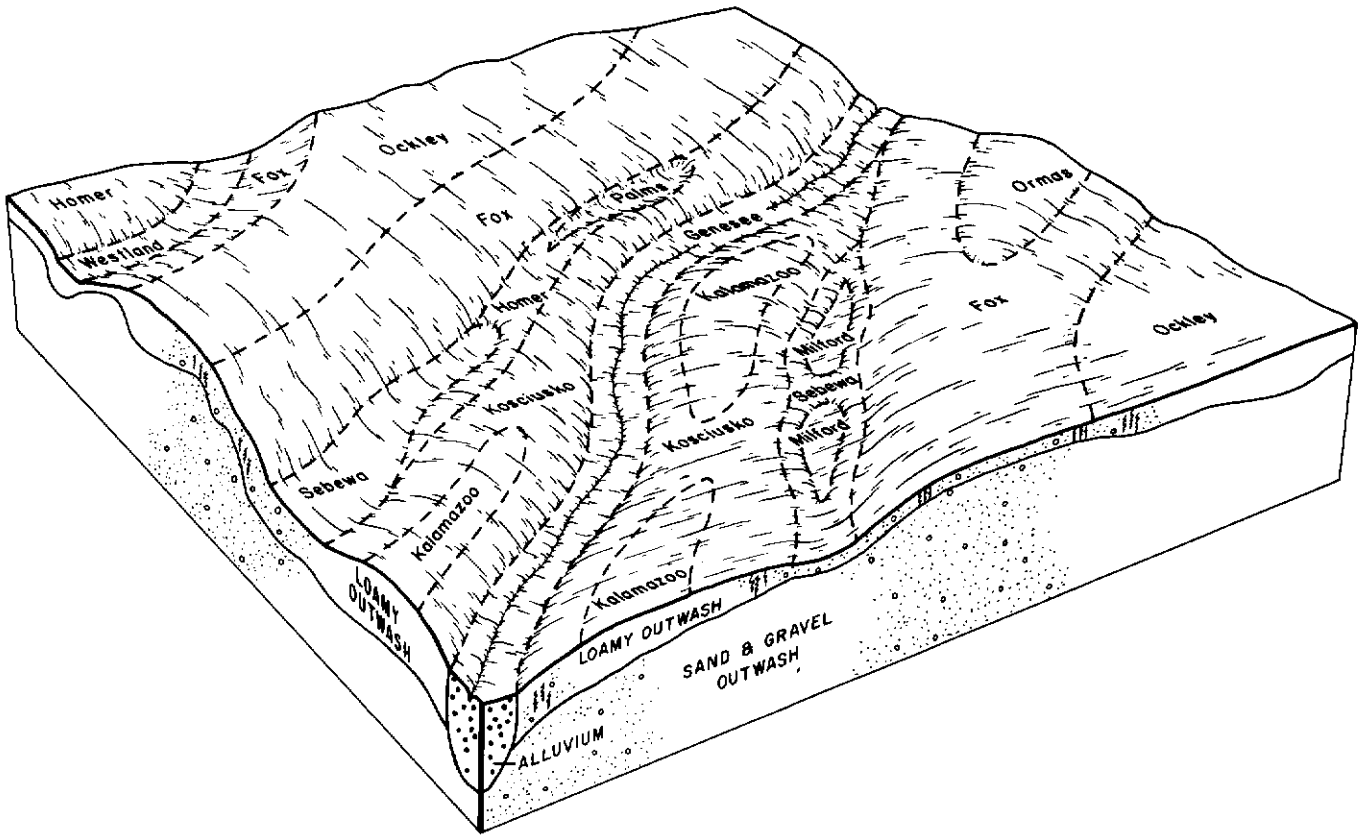

Figure 9.—Pattern of soils and underlying material in the Fox-Ockley-Kosciusko map unit.

are well drained. They are on low terraces and along breaks. The surface layer is dark brown loam in the slightly eroded areas and dark brown clay loam in the severely eroded areas. The subsoil is dark yellowish brown gravelly clay loam in the upper part and gravelly sandy clay loam in the lower part.

Ockley soils are nearly level and gently sloping, and they are well drained. They are on high terraces. The surface layer is dark grayish brown loam. The subsoil is dark brown and dark reddish brown sandy clay loam and gravelly sandy loam.

Kosciusko soils are nearly level to moderately sloping, and they are well drained. They are on terraces. Kosciusko soils are sandier than Fox or Ockley soils. The surface layer is brown sandy loam. The subsoil is brown sandy clay loam and gravelly sandy clay loam in the upper part and dark yellowish brown and dark brown gravelly sandy loam in the lower part.

The minor soils include the well drained Kalamazoo, Ormas, and Genesee soils. Kalamazoo soils have less gravel than the major soils in this map unit; Ormas soils are sandier and are on ridges and breaks; Genesee soils are stratified and are on bottom lands. Other minor soils are the somewhat poorly drained Homer and Whitaker soils in low-lying areas and the very poorly drained Houghton, Martisco, Milford, Palms, Rensselaer, Sebewa, and Westland soils in depressions.

The soils making up this map unit are used mainly for cultivated crops. The well drained soils tend to be droughty. Many of the deep depressions are difficult to drain. Erosion is a hazard on the sloping soils.

There are few woodlots in areas of this map unit. The well drained soils are well suited to trees and produce excellent hardwood timber if properly managed. The very poorly drained soils in depressions are suited to water-tolerant trees, but wetness limits the use of logging equipment on these soils.

The soils have fair potential for residential development. The well drained soils have few limitations for dwellings. Most of the well drained soils are limited for septic tank absorption fields by the poor filtering qualities of the soils. The soils in the depressions are not suited to building site development because of wetness and ponding.

The soils in this map unit have good potential for intensive recreation uses.

Areas dominated by deep and moderately deep, nearly level to moderately sloping, well drained and somewhat poorly drained soils on bottom lands and terraces

These areas are made up of flood plains and several levels of limestone terraces that are nearly level to moderately sloping. The soils are used mainly for cultivated crops. Flooding and erosion are the main concerns in management. The soils on the bottom lands are subject to occasional flooding, but the hazard of flooding has been reduced by reservoirs. The soils on the terraces are moderately deep to limestone. They are droughty and are subject to erosion.

9. Genesee-Milton-Shoals

Nearly level to moderately sloping, well drained and somewhat poorly drained soils that formed in loamy alluvium or in loamy glacial drift and limestone residuum

The areas of this map unit are characterized by flat bottom lands and several levels of limestone terraces (fig. 10). Limestone outcrops are common on the upland limestone shelves. Surface drainage is well defined.

This map unit makes up about 4 percent of the county. About 35 percent is Genesee soils, 30 percent Milton soils, 13 percent Shoals soils, and 22 percent minor soils.

Genesee soils are nearly level and well drained. They are on bottom lands adjacent to the river. The surface layer is brown loam. The subsoil is dark brown loam.

Milton soils are nearly level to moderately sloping, and they are well drained. They are on limestone terraces. The surface layer is dark brown silt loam. The subsoil is dark yellowish brown, dark brown, and brown clay and clay loam. Limestone is at a depth of 38 inches.

Shoals soils are nearly level and somewhat poorly drained. They are on bottom lands in lower lying areas away from the river. The surface layer is dark grayish brown silt loam. The subsoil is dark grayish brown and grayish brown silt loam, loam, and sandy loam, and it is stratified in the lower part.

The minor soils are the somewhat poorly drained, clayey Randolph soils and the very poorly drained Millsdale soils on flats and in depressions on limestone terraces; the well drained Milton Variant soils, which have a high content of coarse fragments, on abrupt breaks; the well drained Fox and Ockley soils, which have a high content of gravel, on ridges on the limestone terraces; and the very poorly drained Sloan and Palms soils on low bottom lands and in sloughs.

The soils on the bottom lands and those on the uplands, for the most part, are used for cultivated crops. Flooding is a hazard on the bottom lands, but reservoirs have controlled most of the flooding. Erosion is a hazard on the upland slopes. Many of the soils on terraces are droughty because they are shallow to limestone. Stones and rock outcrops hinder farming operations on the terraces.

Some woodlots are in areas of this map unit. They generally are on steep breaks and between limestone outcrops. The well drained soils on bottom lands are well suited to use as woodland and produce excellent hardwoods if properly managed. The soils on the upland limestone shelves are suited to trees.

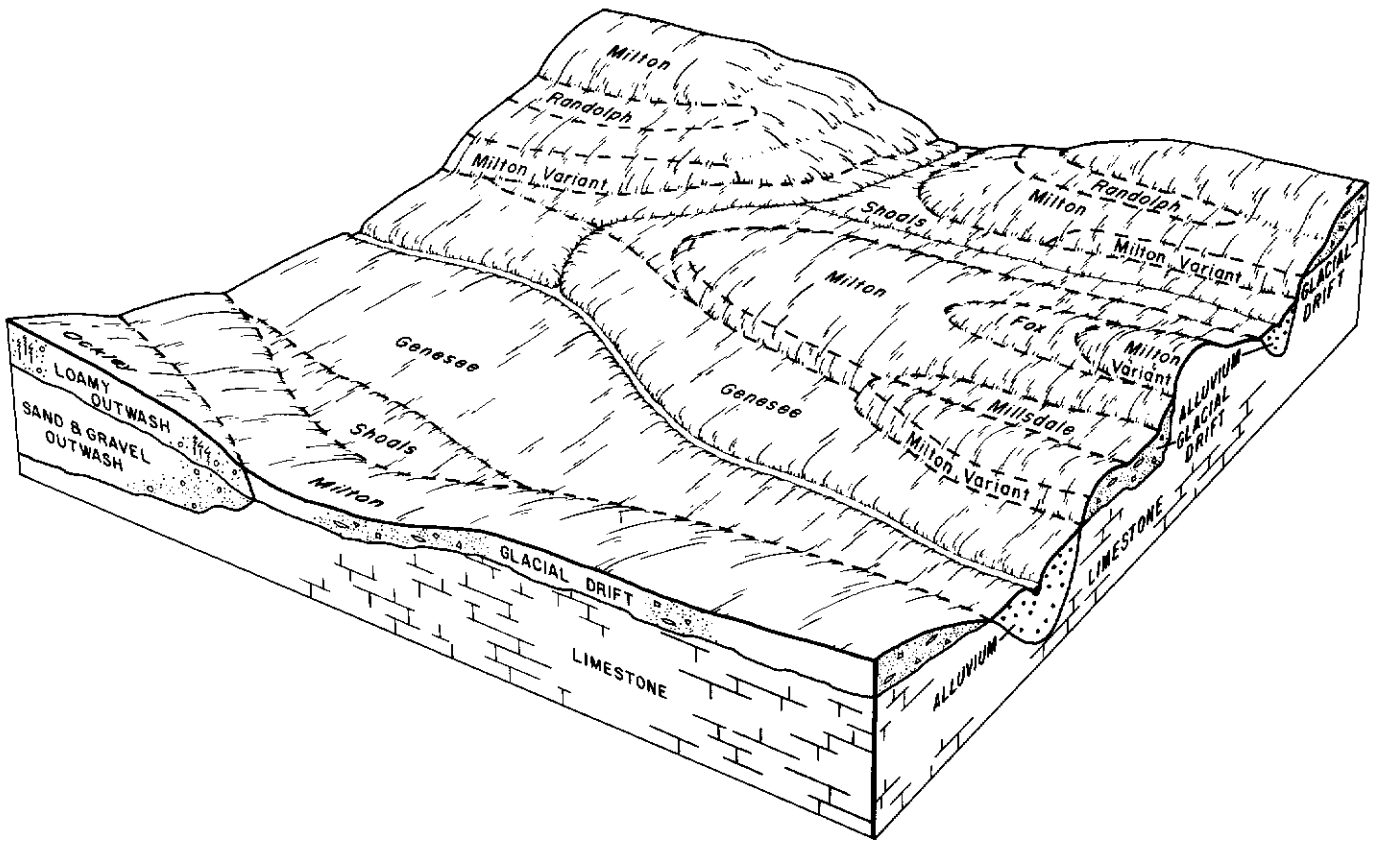

Figure 10.—Pattern of soils and underlying material in the Genesee-Milton-Shoals map unit.

The soils have poor potential for residential development. The bottom lands are subject to occasional flooding. Shallowness to limestone bedrock on the upland terraces limits the type of construction. The slow permeability and shallowness to bedrock severely limit the use of the soils as septic tank absorption fields.

The soils have poor potential for intensive recreation uses. Flood water can damage permanent structures on the bottom lands. Shallowness to bedrock limits construction on the limestone terraces.

broad land use considerations

Each year more land is used for urban development in Wabash County. About 10 percent of the county is in nonfarm uses (*5*). As demands for land for residential, commercial, industrial, agricultural, and recreation uses increase, it becomes more important that county and city officials plan for orderly growth. It is important that the soil and water resources of the county be considered in planning so that they provide the greatest benefit and enjoyment at the lowest cost in money and energy. The general soil map is useful in planning an outline of future changes in land use, but it should not be used to select sites for specific structures. In areas where the potential is good for cultivated crops, the potential for urban development may not be good. The data about specific soils in the survey can be helpful in planning land use patterns.

Areas where the soils are so unfavorable that the cost of urban development is prohibitive are extensive in the survey area. The soils in areas of the Fincastle-Cyclone, Crosby-Brookston-Crosier, Rensselaer-Whitaker, and Blount-Pewamo-Glynwood map units have a high water table during wet periods. These soils need extensive surface and subsurface drainage if they are to be used for urban uses. Soils that are ponded are not suited to sanitary facilities, and soils that have a high water table and have slow permeability are severely limited for this

use. With subsurface drainage, the soils in these map units can be cropped intensively. They have fair potential for intensive recreation uses, but wetness and slow permeability are limitations.

The soils in the Genesee-Milton-Shoals map unit have many limitations that are prohibitive for urban development. The Genesee and Shoals soils are on river bottom lands that are subject to flooding. The Milton soils have bedrock within 40 inches of the surface, which causes problems in constructing buildings and roads. Bedrock must be excavated for utility lines and other uses. The soils in this map unit are well suited to use as woodland and fairly suited to cultivated crops. Occasional flooding and erosion are the major hazards. The soils have poor potential for intensive recreation uses because of flooding and shallowness to bedrock.

Some soils have poor filtering qualities but are otherwise suited to urban development. The major soils in the Fox-Ockley-Kosciusko map unit, which formed in well drained loamy, sandy, and gravelly glacial outwash, have fair potential for urban development. They are well drained, have a deep water table, have good strength for foundations, and are permeable enough for use as septic tank absorption fields. Seepage can pollute shallow wells if absorption fields are placed in the loose sand and gravel. The soils are well suited to cultivated crops and to trees. They have good potential for intensive recreation uses.

The soils in the Glynwood-Morley, Miami-Riddles, and Miami-Crosby map units have fair potential for urban development. The major limitation is slope. Structures should be designed to fit the slope. Soils in the Glynwood-Morley and Miami-Crosby units have severe limitations for use as septic tank absorption fields because of slow permeability. The Crosby soils are limited by wetness and need subsurface drainage before they are used for urban development. The soils in all these map units have good potential for woodland and have fair potential for cultivated crops. Erosion is the major hazard. Slope and slow permeability are limitations for intensive recreation uses.

detailed soil map units

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

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

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

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

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, 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 silt loam, 2 to 6 percent slopes, eroded, 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 in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Sebewa-Milford complex is an example.

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

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

Table 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.

Some of the boundaries on the soil maps of Wabash County do not match those on the soil maps of adjacent counties, and some of the soil names and descriptions do not fully agree. The differences are a result of improvements in the classification of soils, particularly modification or refinements in soil series concepts. Also, there may be differences in the intensity of mapping or in the extent of the soils within the survey area.

soil descriptions

BaA—Blount silt loam, 0 to 2 percent slopes. This is a nearly level, deep, somewhat poorly drained soil on slight rises on upland till plains. The areas are irregular in shape and range from 3 to 25 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 11 inches thick. The subsoil is dark yellowish brown, mottled, firm clay loam and silty clay loam about 18 inches thick. The underlying material to a depth of 60 inches is yellowish brown, mottled clay loam. In places there is a mantle of loess or loamy outwash as much as 30 inches thick. In places the surface layer and subsoil are more than 45 inches thick. In places the slope is more than 2 percent. In some areas the soil is underlain by loam glacial till.

Included with this soil in mapping are small areas of well drained Morley soils and moderately well drained Glynwood soils on slight rises and very poorly drained Pewamo soils in depressions. The included soils make up 2 to 10 percent of the map unit.

The available water capacity of this soil is moderate. Permeability is slow. The seasonal high water table is at a depth of 1 foot to 3 feet. Surface runoff is slow. The

surface layer has a moderate content of organic matter, and it is friable. Tilth is good.

This soil is mainly used for cultivated crops. In some areas it is used for hay or as pasture. A few areas have been left wooded, but many of these are being cleared for cultivation.

This soil is well suited to corn, soybeans, and small grains if it is adequately drained. Subsurface drains are effective in removing excess water. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help reduce crusting, improve soil tilth, and increase the infiltration of water.

This soil is well suited to grasses and legumes for hay or pasture if it is adequately drained. Deep-rooted legumes such as alfalfa grow poorly in undrained areas because they cannot tolerate a high water table. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is suited to trees. Seedling mortality and a windthrow hazard are the main concerns in management. It may be necessary to replant some seedlings. Care in thinning or no thinning at all can help prevent windthrow.

This soil is severely limited for use as building sites because of wetness. Dwellings should be constructed without a basement. Subsurface drains can help lower the water table. This soil is severely limited for local roads and streets because of low strength and frost action. Providing drainage along roads reduces the possibility of frost action. The base material needs to be replaced or strengthened with more suitable material to support vehicular traffic. This soil is severely limited for use as septic tank absorption fields because of wetness and the slow permeability. Filling or mounding the septic tank absorption field with suitable fill material and elevating the absorption field help offset the slow permeability. Drainage around the outer edge of the absorption field helps remove excess water.

This soil is in capability subclass IIw and in woodland suitability subclass 3c.

BaB2—Blount silt loam, 1 to 4 percent slopes, eroded. This is a gently sloping, deep, somewhat poorly drained soil on upland till plains and moraines. The areas are irregular in shape and range from 3 to 100 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 9 inches thick. The subsoil is dark brown and dark yellowish brown, mottled, firm clay loam about 14 inches thick. The underlying material to a depth of 60 inches is yellowish brown, mottled clay loam. In places, the thickness of the surface layer and subsoil is less than 22 inches. In some areas there is a loamy mantle that is as much as 30 inches thick. In places the slope is more than 4 percent. Some areas are underlain by loam glacial till.

Included with this soil in mapping are small areas where the soil is severely eroded and the surface layer is clay loam. Also included are small areas of well drained Morley soils and moderately well drained Glynwood and Rawson soils on the crest of hills and steeper side slopes and small areas of very poorly drained Pewamo soils in depressions. The included soils make up 4 to 12 percent of the map unit.

The available water capacity of this soil is moderate. Permeability is slow. The seasonal high water table is at a depth of 1 foot to 3 feet. Surface runoff is medium. The surface layer has a moderate content of organic matter and is friable. Tilth is fair.

This soil is used mainly for cultivated crops. In some areas it is used for hay or pasture. A few areas have been left in woods, but many of these are being cleared for cultivation.

This soil is well suited to corn, soybeans, and small grains if it is properly managed. The soil has a few cobbles and stones on or near the surface that can hinder farming operations. Subsurface drains can be used to remove excess water. Crop rotation, diversions, terraces, contour farming, grassed waterways, grade stabilization structures, and other conservation practices help to reduce erosion and control runoff if cultivated crops are grown (fig. 11). Tillage methods that leave a protective amount of crop residue on the surface and cover crops help control erosion, reduce crusting, improve soil tilth, and increase the infiltration of water.

This soil is well suited to grasses and legumes for hay or pasture if it is adequately drained. Deep-rooted legumes, such as alfalfa, do poorly in undrained areas because they cannot tolerate a high water table. Overgrazing or grazing when the soil is wet causes surface compaction, excessive runoff, and poor tilth. Pasture rotation and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is suited to trees. Seedling mortality and a windthrow hazard are the main concerns in management. It may be necessary to replant some seedlings. Care in thinning or no thinning at all can help prevent windthrow.

This soil is severely limited for use as building sites because of wetness. Dwellings should be constructed without a basement. Subsurface drains can help lower the water table. Existing vegetation should be disturbed as little as possible during construction, and disturbed areas should be revegetated as soon as possible to check erosion. This soil is severely limited for local roads and streets because of low strength and frost action. The road base material needs to be strengthened or replaced with more suitable material to support vehicular traffic. Providing drainage along roads helps prevent frost action. This soil is severely limited for septic tank absorption fields because of wetness and the slow

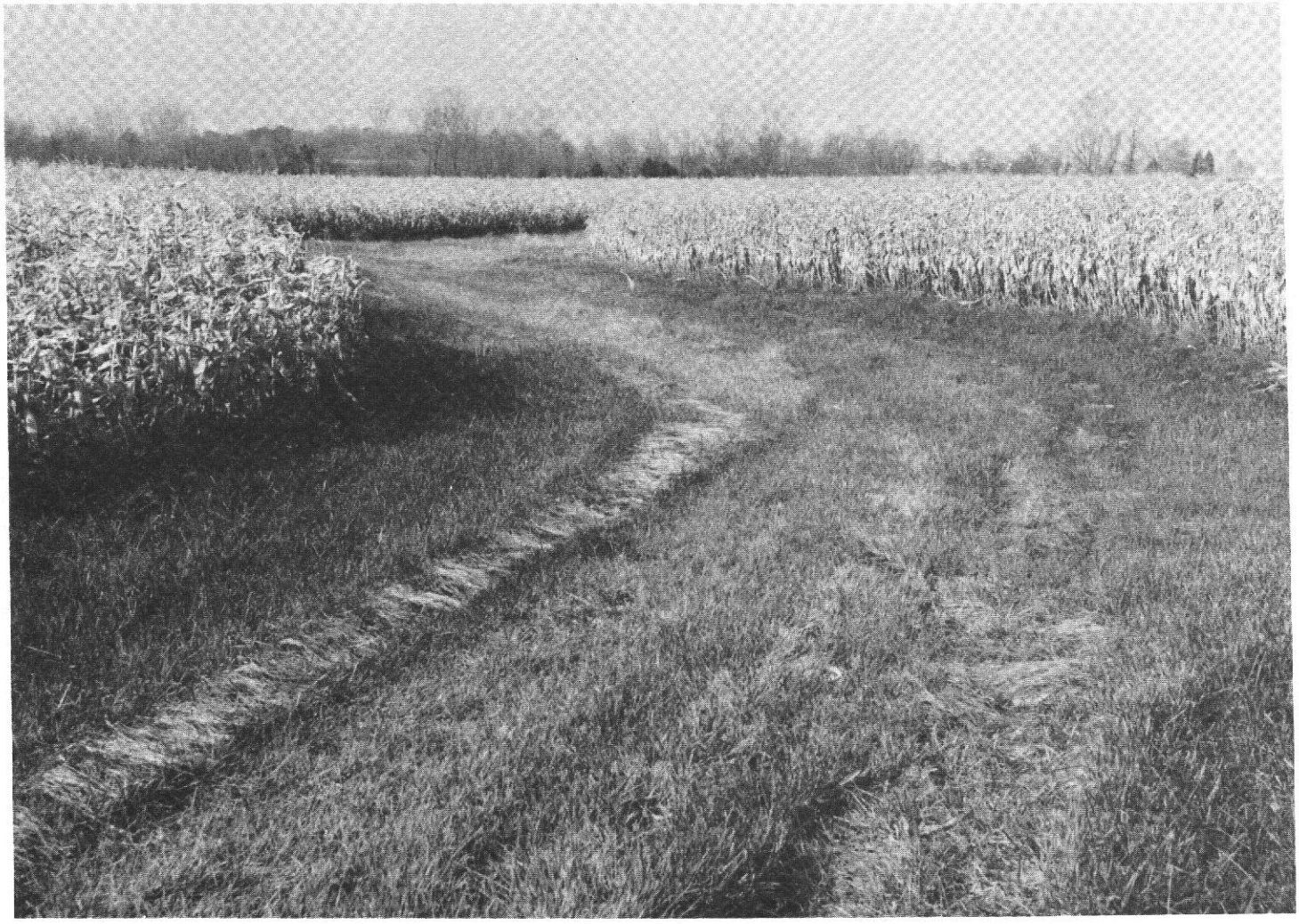

Figure 11.—A grassed waterway on Blount silt loam, 1 to 4 percent slopes, eroded.

permeability. Filling or mounding the septic tank absorption field with suitable fill material and elevating the absorption field help offset the slow permeability. Drainage around the outer edge of the absorption field helps remove excess water.

This soil is in capability subclass IIe and in woodland suitability subclass 3c.

Br—Brookston loam. This is a nearly level, deep, very poorly drained soil in depressions on upland till plains and in narrow drainageways on moraines. In places the soil is frequently ponded by surface runoff from adjacent higher areas. The areas of this map unit are irregular in shape and range from 5 to 80 acres in size.

Typically, the surface layer is very dark grayish brown loam about 10 inches thick. The subsurface layer is very dark grayish brown, mottled loam about 6 inches thick. The subsoil is gray, grayish brown, and brown, mottled, firm clay loam about 33 inches thick. The underlying material to a depth of 60 inches is brown, mottled loam. In a few places the dark surface soil is less than 10 inches thick. In places the underlying material is stratified and is sandy.

Included with this soil in mapping are soils in small undrained areas in woodlots or deep depressions in fields. These areas are wet most of the year. Also included in mapping are somewhat poorly drained Crosby and Crosier soils on slight rises and very poorly drained Milford, Pella, and Washtenaw soils in the deeper depressions. Milford soils are more clayey and Pella soils are siltier than the Brookston soil, and

Washtenaw soils do not have a thick, dark surface layer. The included soils make up 5 to 15 percent of the map unit.

The available water capacity of this soil is high. Permeability is moderate. The water table is at or above the surface in winter and early in spring. Surface runoff is very slow or ponded. The surface layer has a high content of organic matter and is friable. Tilth is good.

In most places, this soil has been drained and is used for cultivated crops. In some areas it is used for hay or pasture. A few areas have been left wooded, but many of these areas are being cleared and drained for cultivation.

This soil is well suited to corn, soybeans, and small grains if it is adequately drained. Wetness is the major limitation, and ponding is the major hazard. It is difficult to grow crops in undrained areas of this soil (fig. 12). Where there are adequate outlets, shallow surface drains and subsurface drains can be used to remove excess water. In some areas the surface layer has more clay and is difficult to work into a suitable seedbed. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help reduce crusting, improve soil tilth, and increase water infiltration.

This soil is well suited to grasses and legumes for hay and pasture if it is adequately drained. Deep-rooted legumes such as alfalfa grow poorly in inadequately drained areas because they cannot tolerate ponding or a high water table. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Pasture rotation and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is suited to trees. Seedling mortality, a windthrow hazard, equipment limitations, and plant competition are concerns in management. Water-tolerant species should be favored. Replanting of seedlings is often necessary to establish a good stand. Care in thinning or no thinning at all helps prevent windthrow. In harvesting, trees should not be left standing alone or widely spaced. In general, heavy equipment can be used on this soil only in dry periods or when the ground is frozen. Competing vegetation can be controlled by cutting, girdling, or spraying.

This soil generally is not suited to building sites and sanitary facilities because of ponding. It is severely

Figure 12.—Ponding on Brookston loam in a depression.

limited for roads because of ponding, low strength, and frost action. Constructing roads on raised and well compacted fill material and providing side ditches and culverts for drainage help to prevent road damage caused by frost action. If this soil is to support vehicular traffic, the road base material needs to be replaced or strengthened with more suitable material.

This soil is in capability subclass IIw and in woodland suitability subclass 2w.

ChC—Chelsea fine sand, 4 to 15 percent slopes. This is a moderately sloping, deep, excessively drained soil on side slopes and ridges on uplands and river terraces. The areas are oval or long and narrow and range from 2 to 15 acres in size.

Typically, the surface layer is dark brown fine sand about 7 inches thick. The subsurface layers collectively are 33 inches thick. They are yellowish brown, light yellowish brown, and very pale brown fine sand and loamy fine sand. The next layer is about 31 inches thick. It is very pale brown, loose fine sand that has thin bands of dark brown, very friable fine sandy loam. The underlying material to a depth of about 80 inches is very pale brown fine sand. In some places the surface layer is fine sandy loam. In places the subsoil is a single band 4 to 8 inches thick. In a few places there are no bands of subsoil material above a depth of 60 inches.

Included with this soil in mapping are small spots where the soils are severely eroded and a few areas of soils on short steep slopes. Also included are small areas of Metea soils, which are underlain by till, on knobs and ridges and small areas of well drained Fox, Kosciusko, Martinsville, and Miami soils on foot slopes of knolls and ridges. The included soils make up 10 to 30 percent of the map unit.

The available water capacity of this soil is low. Permeability is rapid. Surface runoff is medium. The surface layer has a low content of organic matter and is very friable. Tilth is good.

This soil is used mainly for hay or pasture. In a few areas it is used for cultivated crops. Some areas have been left wooded or are being left to reforest.

This soil is poorly suited to cultivated crops. Drought is a severe hazard in extended dry periods because the available water capacity is low. Because this soil is sandy, it is susceptible to soil blowing if it is cultivated. Crop rotation, cover crops, and conservation tillage that leaves a protective amount of crop residue on the surface can help control wind erosion and also increase the content of organic matter and the available water capacity.

This soil is suited to grasses and legumes for hay or pasture. The low available water capacity is a limitation. Grasses and legumes that withstand droughty conditions should be selected for planting. Pasture rotation and timely deferment of grazing help to keep the pasture in good condition.

This soil is suited to trees. Seedling mortality is the main concern in management. Replanting may be necessary to establish a good stand. Species that tolerate droughty conditions should be favored. Seedlings survive and grow better if competing vegetation is controlled.

This soil is moderately limited for use as building sites and for local roads and streets because of slope. Buildings can be designed to conform to the slope. Roads should be built on the contour where possible; cutting and filling may also be needed. Existing vegetation should be disturbed as little as possible during construction, and disturbed areas should be revegetated as soon as possible to reduce erosion. This soil readily absorbs the effluent from a septic tank absorption field, but it does not adequately filter the effluent. Consequently, the ground water can become contaminated.

This soil is in capability subclass IVs and in woodland suitability subclass 3s.

CrA—Crosby silt loam, 0 to 3 percent slopes. This is a nearly level, deep, somewhat poorly drained soil on slight rises on upland till plains. The areas are irregular in shape and range from 3 to 25 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 10 inches thick. The subsurface layer is light brownish gray silt loam about 3 inches thick. The subsoil is brown, mottled, firm clay loam about 12 inches thick. The underlying material to a depth of 60 inches is yellowish brown, mottled loam. In places there is a mantle of loess or loamy material that is as much as 20 inches thick. In places the slope is more than 3 percent. In places the underlying material is clay loam glacial till.

Included with this soil in mapping are small areas of severely eroded soils on knolls and breaks; in these areas the surface layer is clay loam. Also included are small areas of well drained Miami soils on rises and very poorly drained Brookston soils in depressions and drainageways. The included soils make up 5 to 15 percent of the map unit.

The available water capacity of this soil is high. Permeability is slow. The seasonal high water table is at a depth of 1 foot to 3 feet. Surface runoff is slow. The surface layer has a moderate content of organic matter, and it is friable. Tilth is good.

This soil is used mainly for cultivated crops. In some areas it is used for hay or pasture. A few areas have been left wooded, but many of these are being cleared for cultivation.

This soil is well suited to corn, soybeans, and small grains. It has a few cobbles and stones on or near the surface that can hinder farming operations. Subsurface drains can be used to remove excess water. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help reduce

crusting, improve soil tilth, and increase the infiltration of water.

This soil is well suited to grasses and legumes for hay or pasture if it is adequately drained. Deep-rooted legumes such as alfalfa grow poorly in undrained areas because they cannot tolerate a high water table. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Pasture rotation and timely deferment of grazing help keep the pasture and soil in good condition.

The soil is suited to trees. Plant competition is the main concern in management. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying.

This soil is severely limited for use as building sites because of wetness. Dwellings should be constructed without a basement. Subsurface drains can help lower the water table. This soil is severely limited for local roads and streets because of low strength and frost action. If this soil is to support vehicular traffic, the material for the road base needs to be replaced or strengthened with a more suitable material. Providing drainage along roads reduces the possibility of frost action. This soil is severely limited for septic tank absorption fields because of wetness and the slow permeability. Drainage around the outer edge of the absorption field helps remove excess water. Filling or mounding the septic tank absorption field with suitable fill material and elevating the absorption field help offset the slow permeability.

This soil is in capability subclass IIw and in woodland suitability subclass 3o.

CsA—Crosier loam, 0 to 3 percent slopes. This is a nearly level, deep, somewhat poorly drained soil on slight rises on upland till plains. The areas are irregular in shape and range from 3 to 25 acres in size.

Typically, the surface layer is dark grayish brown loam about 11 inches thick. The subsoil is yellowish brown and dark yellowish brown, mottled, firm loam and clay loam about 21 inches thick. The underlying material to a depth of 60 inches is yellowish brown, mottled loam. In some areas, this soil formed in loamy outwash over loam glacial till. In places, the subsoil has more clay, and in places it is underlain by stratified sand and silt. In places, the slope is more than 3 percent.

Included with this soil in mapping are small knolls and breaks where the soil is severely eroded and the surface layer is clay loam. Also included are small areas of well drained Miami and Riddles soils on rises and very poorly drained Brookston soils in depressions and drainageways. The included areas make up 8 to 20 percent of the map unit.

The available water capacity of this soil is high. Permeability is moderately slow. The seasonal high water table is at a depth of 1 foot to 3 feet. Surface runoff is slow. The surface layer has a moderate content of organic matter, and it is friable. Tilth is good.

This soil is used mainly for cultivated crops. In some areas it is used for hay and pasture. A few areas have been left wooded, but many of these are being cleared for cultivation.

This soil is well suited to corn, soybeans, and small grains. It has a few cobbles and stones on or near the surface that can hinder farming operations. Subsurface drains can be used to remove excess water. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help control erosion, reduce crusting, improve soil tilth, and increase the infiltration of water.

This soil is well suited to grasses and legumes for hay or pasture if it is adequately drained. Deep-rooted legumes such as alfalfa grow poorly in undrained areas because they cannot tolerate a high water table. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is suited to trees. Plant competition is the main concern in management. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled by cutting, girdling, or spraying.

This soil is severely limited for use as building sites because of wetness. Dwellings should be constructed without a basement. Subsurface drains can help lower the water table. This soil is severely limited for local roads and streets because of frost action and low strength. Providing drainage along roads reduces the possibility of frost action. The road base material needs to be replaced or strengthened with more suitable material to support vehicular traffic. This soil is severely limited for septic tank absorption fields because of wetness and the slow permeability. Filling or mounding the septic tank absorption field with suitable fill material and elevating the absorption field help offset the slow permeability. Drainage around the outer edge of the absorption field helps remove excess water.

This soil is in capability subclass IIw and in woodland suitability subclass 3o.

Cy—Cyclone silt loam. This is a nearly level, deep, very poorly drained soil in depressions on upland till plains. It is often ponded by runoff from adjacent higher areas. The areas of this map unit are irregular in shape and range from 5 to 80 acres in size.

Typically, the surface layer is very dark gray silt loam about 10 inches thick. The subsoil is about 48 inches thick. The upper part is very dark gray silty clay loam 4 inches thick. The middle part is dark gray and gray, mottled, firm silty clay loam, and the lower part is gray and yellowish brown, mottled, firm clay loam. The

underlying material is brown, mottled loam. In some areas the dark surface layer is less than 10 inches thick. In places the loess mantle is less than 40 inches thick. In many places this soil has a layer of sandy loam or sandy clay loam as much as 12 inches thick between the loess mantle and the glacial till. In a few places there is more sand in the upper part of the subsoil.

Included with this soil in mapping are soils in small undrained areas in woodlots or deep depressions in fields. These soils are wet most of the year. Also included are small areas of somewhat poorly drained Fincastle soils on rises. The included soils make up 2 to 10 percent of the map unit.

The available water capacity of this soil is high. Permeability is moderately slow. The water table is at or above the surface in winter and early in spring. Surface runoff is very slow or is ponded. The surface layer has a high content of organic matter, and it is friable. Tilth is good.

In most areas, this soil has been drained and is used for cultivated crops. In some areas it is used for hay or pasture. A few areas have been left wooded, but most of these are being cleared for cultivation.

The soil is well suited to corn, soybeans, and small grains if it is adequately drained. Wetness is a major limitation, and ponding is a major hazard. Most crops grow poorly in undrained areas. Where there are adequate outlets, shallow surface drains and subsurface drains can be used to remove excess water. In some areas, the surface layer has more clay and is difficult to work into a suitable seedbed. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help control erosion, reduce crusting, improve soil tilth, and increase water infiltration.

This soil is well suited to grasses and legumes for hay and pasture if it is adequately drained. Deep-rooted legumes such as alfalfa grow poorly in inadequately drained areas because they cannot tolerate a high water table or ponding. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is suited to trees. Equipment limitations, seedling mortality, a windthrow hazard, and plant competition are concerns in management. Tree species that tolerate wetness should be favored. Replanting is often necessary to establish a good stand. Care in thinning or no thinning at all can help prevent windthrow. In harvesting, trees should not be left standing alone or widely spaced. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying. Trees generally are harvested in dry weather or when the ground is frozen.

This soil generally is not suited to use as building sites and for sanitary facilities because of ponding. It is severely limited for roads because of low strength, ponding, and frost action. The road base material needs to be replaced or strengthened with more suitable material if the soil is to support vehicular traffic. Constructing roads on raised and well compacted fill material and providing side ditches and culverts for drainage help to prevent the damage caused by ponding and frost action.

This soil is in capability subclass IIw and in woodland suitability subclass 2w.

FnA—Fincastle silt loam, 0 to 2 percent slopes. This is a nearly level, deep, somewhat poorly drained soil on slight rises on upland till plains. The areas are irregular in shape and range from 3 to 80 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 10 inches thick. The subsoil is about 32 inches thick. The upper part is grayish brown, dark grayish brown, and yellowish brown, mottled, firm and very firm silt loam and silty clay loam. The lower part is yellowish brown, mottled, firm clay loam and loam. The underlying material to a depth of 60 inches is yellowish brown, mottled loam. In places, the loess is less than 20 inches thick, and the surface layer and subsoil are less than 40 inches thick. In other places, the surface layer and subsoil are more than 60 inches thick. In places, there is a layer of loamy outwash, as much as 10 inches thick, between the loess mantle and the glacial till.

Included with this soil in mapping are small areas of severely eroded soils on knolls and breaks; these soils have a surface layer of clay loam. Also included are small areas of soils that have slopes of more than 2 percent, very poorly drained Cyclone soils in depressions, and well drained Miami and Riddles soils on rises. The included soils make up 4 to 12 percent of the map unit.

The available water capacity of this soil is high. Permeability is moderately slow. The seasonal high water table is at a depth of 1 foot to 3 feet. Surface runoff is slow. The surface layer has a moderate content of organic matter and is friable. Tilth is good.

This soil is used mainly for cultivated crops. In some areas it is used for hay or pasture. A few areas have been left wooded, but some of these are being cleared for cultivation.

This soil is well suited to corn, soybeans, and small grains if it is adequately drained. Subsurface drains can be used to remove excess water. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help control erosion, reduce crusting, improve soil tilth, and increase water infiltration.

This soil is well suited to grasses and legumes for hay or pasture if it is adequately drained. Deep-rooted legumes such as alfalfa grow poorly in undrained areas because they cannot tolerate a high water table. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Pasture rotation and

timely deferment of grazing help keep the pasture and soil in good condition.

This soil is suited to trees. Plant competition is the main concern in management. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying.

This soil is severely limited for use as building sites because of wetness. Dwellings should be constructed without a basement. Subsurface drains can help lower the water table. This soil is severely limited for local roads and streets because of low strength and frost action. The road base material needs to be replaced or strengthened with more suitable material to support vehicular traffic. Providing drainage along roads reduces the possibility of frost action. This soil is severely limited for septic tank absorption fields because of wetness and the slow permeability. Filling or mounding the septic tank absorption field with suitable fill material and elevating the absorption field help offset the slow permeability. Drainage around the outer edge of the absorption field helps remove excess water.

This soil is in capability subclass IIw and in woodland suitability subclass 3o.

FsA—Fox loam, 0 to 2 percent slopes. This is a nearly level, well drained soil on river terraces and outwash plains. It is moderately deep over sand and gravelly sand. The areas are elongated and range from 3 to 50 acres in size.

Typically, the surface layer is dark brown loam about 9 inches thick. The subsurface layer is dark yellowish brown loam about 3 inches thick. The subsoil is dark yellowish brown, firm gravelly clay loam and gravelly sandy clay loam about 15 inches thick. The underlying material to a depth of 60 inches is yellowish brown, stratified sand and gravelly sand. In places, the subsoil extends to a depth of more than 40 inches. In some places the surface layer is darker, and in some places it is sandy loam. In places the slope is more than 2 percent.

Included with this soil in mapping are small areas of soils that have a stony or gravelly surface layer and small areas of soils on short steep slopes along the edge of some mapped areas. Also included are small areas of somewhat poorly drained Homer soils in lower positions than those of the Fox soil and very poorly drained Sebewa and Westland soils in depressions. The included soils make up 2 to 10 percent of the map unit.

The available water capacity of this soil is moderate. Permeability is moderate in the surface soil and subsoil and rapid in the underlying material. Surface runoff is slow. The surface layer has a moderate content of organic matter and is friable. Tilth is good.

This soil is used mainly for cultivated crops. In a few areas it is used for hay, pasture, and trees. It is a probable source of sand and gravel.

This soil is well suited to corn, soybeans, and small grains. Droughtiness in extended dry periods is the major hazard. This soil has a few stones and cobbles on or near the surface that can hinder farming operations. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help reduce evaporation and crusting, improve soil tilth, and increase water infiltration.

This soil is well suited to grasses and legumes for hay or pasture. Pasture rotation, timely deferment of grazing, and restricted use during dry periods help to keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main concern in management. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying.

This soil is moderately limited for dwellings without basements because of a moderate shrink-swell potential. It is well suited to dwellings with basements. Foundations and footings should be designed and constructed to help prevent structural damage caused by the shrinking and swelling of the soil. This soil is moderately limited for local roads and streets because of the shrink-swell potential and frost action. The layers that have a moderate shrink-swell potential need to be replaced with suitable soil material. Providing side ditches and culverts for drainage helps prevent damage caused by frost action. This soil readily absorbs the effluent from a septic tank absorption field, but it does not adequately filter the effluent. Consequently, the ground water can become contaminated.

This soil is in capability subclass IIs and in woodland suitability subclass 2o.

FsB2—Fox loam, 2 to 6 percent slopes, eroded. This is a gently sloping, well drained soil on river terraces and outwash plains. It is moderately deep over sand and gravelly sand. The areas are oblong or irregular in shape and range from 2 to 30 acres in size.

Typically, the surface layer is dark brown loam about 8 inches thick. The subsoil is dark brown and dark reddish brown, firm gravelly clay loam and gravelly sandy clay loam about 22 inches thick. The underlying material to a depth of 60 inches is yellowish brown stratified sand and gravelly sand. In places the surface layer and subsoil are more than 40 inches thick. In places the surface layer is darker. In some areas the surface layer is sandy loam. In places the slope is less than 2 percent, and in others it is more than 6 percent.

Included with this soil in mapping are small areas of soils that have a stony or gravelly surface layer and soils on short steep slopes along the edge of some mapped areas. Also included are small areas of severely eroded soils that have a surface layer of dark reddish brown clay loam or gravelly clay loam. These soils are on the more sloping part of the mapped areas. Also included

are small areas of somewhat poorly drained Homer soils at a slightly lower elevation than the Fox soil and small areas of very poorly drained Sebewa and Westland soils in depressions. The included soils make up 5 to 20 percent of the map unit.

The available water capacity of this soil is moderate. Permeability is moderate in the surface layer and subsoil and rapid in the underlying material. Surface runoff is medium. The surface layer has a moderate content of organic matter, and it is friable. Tilth is fair.

This soil is used mainly for cultivated crops. In a few areas it is used for hay, pasture, and woodland. It is a probable source of sand and gravel.

This soil is well suited to corn, soybeans, and small grains. Droughtiness is a hazard in extended dry periods. This soil has stones and cobbles on or near the surface that can hinder farming operations. Crop rotation, terraces, diversions, contour farming, grassed waterways, grade stabilization structures, and other conservation practices help to reduce erosion and control runoff if cultivated crops are grown. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help control erosion, reduce evaporation, improve soil tilth, and increase water infiltration.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing causes surface compaction, excessive runoff, and poor tilth. Pasture rotation, timely deferment of grazing, and restricted use during dry periods help to keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main concern in management. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying.

This soil is moderately limited for dwellings without basements because of a moderate shrink-swell potential. It is well suited to dwellings with basements. Foundations and footings should be designed and constructed to help prevent structural damage caused by the shrinking and swelling of the soil. Existing vegetation should be disturbed as little as possible during construction, and disturbed areas should be revegetated as soon as possible to reduce erosion. This soil is moderately limited for local roads and streets because of the shrink-swell potential and frost action. The layers that have a moderate shrink-swell potential may need to be replaced with suitable soil material. Providing side ditches and culverts for drainage helps prevent damage caused by frost action. This soil readily absorbs effluent from a septic tank absorption field, but it does not adequately filter the effluent. Consequently, ground water may become contaminated.

This soil is in capability subclass IIe and in woodland suitability subclass 2o.

FsC2—Fox loam, 6 to 12 percent slopes, eroded. This is a moderately sloping, well drained soil on breaks of river terraces and outwash plains. It is moderately deep over sand and gravelly sand. The areas are long and narrow or irregular in shape and range from 2 to 10 acres in size.

Typically, the surface layer is dark brown loam about 8 inches thick. The subsoil is dark brown and dark reddish brown, firm gravelly clay loam and gravelly sandy clay loam about 20 inches thick. The underlying material to a depth of 60 inches is yellowish brown stratified sand and gravelly sand. In places the surface layer is darker. In some areas the surface layer is sandy loam. In places the slope is less than 6 percent or more than 12 percent.

Included with this soil in mapping are small areas of soils that have a stony or gravelly surface layer. Along the edge of some mapped areas the soils have slopes of more than 18 percent. Also included are small areas of severely eroded soils that have a surface layer of dark reddish brown clay loam or gravelly clay loam. Also included are small areas of very poorly drained Sebewa and Westland soils in depressions. The included soils make up 2 to 8 percent of the map unit.

The available water capacity of this soil is moderate. Permeability is moderate in the surface layer and subsoil and rapid in the underlying material. Surface runoff is medium to rapid. The surface layer has a moderate content of organic matter, and it is friable. Tilth is fair.

This soil is used mainly for cultivated crops. In a few areas it is used for hay, pasture, and woodland. It is a probable source of sand and gravel.

This soil is suited to corn, soybeans, and small grains. Droughtiness is a limitation in extended dry periods. This soil has a few stones on or near the surface that can hinder farming operations. Crop rotation, terraces, diversions, contour farming, grassed waterways, grade stabilization structures, and other conservation practices help to reduce erosion and runoff if cultivated crops are grown. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help control erosion, reduce evaporation, improve soil tilth, and increase the infiltration of water.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing causes surface compaction, excessive runoff, and poor tilth. Pasture rotation, timely deferment of grazing, and restricted use during dry periods help to keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main concern in management. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying.

This soil is moderately limited for use as building sites because of slope and the moderate shrink-swell potential. Buildings can be designed to conform to the

slope. Foundations and footings should be designed and constructed to help prevent structural damage caused by the shrinking and swelling of the soil. Existing vegetation should be disturbed as little as possible during construction, and disturbed areas should be revegetated as soon as possible to reduce erosion. This soil is moderately limited for local roads and streets because of the shrink-swell potential, frost action, and slope. The layers of the soil that have a moderate shrink-swell potential need to be replaced with suitable soil material. Providing side ditches and culverts for drainage helps prevent damage caused by frost action. Local roads and streets should be constructed on the contour where possible. Land shaping can modify the slope. This soil readily absorbs the effluent from a septic tank absorption field, but it does not adequately filter the effluent. Consequently, the ground water can become contaminated. Absorption fields should be installed on the contour to distribute the effluent evenly.

This soil is in capability subclass IIIe and in woodland suitability subclass 2o.

FsD2—Fox loam, 12 to 20 percent slopes, eroded. This is a strongly sloping, well drained soil on breaks of river terraces. It is moderately deep over sand and gravelly sand. The areas are long and narrow or irregular in shape and range from 2 to 10 acres in size.

Typically, the surface layer is dark brown loam about 6 inches thick. The subsoil is dark yellowish brown, firm gravelly clay loam and gravelly sandy clay loam about 19 inches thick. The underlying material to a depth of 60 inches is pale brown stratified sand and gravelly sand. In places the slope is less than 12 percent or more than 20 percent.

Included with this soil in mapping are small areas of soils that have a stony or gravelly surface layer and some small areas of severely eroded soils that have a surface layer of dark reddish brown clay loam or gravelly clay loam. Also included are small areas of very poorly drained Sebewa and Westland soils in some drainageways and excessively drained Rodman soils on steep breaks. The included soils make up 2 to 6 percent of the map unit.

The available water capacity of this soil is moderate. Permeability is moderate in the surface layer and subsoil and rapid in the underlying material. Surface runoff is rapid. The surface layer has a moderate content of organic matter, and it is friable. Tilth is fair.

This soil is used mainly for hay, pasture, and woodland. In some areas it is used for cultivated crops. It is a probable source of sand and gravel.

This soil is poorly suited to corn, soybeans, and small grains. Droughtiness is a limitation in extended dry periods. This soil has a few stones on or near the surface that can hinder farming operations. Crop rotation, diversions, contour farming, grassed waterways, grade stabilization structures, or other conservation practices help to reduce erosion and control runoff. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help control erosion, reduce evaporation, improve soil tilth, and increase the infiltration of water.

This soil is suited to grasses and legumes for hay or pasture. Overgrazing causes surface compaction, excessive runoff, and poor tilth. Pasture rotation, timely deferment of grazing, and restricted use during dry periods help to keep the pasture and soil in good condition.

This soil is suited to trees. Plant competition, the hazard of erosion, and equipment limitations are concerns in management. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying. The hazard of erosion and the steepness of slopes limit the use of heavy equipment on this soil.

This soil is severely limited for use as building sites because of slope. Buildings should be designed to accommodate the slope. Land shaping and installing retaining walls help to overcome this limitation. Existing vegetation should be disturbed as little as possible during construction, and disturbed areas should be revegetated as soon as possible to reduce erosion. This soil is severely limited for local roads and streets because of slope. Cutting and filling may be needed, and roads should be built on the contour where possible. This soil is severely limited for septic tank absorption fields because of slope and poor filtering qualities. Absorption fields should be installed on the contour to help offset the slope. The soil readily absorbs the effluent from a septic tank absorption field, but it does not adequately filter the effluent. Consequently, the ground water can become contaminated.

This soil is in capability subclass IVe and in woodland suitability subclass 2r.

FtC3—Fox clay loam, 6 to 12 percent slopes, severely eroded. This is a moderately sloping, well drained soil on breaks on river terraces and outwash plains. It is moderately deep over sand and gravelly sand. The areas are long and narrow and range from 2 to 8 acres in size.

Typically, the surface layer is dark brown clay loam about 8 inches thick. The subsoil is brown and dark yellowish brown, firm gravelly sandy clay loam about 20 inches thick. The underlying material to a depth of 60 inches is yellowish brown stratified sand and gravelly sand. In some places the surface layer is gravelly clay loam or gravelly sandy clay loam, and in some of these places the surface layer and subsoil are less than 20 inches thick. In places there is less erosion, and in some places there are deposits of lighter colored, recent soil material on the surface. In some places erosion is very severe, and the underlying sand and gravel are exposed

at plow depth. In some places the slope is less than 6 percent, and in others it is more than 12 percent.

Included with this soil in mapping are small areas of soils on short steep slopes. Also included are small areas of excessively well drained Rodman soils on the steep slopes. The included soils make up about 5 to 15 percent of the map unit.

The available water capacity of this soil is moderate. Permeability is moderate in the surface layer and subsoil and rapid in the underlying material. Surface runoff is rapid. The surface layer has a low content of organic matter and is firm. Tilth is poor.

This soil is used mainly for cultivated crops. In a few areas it is used for hay and pasture. Some areas are being left to revert to woodland. This soil is a probable source of sand and gravel.

This soil is poorly suited to corn, soybeans, and small grains. Droughtiness is a limitation in extended dry periods. The clay loam surface layer is difficult to plow and work into a suitable seedbed. This soil has a few stones on or near the surface that can hinder farming operations. Crop rotation, diversions, contour farming, grassed waterways, grade stabilization structures, and similar conservation practices help to reduce erosion and control runoff. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help control erosion, reduce evaporation, improve soil tilth, and increase the infiltration of water.

This soil is suited to grasses and legumes for hay or pasture. Overgrazing causes surface compaction, excessive runoff, and poor tilth. Pasture rotation, timely deferment of grazing, and restricted use during dry periods help to keep the pasture and soil in good condition.

This soil is suited to trees. Plant competition is the main concern in management. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying.

This soil is moderately limited for use as building sites because of the slope and shrink-swell potential. Buildings should be designed to complement the slope. Foundations and footings should be designed and constructed to help prevent structural damage caused by the shrinking and swelling of the soil. Existing vegetation should be disturbed as little as possible during construction, and disturbed areas should be revegetated as soon as possible to reduce erosion. This soil is moderately limited for local roads and streets because of the shrink-swell potential, frost action, and slope. The layers that have a moderate shrink-swell potential can be replaced with suitable soil material. Providing side ditches and culverts for drainage helps prevent damage by frost action. Local roads and streets should be built on the contour where possible. Land shaping can modify the slope. This soil readily absorbs effluent from a septic tank absorption field, but it does not adequately filter the effluent. Consequently, ground water may become contaminated. Absorption fields should be installed on the contour to distribute the effluent more evenly.

This soil is in capability subclass IVe and in woodland suitability subclass 2o.

FtD3—Fox clay loam, 12 to 18 percent slopes, severely eroded. This is a strongly sloping, well drained soil on breaks on river terraces. It is moderately deep over sand and gravelly sand. The areas are long and narrow and range from 2 to 6 acres in size.

Typically, the surface layer is dark brown clay loam about 8 inches thick. The subsoil is brown and dark yellowish brown, friable gravelly sandy clay loam about 18 inches thick. The underlying material to a depth of 60 inches is yellowish brown, stratified sand and gravelly sand. In some places the surface layer is gravelly clay loam or gravelly loamy sand. In places the surface layer and subsoil are less than 20 inches thick. In some places there is less erosion, and in some places deposits of lighter colored, recent soil material are on the surface. In some places erosion is very severe, and the underlying sand and gravel are exposed at plow depth. In some small areas the slope is less than 12 percent.

Included with this soil in mapping are small areas of soils on short steep slopes. Also included are small areas of excessively well drained Rodman soils on steep slopes. The included soils make up 5 to 15 percent of the map unit.

The available water capacity of this soil is moderate. Permeability is moderate in the surface layer and subsoil and rapid in the underlying material. Surface runoff is rapid. The surface layer has a low content of organic matter and is firm. Tilth is poor.

This soil is used mainly for cultivated crops. In a few areas it is used for hay, pasture, and woodland. Some areas are reverting to woodland. This soil is a probable source of sand and gravel.

This soil generally is not suited to cultivated crops because of the steep slopes and the severe hazard of erosion. The risk of further erosion is high if this soil is used for cultivated crops.

This soil is suited to grasses and legumes for hay or pasture. Overgrazing causes surface compaction, excessive runoff, and poor tilth. Pasture rotation, timely deferment of grazing, and restricted use during dry periods help to keep the pasture and soil in good condition.

This soil is suited to trees. Plant competition, the hazard of erosion, and equipment limitations are concerns in management. Seedlings survive and grow if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying. Because of the hazard of erosion and the slope, the use of heavy equipment should be restricted on this soil.

This soil is severely limited for use as building sites because of the slope. Buildings need to be designed to conform to the slope. Land shaping and installing retaining walls also help to overcome this limitation. Existing vegetation should be disturbed as little as possible during construction, and disturbed areas should be revegetated as soon as possible to reduce erosion. This soil is severely limited for roads because of the slope. Cutting and filling may be needed, and roads should be built on the contour where possible. This soil is severely limited for septic tank absorption fields because of slope and poor filtering qualities. Absorption fields should be installed on the contour to help offset the slope. This soil readily absorbs the effluent from a septic tank absorption field, but it does not adequately filter the effluent. Consequently, the ground water can become contaminated.

This soil is in capability subclass VIe and in woodland suitability subclass 2r.

Ge—Genesee loam, occasionally flooded. This is a nearly level, deep, well drained soil on bottom lands. The areas are long and narrow and range from 15 to 500 acres in size.

Typically, the surface layer is brown loam about 10 inches thick. The subsoil is about 25 inches thick. The upper part is dark brown, friable loam, and the lower part is dark yellowish brown, friable loam. The underlying material to a depth of 60 inches is brown sandy loam that has thin strata of loamy very fine sand. In the small bottoms and along the Eel River this soil is underlain by gravelly sand. The gravelly sand can be within 30 inches of the surface. In many areas there are free carbonates throughout the soil, but in some areas there are no free carbonates above a depth of 40 inches. In places on bottom lands of the Wabash River and along its small tributaries, limestone bedrock is within 40 inches of the surface.

Included with this soil in mapping are small natural levees along the river channel that are sandy throughout. Also included are small areas of somewhat poorly drained Shoals soils and very poorly drained Sloan soils in floodwater channels and slack water areas. The included areas make up 2 to 15 percent of the map unit.

The available water capacity of this soil is high. Permeability is moderate. Surface runoff is slow. The surface layer has a moderate content of organic matter, and it is friable. Tilth is good.

On large bottom lands, this soil is used mainly for cultivated crops. On small, narrow bottom lands, it is used as pasture or left as woodland.

This soil is suited to corn and soybeans. In some years planting may be delayed or replanting may be necessary because of spring flooding. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help control scouring by floodwater, reduce crusting, improve soil tilth, and increase the infiltration of water.

If it is protected from flooding, this soil is well suited to grasses and legumes for hay or pasture. Flooding can damage the plants, and branches and other debris deposited by floodwater can hinder the harvesting of hay. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth.

This soil is well suited to trees. Plant competition is the main concern in management. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying.

This soil generally is not suitable for use as building sites and for sanitary facilities because of flooding. It is severely limited for local roads because of flooding. Constructing roads on raised and well compacted fill material and providing side ditches and culverts for drainage help prevent flood damage.

This soil is in capability subclass IIw and in woodland suitability subclass 1o.

GnB2—Glynwood silt loam, 4 to 7 percent slopes, eroded. This is a gently sloping, deep, moderately well drained soil on upland till plains and moraines. The areas are irregular in shape and range from 3 to 45 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsoil is dark yellowish brown and yellowish brown, firm clay that is mottled in the lower part and is about 18 inches thick. The underlying material to a depth of 60 inches is brown, mottled clay loam. In some areas on the crest of knobs the underlying material is at a depth of less than 20 inches. In places there is a loamy mantle as much as 30 inches thick. In many places the underlying material has less clay. In some small areas the slope is more than 7 percent.

Included with this soil in mapping are small areas of severely eroded soils that have a surface layer of clay loam or silty clay loam. Also included are breaks where the slope is more than 12 percent. Also included are small areas of somewhat poorly drained Blount and Haskins soils on foot slopes and very poorly drained Pewamo soils along narrow drainageways. The included areas make up 5 to 20 percent of the map unit.

The available water capacity of this soil is moderate. Permeability is slow. The seasonal high water table is at a depth of 2.0 to 3.5 feet. Surface runoff is medium. The surface layer has a moderate content of organic matter, and it is friable. Tilth is fair.

This soil is used mainly for cultivated crops. In a few areas it is used for hay and as pasture and woodland.

This soil is well suited to corn, soybeans, and small grains. It has a few cobbles and stones on or near the surface that can hinder farming operations. Crop rotation, terraces, diversions, contour farming, grassed

waterways, grade stabilization structures, and other conservation practices help to control erosion and runoff if cultivated crops are grown. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help control erosion, reduce crusting, improve soil tilth, and increase the infiltration of water.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing or grazing when the soil is wet causes surface compaction, excessive runoff, and poor tilth. Pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees. Seedling mortality, the windthrow hazard, and plant competition are the main concerns in management. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying. Some replanting of seedlings may be needed. Care in thinning or no thinning at all can help prevent windthrow.

This soil is moderately limited for dwellings without basements because of wetness and the shrink-swell potential. It is severely limited for dwellings with basements because of wetness. Subsurface drains can help lower the water table. Foundations, footings, and basement walls should be strengthened. Backfilling with coarser material helps prevent structural damage caused by the shrinking and swelling of the soil. Existing vegetation should be disturbed as little as possible during construction, and disturbed areas should be revegetated as soon as possible to reduce erosion. This soil is severely limited for local roads and streets because of frost action and low strength. Drainage along roads helps prevent frost action. The road base material needs to be replaced or strengthened with more suitable material to support vehicular traffic. This soil is severely limited for septic tank absorption fields because of wetness and slow permeability. Filling or mounding the septic tank absorption field with suitable fill material and elevating the absorption field help offset the slow permeability. Drainage around the outer edge of the absorption field helps remove excess water.

This soil is in capability subclass IIe and in woodland suitability subclass 2c.

GoC3—Glynwood clay loam, 5 to 12 percent slopes, severely eroded. This is a moderately sloping, deep, moderately well drained soil on upland till plains and moraines. The areas are irregular in shape and range from 3 to 25 acres in size.

Typically, the surface layer is dark brown clay loam about 7 inches thick. The subsoil is dark yellowish brown, mottled, firm clay and clay loam about 16 inches thick. The underlying material to a depth of 60 inches is yellowish brown, mottled clay loam. In some small areas the slope is less than 5 percent or more than 12 percent. In places the soil has fewer gray mottles.

Included with this soil in mapping are small areas where the soil is moderately eroded and the surface layer is silt loam. In places there are breaks where the slope is more than 18 percent. Also included are small areas of somewhat poorly drained Blount and Haskins soils on foot slopes and along narrow drainageways. The included areas make up about 4 to 15 percent of the map unit.

The available water capacity of this soil is moderate. Permeability is slow. The seasonal high water table is at a depth of 2.0 to 3.5 feet. Surface runoff is rapid. The surface layer has a low content of organic matter, and it is firm. Tilth is poor.

This soil is used mainly for cultivated crops. In some areas it is used for hay or pasture, and in a few areas it is reverting to trees.

This soil is poorly suited to corn, soybeans, and small grains. The clay loam surface layer is difficult to plow and work into a suitable seedbed, because it dries out slowly and forms hard clods in drying. This soil has a few cobbles and stones on or near the surface that can hinder farming operations. Crop rotation, terraces, diversions, contour farming, grassed waterways, grade stabilization structures, and other conservation practices help to control erosion and runoff if cultivated crops are grown. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help control erosion, reduce crusting, improve soil tilth, and increase the infiltration of water.

This soil is suited to grasses and legumes for hay or pasture. Overgrazing or grazing when the soil is wet causes surface compaction, excessive runoff, and poor tilth. Pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition, seedling mortality, and the windthrow hazard are the main concerns in management. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying. Some replanting of seedlings may be needed. Care in thinning or no thinning at all can help prevent windthrow.

This soil is moderately limited for dwellings without basements because of wetness, the shrink-swell potential, and the slope. It is severely limited for dwellings with basements because of wetness. Subsurface drains can help lower the water table. Foundations, footings, and basement walls should be strengthened. Backfilling with coarser material helps prevent structural damage caused by the shrinking and swelling of the soil. Existing vegetation should be disturbed as little as possible during construction, and disturbed areas should be revegetated as soon as possible to reduce erosion. This soil is severely limited for local roads and streets because of low strength and frost action. Providing drainage along roads helps prevent frost action. The road base material needs to be

strengthened or replaced with more suitable material to support vehicular traffic. This soil is severely limited for septic tank absorption fields because of wetness and the slow permeability. Filling or mounding the septic tank absorption field with suitable fill material and elevating the absorption field help offset the slow permeability. Drainage around the outer edge of the absorption field helps remove excess water.

This soil is in capability subclass IVe and in woodland suitability subclass 2c.

HaA—Haskins loam, 0 to 3 percent slopes. This is a nearly level, deep, somewhat poorly drained soil on upland till plains and moraines. The areas are irregular in shape and range from 3 to 40 acres in size.

Typically, the surface layer is dark grayish brown loam about 9 inches thick. The subsurface layer is brown, mottled sandy loam about 3 inches thick. The subsoil is about 18 inches thick. The upper part of the subsoil is yellowish brown, mottled, friable loam, and the lower part is brown, mottled, firm clay loam. The underlying material to a depth of 60 inches is brown, mottled clay loam. In many places the underlying material has less clay. In places the subsoil has more clay and less sand. In places the slope is more than 3 percent. On the crest of slight rises, the mantle of loamy outwash is thinner.

Included with this soil in mapping are small areas of moderately well drained Glynwood and Rawson soils in more sloping areas and very poorly drained Pewamo soils in depressions. The included soils make up 10 to 20 percent of the map unit.

The available water capacity of this soil is moderate. Permeability is moderate in the upper part of the soil and slow in the lower part of the subsoil and in the underlying material. The seasonal high water table is at a depth of 1 foot to 2.5 feet. Surface runoff is slow. The surface layer has a moderate content of organic matter, and it is friable. Tilth is good.

This soil is used mainly for cultivated crops. In some areas it is used for hay or pasture. A few areas have been left wooded, but many of these are being cleared for cultivation.

This soil is well suited to corn, soybeans, and small grains if it is adequately drained. Subsurface drains can be used to remove excess water. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops reduce crusting, improve soil tilth, and increase the infiltration of water.

This soil is well suited to grasses and legumes for hay or pasture if it is adequately drained. Deep-rooted legumes, such as alfalfa, grow poorly in undrained areas because they cannot tolerate a high water table. Overgrazing or grazing when the soil is wet can cause surface compaction and poor tilth. Pasture rotation and timely deferment of grazing help to keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main concern in management. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying.

This soil is severely limited for use as building sites because of wetness. Subsurface drains can help remove excess water. This soil is severely limited for local roads and streets because of frost action. Providing drainage along roads and placing a gravel moisture barrier in the subgrade help prevent damage by frost action. This soil is severely limited for septic tank absorption fields because of wetness and the slow permeability in the lower part of the soil. Filling or mounding the septic tank absorption field with suitable material and elevating the absorption field help offset the slow permeability. Drainage around the outer edge of the absorption field helps remove excess water.

This soil is in capability subclass IIw and in woodland suitability subclass 2o.

HeG—Hennepin loam, 25 to 50 percent slopes. This is a steep, deep, well drained soil on sharp breaks between uplands and bottom lands or terraces and along the sides of deeply cut drainageways. The areas are long and narrow and range from 2 to 30 acres in size.

Typically, the surface layer is dark grayish brown loam about 3 inches thick. The subsoil is brown, firm loam about 10 inches thick. The underlying material to a depth of 60 inches is yellowish brown loam. In many places the subsoil is thinner and has more clay.

Included with this soil in mapping are small areas of soils that are severely eroded. Also included are small areas of well drained Miami and Morley soils on ridgetops. These soils have more clay in the subsoil than the Hennepin soil. Also included are small areas of well drained, moderately deep Milton Variant soils and excessively drained Rodman soils. The included soils make up 10 to 25 percent of the map unit.

The available water capacity of this soil is moderate. Permeability is moderately slow. Surface runoff is very rapid. The surface layer has a moderate content of organic matter, and it is friable.

Generally, this soil has been left as woodland. In some areas it is used as pasture.

This soil generally is not suited to cultivated crops. Erosion is a severe hazard, and the use of standard farm machinery is difficult because of the steep slopes.

This soil is poorly suited to grasses and legumes for pasture because of the slope. In the areas that are used as pasture, timely deferment of grazing, rotation, and restricted use during wet periods help to minimize the hazards and keep the pasture and soil in the best condition possible.

This soil is suited to trees. Plant competition, the hazard of erosion, and equipment limitations are

concerns in management. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying. The use of heavy equipment should be restricted on this soil. The type of equipment that can safely be used on these slopes is limited.

This soil generally is not suitable for building sites and sanitary facilities because of the slope. It is severely limited for local roads also because of the slope. Cutting and filling are needed, and roads should be built on the contour where possible. Side ditches and culverts for drainage help reduce erosion. Areas disturbed during construction should be revegetated as soon as possible.

This soil in in capability subclass VIIe and in woodland suitability subclass 1r.

Ho—Homer loam. This is a nearly level, somewhat poorly drained soil on river terraces and outwash plains. It is moderately deep over sand, loamy sand, or gravelly sand. The areas are irregular in shape and range from 3 to 20 acres in size.

Typically, the surface layer is dark grayish brown loam about 8 inches thick. The subsurface layer is brown loam about 3 inches thick. The subsoil is dark yellowish brown and dark brown, mottled, firm clay loam and gravelly sandy clay loam about 24 inches thick. The underlying material to a depth of 60 inches is brown loamy sand and gravelly sand. In places this soil is more than 40 inches thick. In some places there is less gravel.

Included with this soil in mapping are small areas of well drained Fox and Kosciusko soils on rises and very poorly drained Sebewa soils in narrow waterways and depressions. The included soils make up 5 to 20 percent of the map unit.

The available water capacity of this soil is moderate. Permeability is moderate in the surface layer and subsoil and rapid in the underlying material. The seasonal high water table is at a depth of 1 foot to 3 feet. Surface runoff is slow. The surface layer has a moderate content of organic matter, and it is friable. Tilth is good.

This soil is used mainly for cultivated crops. In some areas it is used for hay or pasture. A few areas have been left wooded, but many of these are being cleared for cultivation.

This soil is well suited to corn, soybeans, and small grains if it is adequately drained. Subsurface drains can be used to remove excess water. In some areas this soil has thin layers of fine sand that can flow into subsurface drains and plug them. If this soil is excessively drained by artificial means, it can be droughty in extended dry periods because of its moderate available water capacity. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help reduce evaporation and crusting, improve soil tilth, and increase the infiltration of water.

This soil is well suited to grasses and legumes for hay or pasture if it is adequately drained. Deep-rooted legumes such as alfalfa grow poorly in undrained areas because they cannot tolerate a high water table. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is suited to trees. Plant competition is the main concern in management. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying.

This soil is severely limited for use as building sites because of wetness. Subsurface drains can help lower the water table. This soil is severely limited for local roads and streets because of low strength and frost action. Providing drainage along roads helps prevent damage by frost action. The road base material needs to be replaced with more suitable material or strengthened to support vehicular traffic. This soil is severely limited for septic tank absorption fields because of wetness and poor filtering qualities. Filling or mounding the septic tank absorption field with suitable fill material and elevating the absorption field can provide a more suitable filtering medium. Drainage around the outer edge of the absorption field helps remove excess water. The underlying material of this soil readily absorbs the effluent from a septic tank absorption field but does not adequately filter it. Consequently, the ground water can become contaminated.

This soil is in capability subclass IIw and in woodland suitability subclass 3o.

Ht—Houghton muck, undrained. This is a nearly level, deep, very poorly drained soil in deep depressions on uplands, outwash plains, and river terraces. This soil is ponded or is saturated with water throughout the year by springs and runoff from adjacent higher areas. The areas of this map unit are oval or irregular in shape and range from 2 to 90 acres in size.

Typically, the surface layer is black muck about 8 inches thick. The underlying material to a depth of 60 inches is black, very friable muck. In many places the soil was drained at one time but has reverted to marsh. In these areas there is evidence of a plow layer. In the northwestern part of the county there are places where the muck is on mounds that have slopes of more than 2 percent. In a few places sedimentary peat is within a depth of 48 inches. In places the mineral content of the surface layer is higher than is typical of Houghton soils.

Included with this soil in mapping are small areas of very poorly drained Milford, Pella, Sebewa, and Wallkill soils. Milford, Pella, and Sebewa soils are mineral soils. Wallkill soils have mineral soil material in the upper layers. The included soils are on slight rises near the edge of the mapped areas. They make up 8 to 20 percent of the map unit.

The available water capacity of this soil is very high. Permeability is moderately slow to moderately rapid. The water table is at or above the surface throughout the year. Surface runoff is very slow or ponded. The surface layer has a very high content of organic matter, and it is very friable.

This soil is mainly in marsh vegetation. In some areas that are partly drained it is used as pasture.

This soil generally is not suited to corn, soybeans, and small grains unless it is adequately drained. Drainage systems are difficult to install and maintain.

This soil is poorly suited to grasses for hay or pasture. Grasses that tolerate wetness should be favored. The poor stability of the soil makes the use of equipment for haying very difficult and makes it difficult for livestock to move about.

This soil is poorly suited to trees. Plant competition, seedling mortality, a windthrow hazard, and equipment limitations are concerns in management. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying. Replanting of seedlings is often necessary to establish a good stand. Species that tolerate ponding and wetness should be favored. Care in thinning or no thinning at all can help prevent windthrow. In harvesting, trees should not be left standing alone or widely spaced. Ordinary crawler tractors and rubber-tired skidders are not suited to this soil. Heavy equipment can be used only when the ground is frozen.

This soil generally is not suited to use as building sites and sanitary facilities because of ponding. It is severely limited for roads because of ponding, low strength, and frost action. The organic layers of the soil need to be replaced with suitable soil material to overcome the low strength. Providing side ditches and culverts for drainage helps prevent ponding and damage by frost action.

This soil is in capability subclass Vw and in woodland suitability subclass 4w.

Hx—Houghton muck, drained. This is a nearly level, deep, very poorly drained soil in deep depressions on uplands, outwash plains, and terraces. This soil is saturated with water and is often ponded by springs and runoff from adjacent higher areas. The areas of this map unit are oval or irregular in shape and range from 2 to 40 acres in size.

Typically, the surface layer is black muck about 10 inches thick. The underlying material to a depth of 60 inches is black and very dark grayish brown, very friable muck. In a few places sedimentary peat is within a depth of 48 inches. In places the mineral content of the surface layer is higher than is typical.

Included with this soil in mapping are small areas where the drainage system has failed and marsh vegetation has taken over. Also included are small areas of very poorly drained Milford, Pella, Sebewa, and Wallkill soils. Milford, Pella, and Sebewa soils are mineral soils. Wallkill soils have mineral soil material in the upper layers. All of these soils are on slight rises near the edge of the mapped areas. The included soils make up 10 to 20 percent of the map unit.

The available water capacity of this soil is very high. Permeability is moderately slow to moderately rapid. The water table is at or above the surface in winter and spring. Surface runoff is very slow or is ponded. The surface layer has a very high content of organic matter, and it is very friable. Tilth is good.

This soil has been artificially drained and is used for cultivated crops.

This soil is suited to corn, soybeans, and small grains if drainage is maintained. Wetness is the major limitation and wind erosion the major hazard. The poor stability of the organic material causes ditchbanks to slough and drain tile to lose gradient. The organic matter subsides if the soil is drained. In many areas it may subside to a level at which the drainage system is not adequate because outlets are no longer available. Conservation practices, for example, cover crops and conservation tillage that leave a protective amount of crop residue on the surface, are needed to control wind erosion.

This soil is suited to grasses and legumes for hay and pasture if drainage is maintained. Deep-rooted legumes such as alfalfa grow poorly because they cannot tolerate ponding or a high water table. Equipment can be used for harvesting hay only in dry periods because of the poor stability of the muck.

This soil is poorly suited to trees. Plant competition, seedling mortality, a windthrow hazard, and equipment limitations are concerns in management. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying. Replanting is often necessary to establish a good stand. Species that tolerate wetness should be favored. Care in thinning or no thinning at all can help prevent windthrow. In harvesting, trees should not be left standing alone or widely spaced. Heavy equipment can be used only when the ground is frozen.

This soil generally is not suited to use as building sites and sanitary facilities because of ponding. It is severely limited for roads because of ponding, low strength, and frost action. The organic layers of the soil need to be replaced with suitable soil material to overcome the low soil strength. Providing side ditches and culverts for drainage helps to prevent the damage caused by ponding and frost action.

This soil is in capability subclass IIIw and in woodland suitability subclass 4w.

KaA—Kalamazoo sandy loam, 0 to 2 percent slopes. This is a nearly level, deep, well drained soil on river terraces and outwash plains. The areas are elongated and range from 3 to 25 acres in size.

Typically, the surface layer is dark grayish brown sandy loam about 10 inches thick. The subsurface layer is brown sandy loam about 2 inches thick. The subsoil is about 37 inches thick. It is yellowish brown, brown, and

dark brown, firm to friable sandy loam and gravelly sandy clay loam in the upper part and brown and strong brown, friable and very friable loamy sand and gravelly sandy loam in the lower part. The underlying material to a depth of 60 inches is brown gravelly sand. In some places the surface layer is darker than is typical, and in places it is loamy fine sand. In some small areas the slope is more than 2 percent. In places the underlying material is at a depth of less than 40 inches.

Included with this soil in mapping are small areas of soils that have a gravelly surface layer and soils on short steep slopes along the edge of some mapped areas. Also included are small areas of well drained Ormas soils, which have more sand than the Kalamazoo soil, on slight rises and very poorly drained Sebewa soils in depressions. The included soils make up 4 to 12 percent of the map unit.

The available water capacity of this soil is moderate. Permeability is moderate in the subsoil and rapid in the underlying material. Surface runoff is slow. The surface layer has a moderate content of organic matter, and it is friable. Tilth is good.

This soil is used mainly for cultivated crops. In a few areas it is used for hay, pasture, and woodland. It is a probable source of sand and gravel.

This soil is well suited to corn, soybeans, and small grains. Drought is a moderate hazard in extended dry periods. This soil has a few stones on or near the surface that can hinder farming operations. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help reduce evaporation, reduce crusting, and increase the infiltration of water.

This soil is well suited to grasses and legumes for hay or pasture. Pasture rotation, timely deferment of grazing, and restricted use during dry periods help to keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main concern in management. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying.

This soil is moderately limited for use as building sites because of the shrink-swell potential. Foundations, footings, and basement walls should be strengthened and backfilled with coarser material to help prevent structural damage caused by the shrinking and swelling of the soil. This soil is moderately limited for local roads and streets because of low strength and frost action. Providing drainage along roads helps prevent frost action. The base material needs to be replaced or strengthened with more suitable material to support vehicular traffic. This soil readily absorbs the effluent from a septic tank absorption field, but it does not adequately filter the effluent. Consequently, the ground water can become contaminated.

This soil is in capability subclass IIs and in woodland suitability subclass 2o.

KaB—Kalamazoo sandy loam, 2 to 6 percent slopes. This is a gently sloping, deep, well drained soil on river terraces and outwash plains. The areas are elongated and range from 3 to 20 acres in size.

Typically, the surface layer is dark brown sandy loam about 8 inches thick. The subsoil is about 37 inches thick. It is dark yellowish brown, firm gravelly sandy clay loam in the upper part and dark yellowish brown, friable loamy sand and gravelly sandy loam in the lower part. The underlying material to a depth of 60 inches is yellowish brown gravelly sand. In some places the surface layer is darker. In a few places the surface layer is loamy fine sand. In some places the slope is less than 2 percent, and in others it is more than 6 percent. In places the underlying material is at a depth of less than 40 inches.

Included with this soil in mapping are small areas of soils that have a gravelly surface layer and soils on short steep slopes along the edge of some mapped areas. Also included are small areas of well drained Ormas soils, which have more sand than the Kalamazoo soil, on slight rises and very poorly drained Sebewa soils in depressions. The included soils make up 2 to 10 percent of the map unit.

The available water capacity of this soil is moderate. Permeability is moderate in the subsoil and rapid in the underlying material. Surface runoff is medium. The surface layer has a moderate content of organic matter, and it is friable. Tilth is good.

This soil is used mainly for cultivated crops. In a few areas it is used for hay, pasture, and woodland. It is a probable source of sand and gravel.

This soil is well suited to corn, soybeans, and small grains. Drought is a moderate hazard in extended dry periods. This soil has a few stones on or near the surface that can hinder farming operations. Crop rotation, terraces, diversions, contour farming, grassed waterways, grade stabilization structures, or other practices help control erosion and runoff if cultivated crops are grown. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help control erosion, reduce crusting and evaporation, and increase the infiltration of water.

This soil is well suited to grasses and legumes for hay or pasture. Pasture rotation, timely deferment of grazing, and restricted use during dry periods help to keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main concern in management. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying.

This soil is moderately limited for use as building sites because of its shrink-swell potential. Foundations, footings, and basement walls should be strengthened and backfilled with coarser material to help prevent structural damage caused by the shrinking and swelling

of the soil. Existing vegetation should be disturbed as little as possible during construction, and disturbed areas should be revegetated as soon as possible to reduce erosion. This soil is moderately limited for local roads and streets because of low strength and frost action. Providing drainage along roads helps prevent damage by frost action. The base material needs to be replaced or strengthened with more suitable material to support vehicular traffic. This soil readily absorbs the effluent from a septic tank absorption field, but it does not adequately filter the effluent. Consequently, the ground water can become contaminated.

This soil is in capability subclass IIe and in woodland suitability subclass 2o.

KsA—Kosciusko sandy loam, 0 to 2 percent slopes. This is a nearly level, deep, well drained soil on river terraces and outwash plains. The areas are elongated and range from 3 to 30 acres in size.

Typically, the surface layer is brown sandy loam about 9 inches thick. The subsoil is about 24 inches thick. The upper part is brown, friable sandy clay loam and gravelly sandy clay loam. The lower part is dark brown and yellowish brown, very friable gravelly sandy loam and loamy sand. The underlying material to a depth of 60 inches is yellowish brown gravelly sand. In places this soil is more than 40 inches thick. In some places the surface layer is darker than is typical of Kosciusko soils. In some places the surface layer is loamy fine sand. In places the slope is more than 2 percent.

Included with this soil in mapping are small areas of soils that have a gravelly surface layer and a few small areas of soils on short steep slopes. Also included are small areas of well drained Ormas soils, which have more sand than the Kosciusko soil, on ridges, somewhat poorly drained Homer soils and very poorly drained Sebewa soils in slight depressions, and excessively drained Rodman soils on steep breaks. The included soils make up 5 to 15 percent of the map unit.

The available water capacity of this soil is low. Permeability is moderate in the surface layer and subsoil and very rapid in the underlying material. Surface runoff is slow. The surface layer has a moderate content of organic matter, and it is friable. Tilth is good.

This soil is used mainly for cultivated crops. In a few areas it is used for hay, pasture, or woodland. It is a probable source of sand and gravel.

This soil is suited to corn, soybeans, and small grains. Drought is a moderate hazard in extended dry periods. This soil has a few stones on or near the surface that can hinder farming operations. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help reduce evaporation and crusting and increase the infiltration of water.

This soil is suited to grasses and legumes for hay or pasture. Species that withstand drought should be planted. Pasture rotation, timely deferment of grazing, and restricted use during dry periods help to keep the pasture and soil in good condition.

This soil is well suited to trees. Species that withstand drought should be favored. Plant competition is the main concern in management. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying.

This soil is moderately limited for buildings without basements because of the shrink-swell potential. It is well suited to buildings with basements. Foundations and footings should be designed and constructed to help prevent structural damage caused by the shrinking and swelling of the soil. This soil is moderately limited for local roads and streets because of the shrink-swell potential and frost action. The layers of the soil that have a moderate shrink-swell potential should be replaced with suitable soil material. Providing drainage along roads helps prevent damage by frost action. This soil readily absorbs the effluent from a septic tank absorption field, but it does not adequately filter the effluent. Consequently, the ground water can become contaminated.

This soil is in capability subclass IIIs and in woodland suitability subclass 2s.

KsB—Kosciusko sandy loam, 2 to 6 percent slopes. This is a gently sloping, deep, well drained soil on river terraces and outwash plains. The areas are irregular in shape and range from 3 to 25 acres in size.

Typically, the surface layer is brown sandy loam about 9 inches thick. The subsoil is about 29 inches thick. The upper part is brown, firm sandy clay loam and gravelly sandy clay loam. The lower part is dark yellowish brown and dark brown, friable and very friable gravelly sandy loam. The underlying material to a depth of 60 inches is yellowish brown gravelly sand. In places this soil is more than 40 inches thick. In some places the surface layer is darker than is typical, and in some places it is loamy fine sand. In places there are small areas where the slope is less than 2 percent or more than 6 percent.

Included with this soil in mapping are small areas of soils that have a gravelly surface layer and a few areas of soils on short steep slopes. Also included are small areas of well drained Ormas soils, which have more sand than the Kosciusko soil, on ridges, somewhat poorly drained Homer soils in narrow drainageways, and excessively drained Rodman soils on steep breaks. The included soils make up 2 to 15 percent of the map unit.

The available water capacity of this soil is low. Permeability is moderate in the surface layer and subsoil and very rapid in the underlying material. Surface runoff is medium. The surface layer has a moderate content of organic matter, and it is friable. Tilth is good.

This soil is used mainly for cultivated crops. In some areas it is used for hay or pasture. A few areas have

been left wooded. This soil is a probable source of sand and gravel.

This soil is suited to corn, soybeans, and small grains. Drought is a moderate hazard in extended dry periods. This soil has a few stones on or near the surface that can hinder farming operations. Crop rotation, diversions, contour farming, grassed waterways, grade stabilization structures, or other conservation practices help to reduce erosion and runoff if cultivated crops are grown. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help control erosion, reduce crusting and evaporation, and increase the infiltration of water.

This soil is suited to grasses and legumes for hay or pasture. Species that withstand drought should be planted. Pasture rotation, timely deferment of grazing, and restricted use in dry periods help to keep the pasture and soil in good condition.

This soil is well suited to trees. Species that withstand drought should be favored. Plant competition is the main concern in management. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying.

This soil is moderately limited for buildings without basements because of the moderate shrink-swell potential. It is well suited to buildings with basements. Foundations and footings should be designed and constructed to help prevent structural damage caused by the shrinking and swelling of the soil. Existing vegetation should be disturbed as little as possible during construction, and disturbed areas should be revegetated as soon as possible to reduce erosion. This soil is moderately limited for local roads and streets because of the shrink-swell potential and frost action. The layers of soil that have a moderate shrink-swell potential need to be replaced with suitable soil material. Providing side ditches and culverts for drainage helps prevent damage to roads by frost action. This soil readily absorbs the effluent from septic tank absorption fields, but it does not adequately filter the effluent. Consequently, the ground water may become contaminated.

This soil is in capability subclass IIIe and in woodland suitability subclass 2s.

KsC—Kosciusko sandy loam, 6 to 12 percent slopes. This is a moderately sloping, deep, well drained soil on river terraces and outwash plains. The areas are irregular in shape and range from 3 to 8 acres in size.

Typically, the surface layer is brown sandy loam about 8 inches thick. The subsoil is about 21 inches thick. It is brown, firm gravelly sandy clay loam and gravelly sandy loam in the upper part and dark yellowish brown, friable gravelly sandy loam and loamy sand in the lower part. The underlying material to a depth of 60 inches is pale brown sand and gravelly sand. In places this soil is more than 40 inches thick. In some places the surface layer is darker than is typical, and in a few places it is loamy fine sand. In places the slope is less than 6 percent or more than 12 percent.

Included with this soil in mapping are small areas of soils that have slopes of more than 18 percent and small areas of soils that have a gravelly surface layer. Also included are small areas of well drained Ormas soils, which have more sand than the Kosciusko soil, on ridges and excessively drained Rodman soils on steep breaks. The included soils make up 2 to 10 percent of the map unit.

The available water capacity of this soil is low. Permeability is moderate in the surface layer and subsoil and very rapid in the underlying material. Surface runoff is medium. The surface layer has a moderate content of organic matter, and it is friable. Tilth is good.

This soil is used mainly for cultivated crops. In some areas it is used for hay or pasture. A few areas have been left wooded. This soil is a probable source of sand and gravel.

This soil is suited to corn, soybeans, and small grains. Drought is a hazard in extended dry periods. This soil has a few stones on or near the surface that can hinder farming operations. Crop rotation, diversions, contour farming, grassed waterways, grade stabilization structures, or other conservation practices help reduce soil loss and surface runoff. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help control erosion, reduce crusting and evaporation, and increase the infiltration of water.

This soil is suited to grasses and legumes for hay or pasture. Species that withstand drought should be planted. Pasture rotation, timely deferment of grazing, and restricted use in dry periods help to keep the pasture and soil in good condition.

This soil is well suited to trees. Species that withstand drought should be favored. Plant competition is the main concern in management. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying.

This soil is moderately limited for use as building sites because of the slope and the moderate shrink-swell potential. Buildings can be designed to conform to the slope. Foundations and footings should be designed and constructed to help prevent structural damage caused by the shrinking and swelling of the soil. Existing vegetation should be disturbed as little as possible during construction, and disturbed areas should be revegetated as soon as possible to reduce erosion. This soil is moderately limited for local roads and streets because of the shrink-swell potential, frost action, and slope. The layers that have a moderate shrink-swell potential should be replaced with suitable soil material. Providing side ditches and culverts for drainage helps prevent damage caused by frost action. Local roads and streets should

be constructed on the contour where possible. Land shaping helps modify the slope. This soil readily absorbs effluent from septic tank absorption fields, but it does not adequately filter the effluent. Consequently, ground water can become contaminated. Absorption fields should be installed on the contour to distribute the effluent more evenly.

This soil is in capability subclass IIIe and in woodland suitability subclass 2s.

MbA—Martinsville loam, 0 to 2 percent slopes. This is a nearly level, deep, well drained soil on river terraces and outwash plains. The areas are irregular in shape and range from 3 to 25 acres in size.

Typically, the surface layer is dark brown loam about 8 inches thick. The subsurface layer is yellowish brown loam about 4 inches thick. The subsoil is about 41 inches thick. The upper part is dark yellowish brown, firm clay loam and brown, firm sandy clay loam. The lower part is brown, friable sandy loam and very friable loamy sand. The underlying material is yellowish brown, stratified sand, loamy fine sand, and silt loam. In places some layers are as much as 25 percent gravel. In some places the underlying material is at a depth of more than 60 inches, and in some places it is loam glacial till. In some places the surface layer is darker than is typical. In places the slope is more than 2 percent.

Included with this soil in mapping are small areas of somewhat poorly drained Whitaker soils and very poorly drained Rensselaer soils in depressions and narrow waterways at a lower elevation than that of the Martinsville soil. The included soils make up 5 to 15 percent of the map unit.

The available water capacity of this soil is high. Permeability is moderate. Surface runoff is slow. The surface layer has a moderate content of organic matter, and it is friable. Tilth is good.

This soil is mainly used for cultivated crops. In a few areas it is used for hay and as pasture and woodland.

This soil is well suited to corn, soybeans, and small grains. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help reduce evaporation and crusting, improve soil tilth, and increase the infiltration of water.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing causes surface compaction and poor tilth. Pasture rotation and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main concern in management. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying.

This soil is moderately limited for use as building sites because of its shrink-swell potential. Foundations, footings, and basement walls should be strengthened and backfilled with coarser material to help prevent structural damage by the shrinking and swelling of the soil. This soil is moderately limited for local roads and streets because of low strength and frost action. Drainage along roads helps prevent damage by frost action. The base material needs to be replaced or strengthened with more suitable material to support vehicular traffic. This soil is suitable for septic tank absorption fields.

This soil is in capability class I and in woodland suitability subclass 1o.

MbB—Martinsville loam, 2 to 6 percent slopes. This is a gently sloping, deep, well drained soil on river terraces and outwash plains. The areas are irregular in shape and range from 3 to 30 acres in size.

Typically, the surface layer is dark grayish brown loam about 10 inches thick. The subsoil is about 38 inches thick. The upper part is dark yellowish brown, firm sandy clay loam, and the lower part is dark yellowish brown, friable sandy loam. The underlying material is yellowish brown, stratified sand and silt loam. In places, some layers are as much as 20 percent gravel. In some places, the underlying material is at a depth of more than 60 inches, and in a few places it is loam glacial till. In places the surface layer is darker than is typical. In places the slope is less than 2 percent or more than 6 percent.

Included with this soil in mapping are small areas where the soil is severely eroded and a few areas of soils on short steep slopes. Also included are small areas of somewhat poorly drained Whitaker soils in narrow drainageways. The included soils make up 3 to 12 percent of the map unit.

The available water capacity of this soil is high. Permeability is moderate. Surface runoff is medium. The surface layer has a moderate content of organic matter, and it is friable. Tilth is good.

This soil is used mainly for cultivated crops. In a few areas it is used for hay and as pasture and woodland.

This soil is well suited to corn, soybeans, and small grains. Crop rotation, diversions, contour farming, grassed waterways, grade stabilization structures, or other practices help to control erosion and runoff if cultivated crops are grown. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help control erosion, reduce crusting, improve soil tilth, and increase the infiltration of water.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing causes surface compaction, excessive runoff, and poor tilth. Pasture rotation and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main concern in management. Seedlings survive and grow well if competing vegetation is controlled.

Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying.

This soil is moderately limited for use as building sites because of its shrink-swell potential. Foundations, footings, and basement walls should be strengthened and backfilled with coarser material to help prevent structural damage by the shrinking and swelling. This soil is moderately limited for local roads and streets because of low strength and frost action. Drainage along roads helps prevent damage by frost action. The base material needs to be replaced or strengthened with more suitable material to support vehicular traffic. This soil is suitable for septic tank absorption fields.

This soil is in capability subclass IIe and in woodland suitability subclass 1o.

MbC2—Martinsville loam, 6 to 12 percent slopes, eroded. This is a moderately sloping, deep, well drained soil on river terraces and outwash plains. The areas are irregular in shape and range from 3 to 15 acres in size.

Typically, the surface layer is brown loam about 8 inches thick. The subsoil is about 41 inches thick. The upper part is dark brown and dark yellowish brown, firm clay loam, and the lower part is brown and yellowish brown, friable loam and sandy loam. The underlying material is yellowish brown, stratified sand and silt loam. In places some layers are as much as 20 percent gravel. In some places the underlying material is at a depth of more than 60 inches, and in some places it is loam glacial till. In places the surface layer is darker than is typical. In places the slope is less than 6 percent or more than 12 percent.

Included with this soil in mapping are small areas where the soil is severely eroded and a few areas of soils on short steep slopes. Also included are small areas of somewhat poorly drained Whitaker soils in narrow drainageways. The included soils make up 2 to 10 percent of the map unit.

The available water capacity of this soil is high. Permeability is moderate. Surface runoff is medium. The surface layer has a moderate content of organic matter, and it is friable. Tilth is fair.

This soil is used mainly for cultivated crops. In a few areas it is used for hay and as pasture and woodland.

This soil is suited to corn, soybeans, and small grains. Crop rotation, diversions, contour farming, grassed waterways, grade stabilization structures, or other practices help to control erosion and runoff if cultivated crops are grown. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help control erosion, reduce evaporation, improve soil tilth, and increase the infiltration of water.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing causes surface compaction, excessive runoff, and poor tilth. Pasture rotation and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main concern in management. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying.

This soil is moderately limited for use as building sites because of slope and the moderate shrink-swell potential. Buildings should be designed to conform to the slope. Foundations, footings, and basement walls should be strengthened and backfilled with coarser material to help prevent structural damage by the shrinking and swelling. Existing vegetation should be disturbed as little as possible during construction, and disturbed areas should be revegetated as soon as possible to reduce erosion. This soil is moderately limited for local roads and streets because of low strength, frost action, and slope. The layers that have a moderate shrink-swell potential need to be replaced with suitable soil material. The soil surface needs to be covered with suitable road base material so that it will support vehicular traffic. Providing drainage along roads helps prevent damage by frost action. Local roads and streets should be constructed on the contour where possible. Land shaping can modify the slope. This soil is moderately limited for septic tank absorption fields because of slope. Installing the absorption field on the contour helps offset the slope.

This soil is in capability subclass IIIe and in woodland suitability subclass 1o.

Md—Martisco muck, sandy substratum. This is a nearly level, deep, very poorly drained soil in deep depressions on uplands, outwash plains, and terraces. Where it is undrained, this soil is ponded in spring and is saturated with water throughout the year. The areas are oval or irregular in shape and range from 2 to 40 acres in size.

Typicallly, the surface layer is black muck about 8 inches thick. The subsurface layer is black muck about 5 inches thick. The next layer is gray to white, mottled, friable marl about 43 inches thick. The underlying material to a depth of 60 inches is gray loamy sand. In some places the organic material overlying the marl is more than 16 inches thick. In some places, layers of mineral soil that has a high content of organic matter cover the marl.

Included with this soil in mapping are areas where the soil is adequately drained. Also included are small areas of very poorly drained Milford and Rensselaer mineral soils on the edge of the depressions. The included soils make up 8 to 20 percent of the map unit.

The available water capacity of this soil is high. Permeability is moderate or moderately rapid in the muck and slow in the marl. The water table is at or above the surface throughout the year. Surface runoff is very slow or ponded. The surface layer has a very high content of organic matter, and it is very friable. Tilth is good.

This soil is mainly used as pasture or left as marsh. In many areas drainage has been attempted, but many of these areas are reverting to marsh vegetation. In adequately drained areas, the soil is used for cultivated crops.

This soil is poorly suited to corn, soybeans, and small grains unless it is adequately drained. Wetness is the major limitation, and wind erosion is the major hazard. Most crops grow poorly in the undrained areas. Generally, this soil is difficult to drain. In many areas adequate outlets for drainage are not available. The poor stability of the organic material and of layers of fine sand in the underlying material causes ditchbanks to slough. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops are needed to help control wind erosion.

This soil is suited to grasses and legumes for hay and pasture if it is adequately drained. Deep-rooted legumes such as alfalfa grow poorly because they cannot tolerate ponding or a high water table. The poor stability makes the use of equipment for haying difficult and makes it difficult for livestock to move about.

This soil generally is not suited to trees for timber. The water table at or near the surface is the main limitation. The use of equipment is severely restricted on this soil. Seedling mortality and windthrow result in severe losses and are extremely difficult to overcome.

This soil generally is not suitable for use as building sites and sanitary facilities because of ponding. It is severely limited for local roads because of ponding and frost action. Constructing roads on raised and well compacted fill material and providing side ditches and culverts for drainage help to prevent the damage caused by ponding and frost action.

This soil is in capability subclass IVw and in woodland suitability subclass 5w.

MeB—Metea loamy sand, 2 to 6 percent slopes. This is a gently sloping, deep, well drained soil on upland knolls and ridges of moraines and till plains. The areas are irregular in shape and range from 3 to 15 acres in size.

Typically, the surface layer is brown loamy sand about 10 inches thick. The subsoil is about 39 inches thick. The upper part is strong brown, loose loamy sand and brown, very friable fine sandy loam. The lower part is yellowish brown, firm and friable clay loam and loam. The underlying material to a depth of 60 inches is brown loam. In places the sandy part of this soil is less than 20 inches thick. In the places where this soil is adjacent to Blount, Glynwood, Morley, or Rawson soils, the lower part of the subsoil and the underlying material have more clay and slower permeability than is typical of Metea soils. In places the slope is less than 2 percent or more than 6 percent.

Included with this soil in mapping are small areas of well drained Miami and Riddles soils on side slopes. These soils have more clay and less sand than the Metea soil. Also included are small areas of moderately well drained Rawson soils on foot slopes. The included soils make up 5 to 20 percent of the map unit.

The available water capacity of this soil is moderate. Permeability is rapid in the surface layer and the upper part of the subsoil; it is moderate in the lower part of the subsoil and in the underlying material. Surface runoff is slow. The surface layer has a low content of organic matter, and it is very friable. Tilth is good.

This soil is used mainly for hay or as pasture. In a few areas it is used for cultivated crops. In some areas it has been left as woodland.

This soil is suited to corn, soybeans, and small grains. Drought is a moderate hazard in extended dry periods, especially for shallow-rooted plants, because of the moderate available water capacity. This soil is also susceptible to wind erosion because the surface layer is sandy. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help control wind erosion, reduce evaporation, and increase the infiltration of water.

This soil is well suited to grasses and legumes for hay or pasture. Pasture rotation, timely deferment of grazing, and restricted use during dry periods help to keep the pasture in good condition.

This soil is well suited to trees. Seedling mortality is the main concern in management. Replanting is often necessary to establish a good stand. Seedlings survive and grow better if competing vegetation is controlled.

This soil is suited to use as building sites. It is moderately limited for local roads and streets because of frost action. Providing drainage along roads helps prevent damage by frost action. Existing vegetation should be disturbed as little as possible during construction, and disturbed areas should be revegetated as soon as possible to reduce erosion. This soil is moderately limited for septic tank absorption fields because of the moderate permeability in the lower part of the subsoil. The absorption field should be enlarged to compensate for the moderate permeability.

This soil is in capability subclass IIIe and in woodland suitability subclass 2s.

MeC—Metea loamy sand, 6 to 12 percent slopes. This is a moderately sloping, deep, well drained soil on upland knolls and ridges of moraines and till plains. The areas are irregular in shape and range from 2 to 10 acres in size.

Typically, the surface layer is brown loamy fine sand about 8 inches thick. The subsoil is about 32 inches thick. The upper part is yellowish brown, very friable loamy fine sand. The lower part is dark yellowish brown, firm sandy clay loam and clay loam. The underlying material to a depth of 60 inches is brown loam. In places the sandy upper part of the soil is less than 20 inches thick. In places where this soil is adjacent to Blount,

Glynwood, Morley, or Rawson soils, the lower part of the subsoil and the underlying material have more clay and slower permeability than is typical of Metea soils.

Included with this soil in mapping are a few small areas of well drained Miami and Riddles soils on side slopes. These soils have more clay and less sand than the Metea soil. Also included are small areas of moderately well drained Rawson soils on foot slopes. The included soils make up 5 to 20 percent of the map unit.

The available water capacity of this soil is moderate. Permeability is rapid in the surface layer and the upper part of the subsoil; it is moderate in the lower part of the subsoil and the underlying material. Surface runoff is medium. The surface layer has a moderate content of organic matter, and it is very friable. Tilth is good.

This soil is used mainly for hay or as pasture. In a few areas it is used for cultivated crops. Some areas have been left as woodland.

This soil is suited to corn, soybeans, and small grains. Drought is a moderate hazard in extended dry periods, especially for shallow-rooted plants, because of the moderate available water capacity. This soil is susceptible to both wind and water erosion because of the sandy surface layer. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help control erosion, reduce evaporation, and increase the infiltration of water.

This soil is well suited to grasses and legumes for hay or pasture. Pasture rotation, timely deferment of grazing, and restricted use during dry periods help to keep the pasture in good condition.

This soil is well suited to trees. Seedling mortality is the main concern in management. Replanting is often necessary to establish a good stand. Seedlings survive and grow better if competing vegetation is controlled.

This soil is moderately limited for use as building sites because of slope. Buildings can be designed to conform to the slope. Existing vegetation should be disturbed as little as possible during construction, and disturbed areas should be revegetated as soon as possible to reduce erosion. This soil is moderately limited for local roads and streets because of slope and frost action. Cutting and filling may be needed for roads and streets. Roads should be built on the contour where possible to help overcome slope. Providing drainage along roads helps prevent damage by frost action. This soil is moderately limited for septic tank absorption fields because of the moderate permeability in the lower part of the soil and the slope. The absorption field should be enlarged to compensate for the moderate permeability. Installing the absorption lines on the contour helps to offset the slope.

This soil is in capability subclass IIIe and in woodland suitability subclass 2s.

MfB2—Miami loam, 2 to 6 percent slopes, eroded. This is a gently sloping, deep, well drained soil on upland till plains and moraines. The areas are irregular in shape and range from 3 to 45 acres in size.

Typically, the surface layer is dark brown loam about 8 inches thick. The subsoil is yellowish brown and dark yellowish brown, firm clay loam and loam about 24 inches thick. The underlying material to a depth of 60 inches is yellowish brown loam. In places the subsoil has less clay and more sand. In places the subsoil has thin layers that are more than 35 percent clay. In some places the underlying material is at a depth of more than 40 inches. In places the slope is more than 6 percent.

Included with this soil in mapping are small areas where the soil is severely eroded and the surface layer is clay loam. Also included are small breaks where the slope is more than 12 percent. Also included are small areas of somewhat poorly drained Crosier soils on foot slopes, along narrow drainageways, and on small flats and small areas of well drained Metea soils, which are sandier than the Miami soil, on the crest of hills. The included soils make up 2 to 12 percent of the map unit.

The available water capacity of this soil is high. Permeability is moderate. Surface runoff is medium. The surface layer has a moderate content of organic matter, and it is friable. Tilth is fair.

This soil is used mainly for cultivated crops. In some areas it is used for hay or pasture, and in a few areas it has been left as woodland.

This soil is well suited to corn, soybeans, and small grains. It has a few cobbles and stones on or near the surface that can hinder farming operations. Crop rotation, terraces, diversions, contour farming, grassed waterways, grade stabilization structures, or other conservation practices help to control erosion and runoff if cultivated crops are grown. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help control erosion, reduce crusting, improve soil tilth, and increase the infiltration of water.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing or grazing when the soil is wet causes surface compaction, excessive runoff, and poor tilth. Pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main concern in management. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying.

This soil is moderately limited for buildings without basements because of its moderate shrink-swell potential. It is well suited to buildings with basements. Foundations and footings should be designed and constructed to help prevent structural damage by the shrinking and swelling of the soil. Existing vegetation should be disturbed as little as possible during construction, and disturbed areas should be revegetated

as soon as possible to reduce erosion. This soil is severely limited for local roads and streets because of low strength. The layers that have a moderate shrink-swell potential should be replaced with suitable soil material, and the soil surface should be covered with suitable road base material so that it will support vehicular traffic. This soil is moderately limited for septic tank absorption fields because of its moderate permeability. Absorption fields can be enlarged to compensate for the moderate permeability.

This soil is in capability subclass IIe and in woodland suitability subclass 1o.

MfC2—Miami loam, 6 to 12 percent slopes, eroded. This is a moderately sloping, deep, well drained soil on upland till plains and moraines and on breaks along drainageways. The areas are irregular in shape and range from 3 to 30 acres in size.

Typically, the surface layer is brown loam about 7 inches thick. The subsoil is dark yellowish brown, firm clay loam about 23 inches thick. The underlying material to a depth of 60 inches is yellowish brown loam. In places the subsoil has less clay and more sand. In places the subsoil has thin layers that are more than 35 percent clay. In some areas the surface layer and subsoil are more than 40 inches thick, and in other areas they are less than 24 inches thick. In some places the slope is less than 6 percent, and in others it is more than 12 percent.

Included with this soil in mapping are small areas where the soil is severely eroded and the surface layer is clay loam. Also included are small breaks where the slope is more than 18 percent, small areas of somewhat poorly drained Crosier soils on foot slopes and along narrow drainageways, and areas of excessively drained Chelsea soils and well drained Metea soils, which are sandier than the Miami soil, on the crest of knolls and ridges. The included soils make up 2 to 10 percent of the map unit.

The available water capacity of this soil is high. Permeability is moderate. Surface runoff is medium. The surface layer has a moderate content of organic matter, and it is friable. Tilth is fair.

This soil is used mainly for cultivated crops. In many areas it is used for hay or pasture. A few areas have been left as woodland or are being left to reforest.

This soil is suited to corn, soybeans, and small grains. It has a few cobbles and stones on or near the surface that can hinder farming operations. Crop rotation, terraces, diversions, contour farming, grassed waterways, grade stabilization structures, or other conservation practices help to control erosion and runoff if cultivated crops are grown. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help control erosion, reduce crusting, improve soil tilth, and increase the infiltration of water.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing or grazing when the soil is wet causes surface compaction, excessive runoff, and poor tilth. Pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main concern in management. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying.

This soil is moderately limited for use as building sites because of its shrink-swell potential and slope. Foundations, footings, and basement walls should be strengthened and backfilled with coarser material to help prevent structural damage by the shrinking and swelling of the soil. Existing vegetation should be disturbed as little as possible during construction, and disturbed areas should be revegetated as soon as possible to reduce erosion. Buildings should be designed to conform to the slope. This soil is severely limited for local roads and streets because of low strength. The road base should be strengthened or replaced with suitable material to support vehicular traffic. This soil is moderately limited for septic tank absorption fields because of its moderate permeability and slope. Absorption fields can be enlarged to compensate for the moderate permeability. The absorption lines should be placed on the contour to offset the slope.

This soil is in capability subclass IIIe and in woodland suitability subclass 1o.

MfD2—Miami loam, 12 to 18 percent slopes, eroded. This is a strongly sloping, deep, well drained soil on upland moraines and along breaks between the uplands and terraces or bottom lands. The areas are long and narrow and range from 2 to 10 acres in size.

Typically, the surface layer is brown loam about 8 inches thick. The subsoil is yellowish brown, firm clay loam and loam about 18 inches thick. The underlying material to a depth of 60 inches is yellowish brown loam. In some areas the surface layer and subsoil are less than 24 inches thick at the crest of the slope. In places north of the Eel River, the underlying material is moderately permeable. In some places the subsoil has less clay. In places the slope is less than 12 percent, and in other places it is more than 18 percent.

Included with this soil in mapping are small areas where the soil is severely eroded and the surface layer is clay loam. Also included are small breaks where the slope is more than 25 percent and small areas of excessively drained Chelsea soils on the crest of knobs and well drained Hennepin soils on steep breaks. Hennepin soils are not so deep above the underlying material as the Miami soil. The included soils make up 2 to 8 percent of the map unit.

The available water capacity of this soil is high. Permeability is moderate or moderately slow. Surface runoff is rapid. The surface layer has a moderate content of organic matter, and it is friable. Tilth is fair.

This soil is used mainly for hay or pasture. In some areas it is used for cultivated crops. Many areas have been left wooded or are being left to reforest.

This soil is poorly suited to corn, soybeans, and small grains. It has a few cobbles and stones on or near the surface that can hinder farming operations. A crop rotation that includes meadow and small grains, diversions, contour farming, grassed waterways, or other conservation practices help to control erosion and reduce runoff if cultivated crops are grown. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help control erosion, reduce crusting, improve soil tilth, and increase the infiltration of water.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing or grazing when the soil is wet causes surface compaction, excessive runoff, and poor tilth. Pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main concern in management. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying.

This soil is severely limited for use as building sites and local roads and streets because of slope. Buildings should be designed to conform to the slope. Cutting and filling may be needed for buildings and roads. Roads should be built on the contour where possible. Existing vegetation should be disturbed as little as possible during construction, and disturbed areas should be revegetated as soon as possible to reduce erosion. This soil is severely limited for septic tank absorption fields because of slope and the moderately slow permeability. Installing the absorption lines on the contour helps to offset the slope. Absorption fields should be enlarged to compensate for the moderately slow permeability.

This soil is in capability subclass IVe and in woodland suitability subclass 1o.

MfE2—Miami loam, 18 to 25 percent slopes, eroded. This is a moderately steep, deep, well drained soil on upland moraines along breaks between the uplands and terraces or bottom lands. The areas are long and narrow and range from 2 to 10 acres in size.

Typically, the surface layer is dark brown loam about 6 inches thick. The subsoil is dark yellowish brown and yellowish brown, firm clay loam and loam about 20 inches thick. The underlying material to a depth of 60 inches is yellowish brown loam. In some areas the surface layer and subsoil are less than 24 inches thick. In some areas north of the Eel River, the underlying material is moderately permeable. In places the subsoil has less clay. In places the slope is less than 18 percent or more than 25 percent.

Included with this soil in mapping are small areas where the soil is severely eroded and the surface layer is clay loam. Also included are small areas of well drained Hennepin soils on breaks. Hennepin soils are not so deep to the underlying material as the Miami soil. The included soils make up 2 to 10 percent of the map unit.

The available water capacity of this soil is high. Permeability is moderate or moderately slow. Surface runoff is rapid. The surface layer has a moderate content of organic matter, and it is friable. Tilth is fair.

This soil is used mainly for hay or pasture. In a few areas it is used for cultivated crops. Many areas have been left wooded or are being left to reforest.

This soil generally is not suited to cultivated crops. Runoff and erosion are severe hazards if this soil is used for cultivated crops. The steepness of the slopes makes it difficult to use most kinds of farm machinery.

This soil is suited to grasses and legumes for hay or pasture. The use of some types of equipment on the steep slopes can be hazardous. Overgrazing or grazing when the soil is wet causes surface compaction, excessive runoff, erosion, and poor tilth. Pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is suited to trees. Plant competition, the hazard of erosion, and equipment limitations are the main concerns in management. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying. Because erosion is a hazard on this soil the use of heavy equipment should be restricted. The types of equipment that can be used safely are limited.

This soil generally is not suitable for use as building sites and sanitary facilities because of the slope. It is severely limited for local roads also because of the slope. Cutting and filling are needed, and roads should be built on the contour where possible. Side ditches and culverts for drainage help reduce erosion. Areas disturbed during construction should be revegetated as soon as possible.

This soil is in capability subclass VIe and in woodland suitability subclass 1r.

MhB2—Miami silt loam, 2 to 6 percent slopes, eroded. This is a gently sloping, deep, well drained soil on upland till plains and moraines. The areas are irregular in shape and range from 2 to 25 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsoil is about 27 inches thick. The upper part is yellowish brown, firm silty clay loam. The lower part is yellowish brown, firm clay loam. The underlying material to a depth of 60 inches is

yellowish brown loam. In places the wind-deposited silt is as much as 24 inches thick. In places the surface layer and subsoil are more than 40 inches thick. In some places some layers of the subsoil are more than 35 percent clay. In some areas the slope is more than 6 percent.

Included with this soil in mapping are small areas where the soil is severely eroded and the surface layer is clay loam. Also included are small breaks where the slope is more than 12 percent and small areas of somewhat poorly drained Crosby and Fincastle soils on foot slopes, along narrow waterways, and on small flats. The included soils make up 4 to 12 percent of the map unit.

The available water capacity of this soil is high. Permeability is moderately slow. Surface runoff is medium. The surface layer has a moderate content of organic matter, and it is friable. Tilth is fair.

This soil is used mainly for cultivated crops. In some areas it is used for hay or pasture. A few areas have been left as woodland.

This soil is well suited to corn, soybeans, and small grains. Crop rotation, terraces, diversions, contour farming, grassed waterways, grade stabilization structures, or other conservation practices help to control erosion and reduce runoff if cultivated crops are grown. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help control erosion, reduce crusting, improve soil tilth, and increase the infiltration of water.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing or grazing when the soil is wet causes surface compaction, excessive runoff, and poor tilth. Pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main concern in management. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying.

This soil is moderately limited for use as building sites because of its shrink-swell potential. Foundations, footings, and basement walls should be strengthened. Backfilling with coarser material helps prevent structural damage by the shrinking and swelling of the soil. Existing vegetation should be disturbed as little as possible during construction, and disturbed areas should be revegetated as soon as possible to reduce erosion. This soil is moderately limited for local roads and streets because of frost action and low strength. The road base should be strengthened or replaced with suitable material to support vehicular traffic. Providing drainage along roads helps prevent damage by frost action. This soil is severely limited for septic tank absorption fields because of the moderately slow permeability. Absorption fields should be enlarged to compensate for the moderately slow permeability.

This soil is in capability subclass IIe and in woodland suitability subclass 1o.

MhC2—Miami silt loam, 6 to 12 percent slopes, eroded. This is a moderately sloping, deep, well drained soil on upland till plains and moraines and on breaks along drainageways. The areas are irregular in shape and range from 2 to 20 acres in size.

Typically, the surface layer is brown silt loam about 8 inches thick. The subsoil is dark yellowish brown, firm clay loam about 24 inches thick. The underlying material to a depth of 60 inches is yellowish brown loam. In places the wind-deposited silt is as much as 18 inches thick. In places the surface layer and subsoil are more than 40 inches thick. In some areas the subsoil has more clay. In places the slope is less than 6 percent or more than 12 percent.

Included with this soil in mapping are small areas where the soil is severely eroded and the surface layer is clay loam. Also included are small breaks where the slope is more than 18 percent. Also included are small areas of the somewhat poorly drained Crosby and Fincastle soils on foot slopes and along small drainageways. The included soils make up 2 to 10 percent of the map unit.

The available water capacity of this soil is high. Permeability is moderately slow. Surface runoff is medium. The surface layer has a moderate content of organic matter, and it is friable. Tilth is fair.

This soil is used mainly for cultivated crops. In many areas it is used for hay or pasture. A few areas have been left as woodland.

This soil is suited to corn, soybeans, and small grains. Terraces, diversions, contour farming, grassed waterways, grade stabilization structures, and a crop rotation that includes small grains and meadow help control erosion and runoff if cultivated crops are grown. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help control erosion, reduce crusting, improve soil tilth, and increase the infiltration of water.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing or grazing when the soil is wet causes surface compaction, excessive runoff, and poor tilth. Pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main concern in management. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying.

This soil is moderately limited for use as building sites because of the shrink-swell potential and slope. Foundations, footings, and basement walls should be

strengthened. Backfilling with coarser material helps prevent structural damage caused by the shrinking and swelling of the soil. Existing vegetation should be disturbed as little as possible during construction, and disturbed areas should be revegetated as soon as possible to reduce erosion. Buildings should be designed to conform to the slope. This soil is moderately limited for local roads and streets because of slope, frost action, and low strength. Local roads and streets should be graded, and the road base should be strengthened or replaced with suitable material to support vehicular traffic. Providing drainage along roads helps prevent damage by frost action. This soil is severely limited for septic tank absorption fields because of the moderately slow permeability. Absorption fields should be enlarged to compensate for the moderately slow permeability. Absorption lines should be placed on the contour for even distribution of the effluent.

This soil is in capability subclass IIIe and in woodland suitability subclass 1o.

MkC3—Miami clay loam, 6 to 12 percent slopes, severely eroded. This is a moderately sloping, deep, well drained soil on upland till plains and moraines and on breaks along drainageways. The areas are oval or irregular in shape and range from 2 to 10 acres in size.

Typically, the surface layer is dark yellowish brown clay loam about 9 inches thick. The subsoil is dark yellowish brown and yellowish brown, firm clay loam about 18 inches thick. The underlying material to a depth of 60 inches is yellowish brown loam. In places the surface layer and subsoil are less than 24 inches thick. In some areas the soil is very severely eroded, and the underlying material is exposed at plow depth. In places the slope is less than 6 percent or more than 12 percent.

Included with this soil in mapping are small breaks where the slope is more than 18 percent. Also included are small areas of somewhat poorly drained Crosby soils on foot slopes and in waterways. The included soils make up 2 to 10 percent of the map unit.

The available water capacity of this soil is high. Permeability is moderately slow. Surface runoff is rapid. The surface layer has a low content of organic matter, and it is firm. Tilth is poor.

This soil is used mainly for cultivated crops. In many areas it is used for hay or pasture. A few areas are being left to reforest.

This soil is poorly suited to corn, soybeans, and small grains. The clay loam surface layer is difficult to plow and work into a suitable seedbed. It dries out slowly and forms hard clods as it dries. This soil has a few stones on or near the surface that can hinder farming operations. Small grains and meadow in rotation and other conservation practices including terraces, diversions, contour farming, grassed waterways, and grade stabilization structures help to control erosion and reduce runoff if cultivated crops are grown. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help control erosion, reduce crusting, improve soil tilth, and increase the infiltration of water.

This soil is suited to grasses and legumes for hay or pasture. Overgrazing or grazing when the soil is wet causes severe surface compaction, excessive runoff, and poor tilth. Pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main concern in management. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying.

This soil is moderately limited for use as building sites because of slope and the shrink-swell potential. Foundations, footings, and basement walls should be strengthened. Backfilling with coarser material helps prevent structural damage caused by the shrinking and swelling of the soil. Existing vegetation should be disturbed as little as possible during construction, and disturbed areas should be revegetated as soon as possible to reduce erosion. Buildings should be designed to conform to the slope. This soil is moderately limited for local roads and streets because of slope, frost action, and low strength. Local roads and streets should be graded, and the road base should be strengthened or replaced with suitable material to support vehicular traffic. Providing drainage along roads helps prevent damage by frost action. This soil is severely limited for septic tank absorption fields because of the moderately slow permeability. Absorption fields should be enlarged to compensate for the moderately slow permeability. Absorption lines should be placed on the contour for even distribution of the effluent.

This soil is in capability subclass IVe and in woodland suitability subclass 1o.

MkD3—Miami clay loam, 12 to 25 percent slopes, severely eroded. This is a strongly sloping and moderately steep, deep, well drained soil on upland moraines and on breaks between uplands and terraces on bottom lands along drainageways. The areas are long and narrow or irregular in shape and range from 2 to 15 acres in size.

Typically, the surface layer is dark yellowish brown clay loam about 7 inches thick. The subsoil is yellowish brown, firm clay loam about 18 inches thick. The underlying material to a depth of 60 inches is yellowish brown loam. In places the surface layer and subsoil are less than 24 inches thick. In some places the soil is very severely eroded, and the underlying material is exposed at plow depth. In places north of the Eel River, this soil is underlain by moderately permeable material. In places

the slope is less than 12 percent or more than 25 percent.

Included with this soil in mapping are small areas of somewhat poorly drained Crosby soils on foot slopes and along narrow drainageways. Also included are small areas of well drained Hennepin soils on the steep breaks. Hennepin soils are not so deep to the underlying material as the Miami soil. The included soils make up 2 to 8 percent of the map unit.

The available water capacity of this soil is high. Permeability is moderately slow. Surface runoff is rapid. The surface layer has a low content of organic matter, and it is firm. Tilth is poor.

This soil is used mainly for hay or pasture. In many areas it is used for cultivated crops. A few areas are being left to reforest.

This soil generally is not suited to cultivated crops. Runoff and erosion are major hazards if this soil is used for cultivated crops.

This soil is suited to grasses and legumes for hay or pasture. The use of some types of equipment on this soil can be hazardous. Overgrazing or grazing when the soil is wet causes surface compaction, excessive runoff, and poor tilth. Pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main concern in management. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying.

This soil is severely limited for use as building sites and local roads and streets because of slope. Buildings can be designed to conform to the slope. Cutting and filling may be necessary for buildings and roads. Roads should be built on the contour where possible. Existing vegetation should be disturbed as little as possible during construction, and disturbed areas should be revegetated as soon as possible to reduce erosion. This soil is severely limited for septic tank absorption fields because of slope and the moderately slow permeability. Installing the absorption lines on the contour helps to offset the slope. Absorption fields should be enlarged to compensate for the moderately slow permeability.

This soil is in capability subclass VIe and in woodland suitability subclass 1o.

MIC3—Miami clay loam, moderately permeable substratum, 6 to 12 percent slopes, severely eroded. This is a moderately sloping, deep, well drained soil on upland till plains and moraines and on breaks along drainageways. The areas are oval or irregular in shape and range in size from 2 to 15 acres.

Typically, the surface layer is dark brown clay loam about 8 inches thick. The subsoil is yellowish brown, firm clay loam and loam about 18 inches thick. The underlying material to a depth of 60 inches is yellowish brown loam. In places the surface layer and subsoil are less than 24 inches thick. In some areas the soil is very severely eroded, and the underlying material is exposed at plow depth. In places the slope is less than 6 percent or more than 12 percent.

Included with this soil in mapping are small breaks where the slope is more than 18 percent. Also included are small areas of somewhat poorly drained Crosier soils on foot slopes and in waterways. The included soils make up 2 to 6 percent of the map unit.

The available water capacity of this soil is high. Permeability is moderate. Surface runoff is rapid. The surface layer has a low content of organic matter, and it is firm. Tilth is poor.

This soil is used mainly for cultivated crops. In some areas it is used for hay or pasture. A few areas are being left to reforest.

This soil is suited to corn, soybeans, and small grains. The clay loam surface layer makes the soil difficult to plow and work into a suitable seedbed, because it dries out slowly and forms hard clods as it dries. This soil has a few stones on or near the surface that can hinder some farming operations. Small grains and meadow in a crop rotation and terraces, diversions, contour farming, grassed waterways, grade stabilization structures, or other conservation practices help to reduce erosion and control runoff if cultivated crops are grown. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help control erosion, reduce crusting, improve soil tilth, and increase the infiltration of water.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing or grazing when the soil is wet causes surface compaction, excessive runoff, and poor tilth. Pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main concern in management. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying.

This soil is moderately limited for use as building sites because of slope and the shrink-swell potential. Foundations, footings, and basement walls should be strengthened. Backfilling with coarse material helps prevent structural damage caused by the shrinking and swelling of the soil. Some grading is necessary to prepare building sites. Existing vegetation should be disturbed as little as possible during construction, and disturbed areas should be revegetated as soon as possible to reduce erosion. This soil is moderately limited for local roads and streets because of slope, frost action, and low strength. Some grading is necessary in constructing roads. The road base should be strengthened or replaced with suitable material to support vehicular traffic. Providing drainage along roads

helps prevent damage by frost action. This soil is moderately limited for septic tank absorption fields because of the moderate permeability and slope. Making the filter field larger helps to compensate for the moderate permeability. Placing the absorption lines on the contour helps distribute the effluent evenly over the entire absorption field.

This soil is in capability subclass IVe and in woodland suitability subclass 1o.

Mm—Milford silty clay loam. This is a nearly level, deep, very poorly drained soil in deep depressions and small glacial lake beds on uplands, outwash plains, and terraces. This soil is often ponded by surface runoff from adjacent higher soils. The areas are irregular in shape and range from 3 to 30 acres in size.

Typically, the surface layer is very dark brown silty clay loam about 8 inches thick. The subsurface layer is very dark brown silty clay loam about 7 inches thick. The subsoil is silty clay about 22 inches thick. The upper part is very dark brown and dark gray, mottled, firm silty clay, and the lower part is dark gray, mottled, firm silty clay loam. The underlying material to a depth of 60 inches is gray and grayish brown silt loam. In places the surface layer is dark grayish brown silt loam. In places the dark color of the surface layer extends to a depth of less than 10 inches. In many places the underlying material has thin strata of loamy fine sand or fine sand. In some areas the underlying material within a depth of 48 inches is glacial till.

Included with this soil in mapping are soils in small undrained areas in depressions. These soils are wet most of the year. Also included are soils that have a thin layer of muck on the surface. These soils are in small areas in depressions. Also included are small areas of very poorly drained Brookston and Sebewa soils, which are less clayey than the Milford soil, on slight rises and very poorly drained, organic Houghton, Martisco, and Palms soils in deep depressions. The included soils make up 5 to 15 percent of the map unit.

The available water capacity of this soil is high. Permeability is moderately slow. The water table is at or above the surface in winter and spring. Surface runoff is very slow or ponded. The surface layer has a high content of organic matter, and it is firm. Tilth is fair.

In most areas, this soil has been drained and is used for cultivated crops. In a few areas it is used for hay or pasture. Most undrained areas are wooded.

This soil is well suited to corn, soybeans, and small grains if it is adequately drained. Wetness is the major limitation, and ponding is the major hazard. Most crops grow poorly in undrained areas. If adequate outlets are available, shallow surface drains and subsurface drains can be used to remove excess water. If subsurface drains are installed below a depth of 3 feet, there is a hazard of encountering a thin layer of fine sand that can flow into the drain and plug it. Adequate outlets are difficult to find in some areas. The silty clay loam surface layer is difficult to work into a suitable seedbed. If the soil is plowed when it is wet, hard clods that are difficult to break up form as the soil dries. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops reduce crusting, improve soil tilth, and increase the infiltration of water.

This soil is suited to grasses and legumes for hay or pasture if it is adequately drained. Deep-rooted legumes such as alfalfa grow poorly in inadequately drained areas because they cannot tolerate ponding or a high water table. Legumes can be damaged even if the area is ponded for only brief periods. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is not rated for use as woodland. Drained areas are used for crops. Generally, trees are planted only for windbreaks.

This soil generally is not suited to use as building sites and to sanitary facilities because of ponding. It is severely limited for roads because of low strength, ponding, and frost action. Constructing roads on raised and well compacted fill material and providing side ditches and culverts for drainage help to prevent the damage caused by frost action.

This soil is in capability subclass IIw. It was not assigned to a woodland suitability subclass.

Mp—Millsdale silty clay loam. This is a nearly level, moderately deep, very poorly drained soil in depressions on limestone terraces. In places it is often ponded by runoff from adjacent higher areas. The areas of this map unit are irregular in shape and range from 3 to 50 acres in size.

Typically, the surface layer is black silty clay loam about 8 inches thick. The subsurface layer is black silty clay about 5 inches thick. The subsoil is about 23 inches thick. The upper part is very dark gray, mottled, firm clay, and the lower part is dark gray and gray, mottled, firm silty clay. The underlying material is limestone bedrock. In places the dark color of the surface layer extends to a depth of less than 10 inches. In places the depth to bedrock is more than 40 inches or less than 20 inches.

Included with this soil in mapping are soils in small undrained depressions. These soils are wet most of the year. Also included are soils that have a thin layer of muck on the surface. These soils are in small areas in deep depressions. Also included are well drained Milton soils and somewhat poorly drained Randolph soils in small areas on slight rises. The included soils make up 2 to 8 percent of the map unit.

The available water capacity of this soil is moderate. Permeability is moderately slow. The water table is at or above the surface in winter and early in spring. Surface

runoff is very slow or ponded. The surface layer has a high content of organic matter, and it is firm. Tilth is fair.

In most areas, this soil has been drained and is used for cultivated crops. In a few areas it is used for hay or pasture. Most undrained areas are left as woodland.

This soil is suited to corn, soybeans, and small grains if it is adequately drained. Wetness is the major limitation, and ponding is the major hazard. It is difficult to grow crops in undrained areas. If adequate outlets are available, shallow surface drains and subsurface drains can be used to remove excess water. In many areas, bedrock interferes with the installation of subsurface drains. The silty clay loam surface layer is difficult to work into a suitable seedbed. If the soil is plowed when it is wet, hard clods that are difficult to break up form as the soil dries. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops reduce crusting, improve soil tilth, and increase the infiltration of water.

This soil is suited to grasses and legumes for hay or pasture if it is adequately drained. Deep-rooted legumes such as alfalfa grow poorly in inadequately drained areas because they cannot tolerate ponding or a high water table. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is suited to trees. Plant competition, seedling mortality, a windthrow hazard, and limitations on the use of equipment are concerns in management. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying. Replanting is often necessary to establish a good stand. Care in thinning or no thinning at all can help prevent windthrow. In harvesting, trees should not be left standing alone or widely spaced. Trees generally are harvested in dry seasons or when the ground is frozen.

This soil generally is not suited to use as building sites and to sanitary facilities because of ponding. It is severely limited for roads because of low strength, ponding, and frost action. Constructing roads on raised and well compacted fill material and providing side ditches and culverts for drainage help to prevent the damage caused by frost action.

This soil is in capability subclass IIIw and in woodland suitability subclass 2w.

MsA—Milton silt loam, 0 to 2 percent slopes. This is a nearly level, moderately deep, well drained soil on limestone terraces. The areas are irregular in shape and range from 3 to 50 acres in size.

Typically, the surface layer is dark brown silt loam about 5 inches thick. The subsurface layer is brown silt loam about 2 inches thick. The subsoil is about 31 inches thick. The upper part is dark yellowish brown, brown, and dark brown, firm clay loam and clay. The lower part is olive, friable silt loam. The underlying material is limestone bedrock. In places the bedrock is at a depth of more than 40 inches, and in other places it is at a depth of less than 20 inches, or it outcrops at the surface. In places the subsoil is gravelly clay loam. In places the slope is more than 2 percent.

Included with this soil in mapping are small areas of soils on short slopes at the edge of terraces or along drainageways, a few areas of soils that have a gravelly or stony surface layer, and small areas of very poorly drained Millsdale soils and somewhat poorly drained Randolph soils in slightly lower positions than those of the Milton soil and in drainageways. Also included in mapping are well drained Milton Variant soils, which have more coarse fragments than the Milton soil, on steep breaks. The included soils make up 8 to 20 percent of the map unit.

The available water capacity of this soil is moderate. Permeability is moderately slow. Surface runoff is slow. The surface layer has a moderate content of organic matter, and it is friable. Tilth is good.

This soil is used mainly for cultivated crops. In a few areas it is used for hay, pasture, or woodland.

This soil is suited to corn, soybeans, and small grains. It has a few stones and rock outcrops that can hinder farming operations. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help reduce evaporation and crusting, improve soil tilth, and increase the infiltration of water.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main concern in management. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying.

This soil is severely limited for dwellings with basements because of the moderate depth to bedrock. It is moderately limited for dwellings without basements because of the depth to bedrock and the shrink-swell potential. Foundations, footings, and basement walls should be strengthened. Backfilling with coarser material helps prevent structural damage caused by the shrinking and swelling of the soil. Excavation of rock is necessary if basements are built. The soil is severely limited for local roads and streets because of low strength. The road base should be strengthened or replaced with suitable material to support vehicular traffic. The moderate depth to bedrock and the moderately slow permeability severely limit this soil for septic tank absorption fields. Filling or mounding the septic tank absorption field with suitable fill material and elevating the absorption field help offset these limitations.

This soil is in capability subclass IIs and in woodland suitability subclass 2o.

MsB2—Milton silt loam, 2 to 6 percent slopes, eroded. This is a gently sloping, moderately deep, well drained soil on limestone terraces along the Wabash River. The areas are irregular in shape and range from 3 to 35 acres in size.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The subsoil is about 25 inches thick. The upper part is dark yellowish brown, firm clay loam, and the lower part is olive brown, friable silt loam. The underlying material is weathered limestone and limestone bedrock. In places bedrock is at a depth of more than 40 inches, and in places it is at a depth of less than 20 inches. In places the subsoil is gravelly clay loam. In places the slope is less than 2 percent or more than 6 percent.

Included with this soil in mapping are areas of soils on short steep slopes at the edge of the terraces or along drainageways and some areas of soils that have a gravelly or stony surface layer. Also included are small areas of well drained Milton Variant soils, which have more coarse fragments than the Milton soil, on steep breaks and areas of somewhat poorly drained Randolph soils in slightly lower positions than those of the Milton soil and in drainageways. The included soils make up 8 to 20 percent of the map unit.

The available water capacity of this soil is moderate. Permeability is moderately slow. Surface runoff is medium. The surface layer has a moderate content of organic matter, and it is friable. Tilth is fair.

This soil is used mainly for cultivated crops. In a few areas it is used for hay or as pasture or woodland.

This soil is well suited to corn, soybeans, and small grains. It has a few stones and rock outcrops that can hinder farming operations. Erosion is the major hazard. Crop rotation, diversions, contour farming, grassed waterways, and other conservation practices help to reduce soil erosion and control runoff if cultivated crops are grown. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help control erosion, reduce crusting, improve soil tilth, and increase infiltration of the water.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing or grazing when the soil is wet causes surface compaction, excessive runoff, and poor tilth. Pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main concern in management. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying.

This soil is severely limited for dwellings with basements because of the moderate depth to bedrock. It is moderately limited for dwellings without basements because of the depth to bedrock and the shrink-swell potential. Foundations, footings, and basement walls need to be strengthened. Backfilling with coarser material helps prevent structural damage caused by the shrinking and swelling of the soil. Excavation of rock is necessary for the construction of basements. This soil is severely limited for local roads and streets because of low strength. The road base should be strengthened or replaced with suitable material to support vehicular traffic. The moderate depth to bedrock and the moderately slow permeability severely limit the use of this soil for septic tank absorption fields. Filling or mounding the absorption field with suitable fill material and elevating the absorption field help to offset these limitations.

This soil is in capability subclass IIe and in woodland suitability subclass 2o.

MsC2—Milton silt loam, 6 to 12 percent slopes, eroded. This is a moderately sloping, moderately deep, well drained soil on the breaks of limestone terraces along the Wabash River. The areas are irregular in shape and range from 3 to 10 acres in size.

Typically, the surface is brown silt loam about 7 inches thick. The subsoil is about 19 inches thick. The upper part is dark yellowish brown, firm clay loam, and the lower part is yellowish brown, friable silt loam. The underlying material is limestone bedrock. In places the depth to bedrock is less than 20 inches. In places the subsoil is gravelly clay loam. In places the slope is less than 6 percent, or it is more than 12 percent.

Included with this soil in mapping are small areas of limestone bedrock outcrops, small areas of soils that have a stony or gravelly surface layer, and a few areas of soils that are severely eroded and have a clay loam surface layer. Also included are soils on short steep slopes at the edge of the terraces or along drainageways, small areas of well drained Milton Variant soils, which have more coarse fragments than the Milton soil, on steep breaks, and somewhat poorly drained Randolph soils on foot slopes or in drainageways. The included soils make up 2 to 12 percent of the map unit.

The available water capacity of this soil is moderate. Permeability is moderately slow. Surface runoff is medium. The surface layer has a moderate content of organic matter, and it is friable. Tilth is fair.

This soil is used mainly for hay or pasture. In some areas it is used for cultivated crops or as woodland.

This soil is suited to corn, soybeans, and small grains. It has stones and rock outcrops that can hinder farming operations. Erosion is a major hazard because it can remove the soil and expose the underlying bedrock. Crop rotation, diversions, contour farming, grassed waterways, or other conservation practices help reduce erosion and control runoff if cultivated crops are grown. Conservation tillage that leaves a protective amount of

crop residue on the surface and cover crops help control erosion, reduce crusting, improve soil tilth, and increase the infiltration of water.

This soil is suited to grasses and legumes for hay or pasture. Overgrazing or grazing when the soil is wet causes surface compaction, increased runoff, and poor tilth. Pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main concern in management. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying.

This soil is severely limited for dwellings with basements because of the moderate depth to bedrock. It is moderately limited for dwellings without basements because of the depth to bedrock, the shrink-swell potential, and slope. Foundations, footings, and basement walls should be strengthened. Backfilling with coarser material helps prevent structural damage caused by the shrinking and swelling of the soil. Excavation of rock is necessary for the construction of basements. Buildings can be designed to conform to the slope. Low soil strength is a severe limitation for local roads and streets. The road base should be strengthened or replaced with suitable material to support vehicular traffic. The moderate depth to bedrock and the moderately slow permeability are severe limitations to the use of this soil for septic tank absorption fields. Filling or mounding the absorption field with suitable fill material and elevating the absorption field help to overcome these limitations.

This soil is in capability subclass IIIe and in woodland suitability subclass 2o.

MtG—Milton Variant silt loam, 30 to 70 percent slopes. This is a very steep, moderately deep, well drained soil on limestone breaks between terraces and bottom lands along the Wabash River. The areas are long and narrow and range from 2 to 15 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 2 inches thick. The subsurface layer is dark brown silt loam about 2 inches thick. The subsoil is dark yellowish brown, friable very flaggy silt loam about 18 inches thick. The underlying material is limestone bedrock. In many places the surface layer is as much as 50 percent coarse fragments.

Included with this soil in mapping are limestone rock outcrops. Also included are some cliffs and escarpments. In some areas there are springs and seeps that issue from the rock and waterfalls where small streams break over the limestone terraces (fig. 13). Also included are small areas of well drained Milton soils, which have fewer coarse fragments than the Milton Variant soil, on narrow ridges or on foot slopes. The included areas make up 8 to 20 percent of the map unit.

The available water capacity of this soil is very low. Permeability is moderate. Surface runoff is very rapid. The surface layer has a moderate content of organic matter, and it is friable.

This soil is used mainly as woodland. In a few areas it is used as pasture.

This soil is not suited to cultivated crops. Erosion is a severe hazard, and the use of equipment is limited on the steep slopes.

This soil generally is not suited to grasses and legumes for pasture and hay. The slope and stoniness limit the use of equipment on this soil. The very low available water capacity and the severe hazard of erosion limit the kinds of grasses and legumes that can be grown.

This soil is poorly suited to trees. Seedling mortality, equipment limitations, and erosion are concerns in management. Replanting is often necessary to establish a good stand. The steep slopes and the stones limit the types of equipment that can be used safely on this soil.

This soil generally is not suitable for use as building sites or for sanitary facilities because of slope and large stones. This soil is severely limited for local roads because of slope and large stones. Cutting and filling are needed, and roads should be built on the contour where possible. The excavation of large stones may require special equipment. Providing side ditches and culverts for drainage helps prevent erosion. Areas disturbed during construction should be revegetated as soon as possible.

This soil is in capability subclass VIIe and in woodland suitability subclass 3r.

MvC2—Morley silt loam, 7 to 12 percent slopes, eroded. This is a moderately sloping, deep, well drained soil on upland till plains and moraines. The areas are irregular in shape and range from 3 to 20 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 6 inches thick. The subsoil is about 21 inches thick. The upper part is yellowish brown, friable silt loam, and the lower part is dark yellowish brown, firm clay loam. The underlying material to a depth of 60 inches is yellowish brown, very firm clay loam. In places the surface layer and subsoil are less than 20 inches thick. In places there is a mantle of loamy sediment as much as 30 inches thick over glacial till. In places the slope is less than 7 percent or more than 12 percent.

Included with this soil in mapping are small areas where the soil is severely eroded and the surface layer is clay loam and soils on small breaks where the slope is more than 18 percent. Also included are small areas of somewhat poorly drained Blount soils on foot slopes and along narrow drainageways and well drained Hennepin soils, which have less clay than the Morley soil, on the steep breaks. The included soils make up 4 to 15 percent of the map unit.

Figure 13.—Milton Variant silt loam, 30 to 70 percent slopes, is underlain by thin-layered limestone bedrock.

The available water capacity of this soil is moderate. Permeability is slow. Surface runoff is medium. The surface layer has a moderate content of organic matter, and it is friable. Tilth is fair.

This soil is used mainly for hay or as pasture or woodland. In some areas it is used for cultivated crops.

This soil is suited to corn, soybeans, and small grains. It has a few stones on or near the surface that can hinder farming operations. Crop rotation, terraces, diversions, contour farming, grassed waterways, grade stabilization structures, or other conservation practices help to control erosion and reduce runoff if cultivated crops are grown. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help control erosion, reduce crusting, improve soil tilth, and increase the infiltration of water.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing or grazing when the soil is wet causes surface compaction, excessive runoff, and poor tilth. Pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main concern in management. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying.

This soil is moderately limited for use as building sites because of the shrink-swell potential and slope. Foundations, footings, and basement walls should be strengthened. Backfilling with coarser material helps prevent structural damage caused by the shrinking and swelling of the soil. Buildings can be designed to conform to the slope. Existing vegetation should be disturbed as little as possible during construction, and disturbed areas should be revegetated as soon as possible to reduce erosion. Low strength severely limits this soil for local roads and streets. The base material for roads needs to be strengthened or replaced with more suitable material to support vehicular traffic. This soil is severely limited for septic tank absorption fields because of the slow permeability. Filling or mounding the absorption field with suitable fill material and elevating the absorption field help offset the slow permeability.

This soil is in capability subclass IIIe and in woodland suitability subclass 2o.

MvD2—Morley silt loam, 12 to 18 percent slopes, eroded. This is a strongly sloping, deep, well drained soil on breaks between uplands and terraces or bottom lands and also on uplands and moraines. The areas are long and narrow and range from 2 to 10 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 5 inches thick. The subsoil is dark yellowish brown and yellowish brown, firm clay loam about 20 inches thick. The underlying material to a depth of 60 inches is yellowish brown clay loam. In places the surface layer and subsoil are less than 20 inches thick. In some areas there is a mantle of loamy sediment as much as 24 inches thick over glacial till. In places the slope is less than 12 percent or more than 18 percent.

Included with this soil in mapping are small areas where the soil is severely eroded and the surface layer is clay loam and soils on small breaks where the slope is more than 25 percent. Also included are small areas of somewhat poorly drained Blount soils along small waterways and well drained Hennepin soils, which have less clay than the Morley soil, on the steep breaks. The included soils make up 2 to 12 percent of the map unit.

The available water capacity of this soil is moderate. Permeability is slow. Surface runoff is rapid. The surface layer has a moderate content of organic matter, and it is friable. Tilth is fair.

This soil is used mainly for hay or pasture. In a few areas it is used for cultivated crops. Many areas are wooded or are being left to reforest.

This soil is poorly suited to corn, soybeans, and small grains. It has a few stones on or near the surface that can hinder farming operations. Meadow and small grains in a crop rotation, diversions, grassed waterways, or similar conservation practices help to reduce erosion and runoff. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help control erosion, reduce crusting, improve soil tilth, and increase the infiltration of water.

This soil is suited to grasses and legumes for hay or pasture. Overgrazing or grazing when the soil is wet causes surface compaction, excessive runoff, and poor tilth. Pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is suited to trees. Plant competition, erosion, and equipment limitations are concerns in management. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying. The use of heavy equipment should be restricted because of the hazard of erosion. The type of equipment that can be used safely on this soil is limited.

This soil is severely limited for use as building sites because of slope. Buildings should be designed to conform to the slope. Land shaping and retaining walls can modify the slope. Existing vegetation should be disturbed as little as possible during construction, and disturbed areas should be revegetated as soon as possible to reduce erosion. This soil is severely limited for local roads and streets because of slope and low strength. Cutting and filling may be needed, and roads should be built on the contour where possible. The base material for roads needs to be strengthened or replaced with more suitable material to support vehicular traffic. This soil is severely limited for septic tank absorption fields because of slope and the slow permeability. Installing the absorption lines on the contour helps to

overcome the slope. Filling or mounding the septic tank absorption field with suitable fill material and elevating the absorption field help to offset the slow permeability.

This soil is in capability subclass IVe and in woodland suitability subclass 2r.

MvE2—Morley silt loam, 18 to 25 percent slopes, eroded. This is a moderately steep, deep, well drained soil on breaks between the uplands and terraces or bottom lands and also on upland moraines. The areas are long and narrow and range from 2 to 10 acres in size.

Typically, the surface layer is brown silt loam about 5 inches thick. The subsoil is yellowish brown and dark yellowish brown, firm clay loam about 17 inches thick. The underlying material to a depth of 60 inches is yellowish brown clay loam. In places the surface layer and subsoil are less than 20 inches thick. In places the slope is less than 18 percent or more than 25 percent.

Included with this soil in mapping are small areas where the soil is severely eroded and the surface layer is clay loam and soils on small breaks where the slope is more than 35 percent. Also included are small areas of well drained Hennepin soils, which have less clay than the Morley soil, on the steep breaks. The included soils make up 2 to 8 percent of the map unit.

The available water capacity of this soil is moderate. Permeability is slow. Surface runoff is rapid. The surface layer has a moderate content of organic matter, and it is friable. Tilth is fair.

This soil is used mainly as woodland. In some areas it is used for hay or pasture. In a few areas it is used for cultivated crops. Some areas that were cleared are being left to reforest.

This soil generally is not suited to cultivated crops. Erosion is the major hazard if this soil is used for cultivated crops. The steepness of slopes makes it difficult to use most types of equipment.

This soil is poorly suited to grasses and legumes for hay or pasture. The type of equipment that can be used safely is limited. Overgrazing or grazing when the soil is too wet causes surface compaction, increased runoff, and poor tilth. Pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is suited to trees. Plant competition, erosion, and equipment limitations are concerns in management. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying. The use of heavy equipment should be restricted because of the hazard of erosion.

This soil generally is not suitable for use as building sites and for sanitary facilities because of the slope. It is severely limited for local roads because of the slope and low soil strength. Cutting and filling are needed, and roads should be built on the contour where possible. The base material for roads needs to be strengthened or replaced with more suitable material to support vehicular traffic. Side ditches and culverts for drainage help reduce erosion. Areas disturbed during construction should be revegetated as soon as possible.

This soil is in capability subclass VIe and in woodland suitability subclass 2r.

MxD3—Morley clay loam, 12 to 25 percent slopes, severely eroded. This is a strongly sloping and moderately steep, deep, well drained soil on till plains and moraines and also on breaks between the uplands and bottom lands. The areas are irregular in shape and range from 2 to 20 acres in size.

Typically, the surface layer is dark yellowish brown clay loam about 6 inches thick. The subsoil is dark yellowish brown, firm clay loam about 16 inches thick. The underlying material to a depth of 60 inches is yellowish brown clay loam. In places the surface layer and subsoil are less than 20 inches thick. In some areas the soil is very severely eroded, and the underlying material is exposed at plow depth. In places the slope is less than 12 percent or more than 25 percent.

Included with this soil in mapping are soils on breaks where the slope is more than 35 percent. Also included are small areas of somewhat poorly drained Blount soils on foot slopes and along narrow drainageways and well drained Hennepin soils, which have less clay than the Morley soil, on steep breaks. The included soils make up 2 to 8 percent of the map unit.

The available water capacity of this soil is moderate. Permeability is slow. Surface runoff is rapid. The surface layer has a low content of organic matter, and it is firm. Tilth is poor.

This soil is used mainly for hay or pasture. In some areas it is used for cultivated crops. Some areas are being left to reforest.

This soil generally is not suited to cultivated crops. Runoff and erosion are the major hazards if this soil is used for cultivated crops.

This soil is poorly suited to grasses and legumes for hay or pasture. Overgrazing or grazing when the soil is wet causes surface compaction, excessive runoff, and poor tilth. Pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is suited to trees. Plant competition, erosion hazard, and equipment limitations are concerns in management. Seedlings survive and grow better if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying. The use of heavy equipment should be restricted because erosion is a severe hazard. The type of equipment that can be used safely is limited.

This soil is severely limited for use as building sites because of slope. Buildings should be designed to conform to the slope. Land shaping and retaining walls can modify the slope. Existing vegetation should be

disturbed as little as possible during construction, and disturbed areas should be revegetated as soon as possible to reduce erosion. This soil is severely limited for local roads and streets because of slope and low strength. Cutting and filling may be needed, and roads should be built on the contour where possible. The base material for roads needs to be strengthened or replaced with more suitable material to support vehicular traffic. This soil is severely limited for septic tank absorption fields because of slope and the slow permeability. Installing the absorption lines on the contour helps to offset the slope. Filling or mounding the absorption field with suitable fill material and elevating the absorption field help offset the slow permeability.

This soil is in capability subclass VIe and in woodland suitability subclass 2r.

OcA—Ockley loam, 0 to 2 percent slopes. This is a nearly level, deep, well drained soil on river terraces and outwash plains. The areas are elongated and range from 3 to 45 acres in size.

Typically, the surface layer is dark grayish brown loam about 10 inches thick. The subsurface layer is dark brown loam about 5 inches thick. The subsoil is about 41 inches thick. The upper part is dark yellowish brown and dark brown, friable and firm loam and sandy clay loam. The lower part is dark reddish brown and dark brown, friable gravelly sandy loam. The underlying material to a depth of 60 inches is pale brown sand and gravelly sand. In some areas the surface layer is darker than is typical. In places the underlying material is at a depth of less than 40 inches, and in other places it is at a depth of more than 60 inches.

Included with this soil in mapping are small areas of soils that have a gravelly surface layer. Also included are small areas of excessively drained Rodman soils on steep breaks and very poorly drained Westland soils in depressions. The included soils make up 5 to 20 percent of the map unit.

The available water capacity of this soil is high. Permeability is moderate in the upper part of the soil and rapid in the underlying material. Surface runoff is slow. The surface layer has a moderate content of organic matter, and it is friable. Tilth is good.

This soil is mainly used for cultivated crops. In a few areas it is used for hay and as pasture and woodland. It is a probable source of sand and gravel (fig. 14).

This soil is well suited to corn, soybeans, and small grains. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help reduce evaporation and crusting, improve soil tilth, and increase the infiltration of water.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing causes compaction and poor tilth. Pasture rotation and timely deferment of grazing help to keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main concern. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying.

This soil is moderately limited for use as building sites because of the shrink-swell potential. Foundations, footings, and basement walls should be strengthened. Backfilling with coarser material helps prevent structural damage caused by the shrinking and swelling of the soil. This soil is severely limited for local roads and streets because of low strength. The road base should be strengthened or replaced with more suitable material to support vehicular traffic. This soil is suitable for septic tank absorption fields. Absorption lines should not be installed below a depth of 3 feet because the rapidly permeable underlying material cannot adequately filter the effluent.

This soil is in capability class I and in woodland suitability subclass 1o.

OcB2—Ockley loam, 2 to 6 percent slopes, eroded. This is a gently sloping, deep, well drained soil on river terraces and outwash plains. The areas are irregular in shape and range from 3 to 20 acres in size.

Typically, the surface layer is dark brown loam about 8 inches thick. The subsoil is dark yellowish brown, firm clay loam and gravelly clay loam about 36 inches thick. The underlying material to a depth of 60 inches is yellowish brown sand and gravelly sand. In some areas the surface layer is darker than is typical. In places the surface layer and subsoil are less than 40 inches thick. In places the slope is less than 2 percent or more than 6 percent.

Included with this soil in mapping are small areas of soils that have a gravelly surface layer. Also included are small areas of excessively drained Rodman soils on steep breaks and very poorly drained Westland soils in depressions. The included soils make up 8 to 20 percent of the map unit.

The available water capacity of this soil is high. Permeability is moderate in the surface layer and subsoil and rapid in the underlying material. Surface runoff is medium. The surface layer has a moderate content of organic matter, and it is friable. Tilth is fair.

This soil is used mainly for cultivated crops. In a few areas it is used for hay, pasture, and woodland. It is a probable source of sand and gravel.

This soil is well suited to corn, soybeans, and small grains. Crop rotation, terraces, diversions, contour farming, grassed waterways, grade stabilization structures, and other conservation practices help control erosion and reduce runoff if cultivated crops are grown. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help control erosion, reduce crusting, improve soil tilth, and increase the infiltration of water.

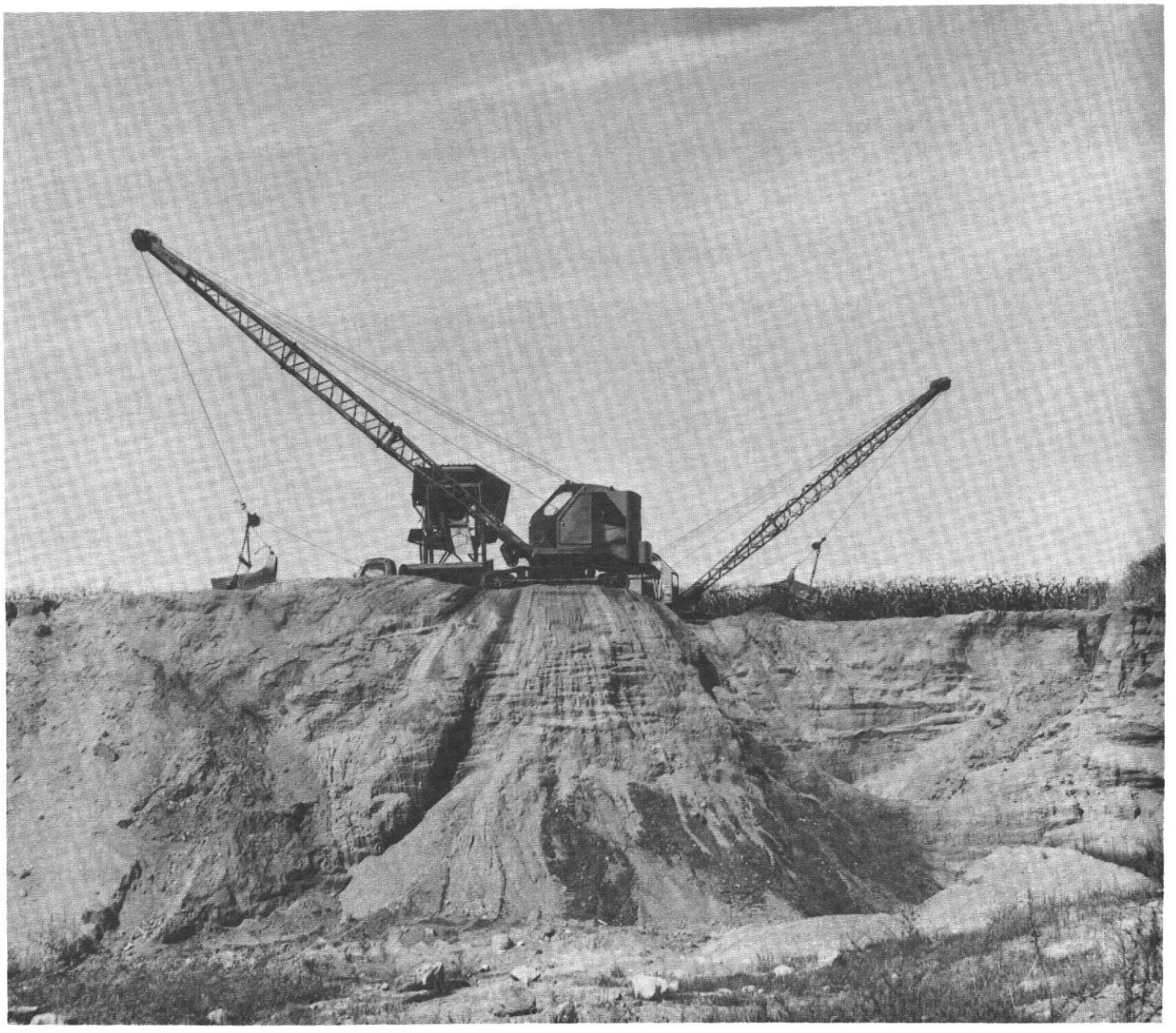

Figure 14.—A gravel pit in an area of Ockley loam, 0 to 2 percent slopes.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing causes surface compaction, excessive runoff, and poor tilth. Pasture rotation and timely deferment of grazing help to keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main concern in management. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying.

This soil is moderately limited for use as building sites because of its shrink-swell potential. Foundations, footings, and basement walls should be strengthened. Backfilling with coarser material helps prevent structural damage caused by the shrinking and swelling of the soil. This soil is severely limited for local roads and streets

because of low strength. The road base should be strengthened or replaced with suitable material to support vehicular traffic. This soil is suitable for septic tank absorption fields. Absorption lines should not be installed below a depth of 3 feet because the rapidly permeable underlying material cannot filter the effluent. Absorption lines should be installed on the contour for even distribution of the effluent.

This soil is in capability subclass IIe and in woodland suitability subclass 1o.

OmA—Ormas loamy sand, 0 to 2 percent slopes. This is a nearly level, deep, well drained soil on river terraces and outwash plains. The areas are irregular in shape and range from 2 to 25 acres in size.

Typically, the surface layer is dark grayish brown loamy sand about 10 inches thick. The subsurface layer is yellowish brown loamy sand about 8 inches thick. The subsoil is about 32 inches thick. The upper part is dark yellowish brown, very friable and friable loamy sand. The lower part is dark yellowish brown, firm and very friable gravelly sandy clay loam and gravelly loamy sand. The underlying material to a depth of 60 inches is pale brown gravelly sand. In places the surface layer is darker than is typical, and in places the combined surface and subsurface layers are thinner. In places the slope is more than 2 percent. In places the subsoil is in thin bands.

Included with this soil in mapping are small areas of soils that have a gravelly surface layer. Also included are small areas of very poorly drained Sebewa soils in small depressions. The included soils make up 2 to 8 percent of the map unit.

The available water capacity of this soil is low. Permeability is moderately rapid in the upper part of the soil and very rapid in the underlying material. Surface runoff is slow. The surface layer has a moderate content of organic matter, and it is very friable. Tilth is good.

This soil is used mainly for cultivated crops. In some areas it is used for hay or pasture. A few areas have been left wooded, but many of these are being cleared for cultivation. This soil is a probable source of sand.

This soil is suited to corn, soybeans, and small grains. Droughtiness and wind erosion are major hazards, especially in extended dry periods. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help control wind erosion, reduce evaporation, and increase the infiltration of water.

This soil is well suited to grasses and legumes for hay or pasture. Species that withstand drought should be planted. Pasture rotation and timely deferment of grazing help to keep the pasture in good condition.

This soil is suited to trees. Seedling mortality and plant competition are concerns in management. Species that withstand drought should be favored. Replanting is often necessary to establish a good stand. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying.

This soil is suitable for use as building sites. It is moderately limited for local roads and streets because of frost action. Providing drainage along roads helps prevent damage by frost action. This soil is suitable for septic tank absorption fields; however, the effluent can pollute shallow sources of ground water if the absorption lines are installed below a depth of 3 feet.

This soil is in capability subclass IIIs and in woodland suitability subclass 3s.

OmB—Ormas loamy sand, 2 to 6 percent slopes. This is a gently sloping, deep, well drained soil on river terraces and outwash plains. The areas are irregular in shape and range from 2 to 15 acres in size.

Typically, the surface layer is dark grayish brown loamy sand about 9 inches thick. The subsurface layer is yellowish brown loamy sand about 19 inches thick. The subsoil is about 19 inches thick. It is dark yellowish brown, firm gravelly clay loam and gravelly sandy clay loam. The underlying material to a depth of 60 inches is yellowish brown gravelly loamy sand. In places the surface layer is darker than is typical, and in places the combined surface and subsurface layers are thinner. In places the slope is less than 2 percent or more than 6 percent. In a few places the subsoil is in thin bands.

Included with this soil in mapping are a few areas of soils that have a gravelly surface layer. Also included are small areas of very poorly drained Sebewa soils in small depressions. The included soils make up 2 to 6 percent of the map unit.

The available water capacity of this soil is low. Permeability is moderately rapid in the upper part of the soil and very rapid in the underlying material. Surface runoff is slow. The surface layer has a moderate content of organic matter, and it is very friable. Tilth is good.

This soil is used mainly for cultivated crops. In some areas it is used for hay or pasture. A few areas have been left wooded. This soil is a probable source of sand.

This soil is suited to corn, soybeans, and small grains. Droughtiness and wind erosion are major hazards, especially in extended dry periods. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help control wind erosion, reduce evaporation, and increase the infiltration of water.

This soil is well suited to grasses and legumes for hay and pasture. Species that withstand drought should be planted. Pasture rotation and timely deferment of grazing help to keep the pasture in good condition.

This soil is suited to trees. Seedling mortality and plant competition are concerns in management. Species that withstand drought should be favored. Replanting is often necessary to establish a good stand. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying.

This soil is suitable for use as building sites. It is moderately limited for local roads and streets because of

frost action. Providing drainage along roads helps prevent damage by frost action. This soil is suitable for septic tank absorption fields. However, effluent can pollute shallow sources of ground water if the absorption lines are installed below a depth of 3 feet. Absorption lines should be installed on the contour for even distribution of the effluent.

This soil is in capability subclass IIIs and in woodland suitability subclass 3s.

OmC—Ormas loamy sand, 6 to 15 percent slopes. This is a moderately sloping, deep, well drained soil on river terraces and outwash plains. The areas are irregular in shape and range from 2 to 8 acres in size.

Typically, the surface layer is dark grayish brown loamy sand about 9 inches thick. The subsurface layer is yellowish brown loamy sand about 17 inches thick. The subsoil is dark yellowish brown, very friable gravelly sandy loam and gravelly sandy clay loam about 20 inches thick. The underlying material to a depth of 60 inches is pale brown gravelly sand. In a few places the subsoil is in thin bands. In places the slope is less than 6 percent or more than 15 percent.

Included with this soil in mapping are a few areas of soils that have a gravelly surface layer. Also included are small areas of very poorly drained Sebewa soils in small depressions. The included soils make up 2 to 5 percent of the map unit.

The available water capacity of this soil is low. Permeability is moderately rapid in the upper part of the soil and very rapid in the underlying material. Surface runoff is medium. The surface layer has a moderate content of organic matter, and it is very friable. Tilth is good.

This soil is used mainly for cultivated crops. In some areas it is used for hay or pasture. A few areas have been left wooded. This soil is a probable source of sand.

This soil is suited to corn, soybeans, and small grains. Droughtiness and wind erosion are major hazards, especially during extended dry periods. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help control wind erosion, reduce evaporation, and increase the infiltration of water.

This soil is well suited to grasses and legumes for hay or pasture. Species that withstand drought should be planted. Pasture rotation and timely deferment of grazing help to keep the pasture in good condition.

This soil is suited to trees. Seedling mortality and plant competition are concerns in management. Species that withstand drought should be favored. Replanting is often necessary to establish a good stand. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying.

This soil is moderately limited for use as building sites because of slope. Buildings can be designed to conform to the slope. Existing vegetation should be disturbed as little as possible during construction, and disturbed areas should be revegetated as soon as possible to reduce erosion. This soil is moderately limited for local roads and streets because of slope and frost action. Some grading may be necessary. Providing drainage along roads helps prevent damage by frost action. This soil is moderately limited for septic tank absorption fields because of slope. The absorption lines should be installed on the contour. The effluent can pollute shallow wells if the absorption lines are installed below a depth of 3 feet.

This soil is in capability subclass IIIs and in woodland suitability subclass 3s.

Or—Orthents, loamy. These are nearly level to moderately sloping, deep, well drained to poorly drained soils in disturbed areas on uplands, terraces, and bottom lands. The areas range from 3 to 100 acres in size.

These soils are mainly around emergency spillways, highway interchanges, shopping centers, and factories and in agricultural areas where reclamation was needed before the land could be used for cultivated crops, hay, or pasture. In places, deep cuts have been made in the original land surface, and the soil material has been used in smoothing and leveling lower lying areas. In other places, the soil material has been removed and used as fill for highway grades, overpasses, and exit ramps. Many borrow areas have filled with water and are used for recreation and as habitat for wildlife.

Typically, in an area of Orthents, loamy, the surface layer is dark grayish brown clay loam about 3 inches thick. The subsoil is dark gray clay about 4 inches thick. The underlying material to a depth of about 48 inches is dark grayish brown clay loam.

Included with these soils in mapping are small areas of soils on short steep slopes, areas of sand, gravel, and stones, and outcrops of bedrock. Also included are highways and other public works and buildings.

The available water capacity of these soils ranges from low to high. Permeability is moderate to slow. In many places the surface layer has a low content of organic matter, and it is firm and has poor tilth.

In most areas, these soils are in permanent grass or low-growing shrubs. Access to most areas is limited. Some areas are surrounded by heavily travelled highways. If the soils are to be used for crops, organic residue or manure should be worked into the surface layer to improve soil structure and tilth, and intensive applications of fertilizer are needed. Conservation practices are needed to control erosion in the gently sloping and moderately sloping areas (fig. 15). Drainage may be needed in the nearly level areas. Exposed areas should be revegetated as soon as possible after construction.

Onsite investigation is needed if these soils are to be used for urban development. The depth to the water table and its relation to the frost action potential should be considered. The soil material is quite variable, and engineering test data are needed. The soil properties

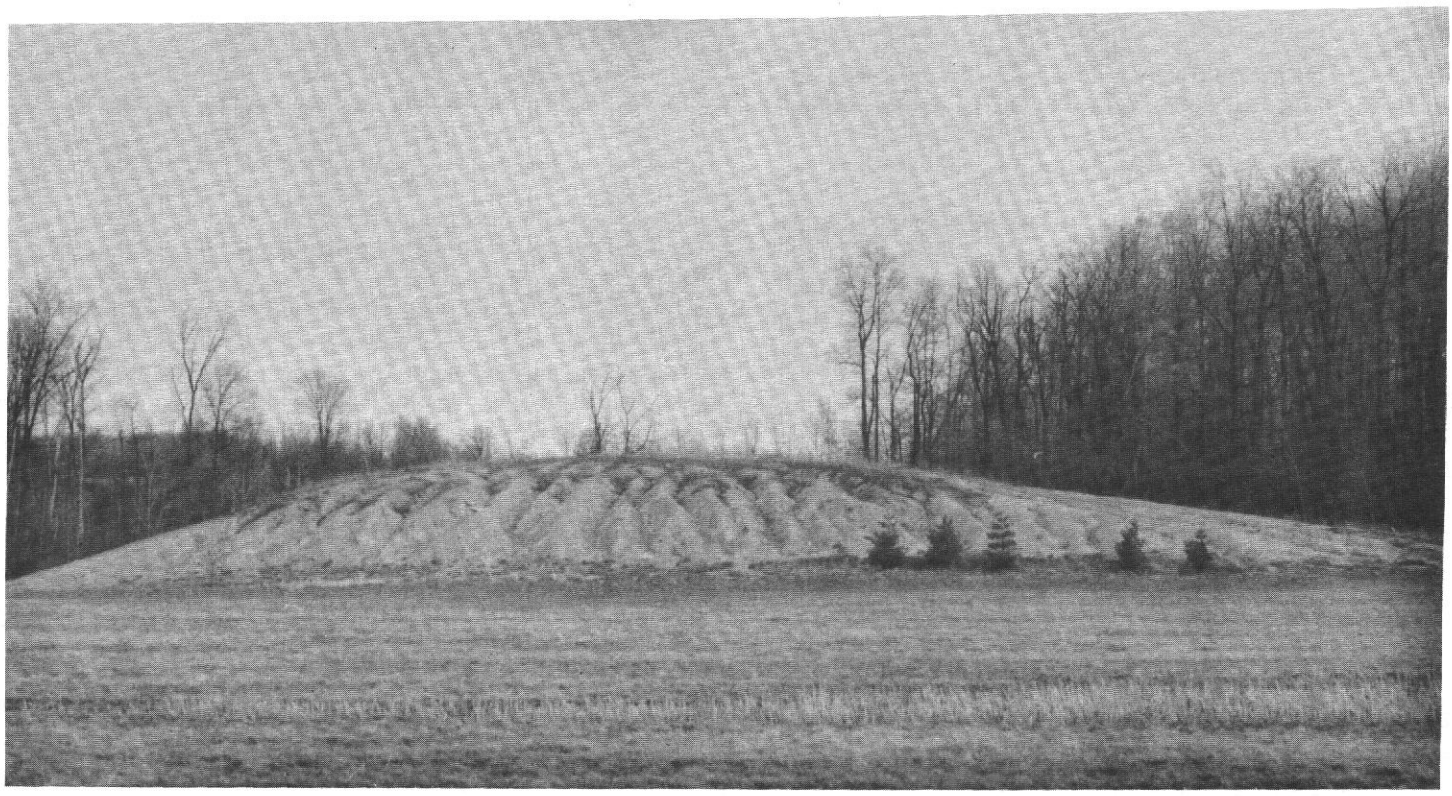

Figure 15.—Erosion is a severe hazard in many areas of Orthents, loamy.

significant to the design of a structure vary from one location to another. If an area of Orthents, loamy, is used as a building site, as little vegetation as possible should be removed, and protective plant cover should be established as quickly as possible so that erosion losses can be kept within limits.

The soils in this map unit were not assigned to a capability class or to a woodland suitability subclass.

Pa—Palms muck, undrained. This is a nearly level, deep, very poorly drained soil in deep depressions on uplands, outwash plains, and river terraces. It is ponded or saturated with water throughout the year by springs and runoff from adjacent higher areas. The areas of this map unit are oval or irregular in shape and range from 2 to 25 acres in size.

Typically, the surface layer is very dark brown muck about 3 inches thick. The subsurface layers are black and dark reddish brown muck about 30 inches thick. The underlying material to a depth of 60 inches is dark gray silty clay loam. Some areas were drained at one time but have reverted to marsh. In these areas there is evidence of a plow layer. In some areas in the northwestern part of the county, this soil is on side slopes and has slopes of more than 2 percent. In places there is a layer of very slowly permeable sedimentary peat between the muck and the underlying mineral material. In many places the surface layer has a high mineral content.

Included with this soil in mapping are small areas of mineral soils near the edge of the depressions and on slight rises. These are the very poorly drained Milford and Pella soils. They make up 7 to 15 percent of the map unit.

The available water capacity of this soil is very high. Permeability is moderately slow to moderately rapid in the muck and moderately slow in the underlying material. The water table is at or above the surface throughout the year. Surface runoff is very slow or is ponded. The surface layer has a very high content of organic matter and is very friable.

This soil is mainly in marsh vegetation. In some areas where it is partly drained, it is used as pasture.

This soil generally is not suited to cultivated crops unless it is adequately drained. Drainage systems are difficult to install and maintain.

This soil is poorly suited to grasses for hay or pasture. Grasses that tolerate wetness should be favored. The poor stability of this soil makes the use of equipment for harvesting hay very difficult, and it makes it difficult for livestock to move about.

This soil is poorly suited to trees. Plant competition,

seedling mortality, windthrow hazard, and equipment limitations are concerns in management. Species that tolerate wetness should be favored. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying. Replanting is often necessary to establish a good stand. Care in thinning or no thinning at all can help prevent windthrow. In harvesting, trees should not be left standing alone or widely spaced. Heavy equipment can be used only when the ground is frozen.

This soil generally is not suited to use as building sites or for sanitary facilities because of ponding. It is severely limited for roads because of ponding, low strength, and frost action. The organic layers need to be replaced with suitable soil material to overcome the low strength. Providing side ditches and culverts for drainage helps to prevent the damage caused by ponding and frost action.

This soil is in capability subclass Vw and in woodland suitability subclass 4w.

Pm—Palms muck, drained. This is a nearly level, deep, very poorly drained soil in deep depressions on uplands, outwash plains, and river terraces. It is ponded or saturated with water from springs and surface runoff in wet periods if it is not adequately drained. The areas are oval or irregular in shape and range from 2 to 25 acres in size.

Typically, the surface layer is black muck about 9 inches thick. The subsurface layers are black muck about 18 inches thick. The underlying material to a depth of 60 inches is gray and dark grayish brown silt loam and silty clay loam. In places there is a layer of very slowly permeable sedimentary peat between the muck and the underlying material. In many places the surface layer is high in mineral content.

Included with this soil in mapping are small areas of mineral soils near the edge of the depressions and on slight rises. These are the very poorly drained Milford and Pella soils. They make up 8 to 20 percent of the map unit.

This soil has a very high available water capacity. Permeability is moderately slow to moderately rapid in the muck and moderately slow in the underlying material. The water table is at or above the surface in winter and spring. Surface runoff is very slow or ponded. The surface layer has a very high content of organic matter and is very friable. Tilth is good.

This soil is used mainly for cultivated crops. It is suited to corn, soybeans, and small grains if drainage is maintained. Wetness is the major limitation, and wind erosion is a major hazard. The poor stability of the organic material causes ditchbanks to slough and drain tiles to lose slope gradient. The organic material subsides in drained areas. It may subside to a level at which the drainage system is not adequate because outlets are no longer available. Conservation tillage that leaves a protective amount of crop residue on the surface, cover crops, or other practices are needed to help control wind erosion.

This soil is suited to grasses and legumes for hay and pasture if drainage is maintained. Grasses grow better than legumes on organic soil. Deep-rooted legumes such as alfalfa grow poorly because they cannot tolerate ponding or a high water table. Hay harvesting is restricted to dry periods because the poor stability of the muck limits the use of equipment.

This soil is poorly suited to trees. Plant competition, seedling mortality, a windthrow hazard, and equipment limitations are concerns in management. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying. Replanting is often necessary to establish a good stand. Species that tolerate wetness should be favored. Care in thinning or no thinning at all can help prevent windthrow. In harvesting, trees should not be left standing alone or widely spaced. Heavy equipment can be used on this soil only when the ground is frozen.

This soil generally is not suited to use as building sites or for sanitary facilities because of ponding. It is severely limited for roads because of ponding, low strength, and frost action. The organic layers need to be replaced with suitable soil material to overcome the low soil strength. Providing side ditches and culverts for drainage helps to prevent the damage caused by ponding and frost action.

This soil is in capability subclass IIIw and in woodland suitability subclass 4w.

Pp—Palms Variant muck, drained. This is a nearly level, deep, very poorly drained soil in deep depressions on outwash plains and river terraces. It is ponded in wet periods if it is not adequately drained by artificial means. The areas are oval or irregular in shape and range from 2 to 15 acres in size.

Typically, the surface layer is black muck about 9 inches thick. The subsurface layers are black muck about 17 inches thick. The underlying material to a depth of 60 inches is dark grayish brown silt loam in the upper part and dark gray stratified loamy sand and sand in the lower part. In a few places there is a layer of very slowly permeable sedimentary peat between the muck and the underlying mineral material. In places the surface layer has a high mineral content.

Included with this soil in mapping are some areas of soils that have not been drained and a few areas of soils that are underlain by gravelly sand or gravelly loamy sand. Also included are small areas of very poorly drained Rensselaer and Sebewa mineral soils near the edge of the depressions and on slight rises. The included soils make up 10 to 20 percent of the map unit.

This soil has a very high available water capacity. Permeability is moderately slow to moderately rapid in the organic material, moderately slow in the loamy material, and moderately rapid in the underlying sandy material. The water table is at or above the surface in winter and early in spring. Undrained areas are ponded or saturated throughout the year. Surface runoff is very

slow or is ponded. The surface layer is very high in content of organic matter and very friable. Tilth is good.

This soil is used mainly for cultivated crops where it has been adequately drained. In undrained areas it is used as pasture or left as marsh.

This soil is suited to corn, soybeans, and small grains if drainage is maintained. Wetness is the major limitation, and wind erosion is a major hazard. The poor stability of the organic material and the underlying material causes ditchbanks to slough off and subsurface drains to lose slope gradient. In some areas, if subsurface drains are installed below a depth of 3 feet, fine sand can flow into the drains and plug them. The organic material subsides in the drained areas. In many areas, it may subside to a level at which the drainage system is not adequate because outlets are no longer available. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops or other practices are needed to help control wind erosion.

This soil is suited to grasses and legumes for hay and pasture if drainage is maintained. Grasses grow better than most legumes on organic soils. Deep-rooted legumes such as alfalfa grow poorly because they cannot tolerate ponding or a high water table. Hay harvesting is restricted to dry periods because the poor stability of the muck limits the use of equipment.

This soil is poorly suited to trees. Plant competition, seedling mortality, a windthrow hazard, and equipment limitations are concerns in management. Species that tolerate wetness should be favored. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying. Replanting is often necessary to establish a good stand. Care in thinning or no thinning at all can help prevent windthrow. In harvesting, trees should not be left standing alone or widely spaced. Heavy equipment can be used on this soil only when the ground is frozen.

This soil generally is not suited to use as building sites or for sanitary facilities because of ponding. This soil is severely limited for roads because of ponding, low strength, and frost action. The organic layers need to be replaced with suitable soil material to overcome the low strength. Providing side ditches and culverts for drainage helps to prevent the damage caused by ponding and frost action.

This soil is in capability subclass IIw and in woodland suitability subclass 4w.

Pt—Pella silty clay loam. This is a nearly level, deep, very poorly drained soil in depressions and small glacial lakebeds on uplands, outwash plains, and terraces. It is often ponded by runoff from adjacent higher areas. The areas of this map unit are oval or irregular in shape and range from 3 to 65 acres in size.

Typically, the surface layer is black silty clay loam about 8 inches thick. The subsurface layer is very dark gray silty clay loam about 7 inches thick. The subsoil is about 16 inches thick. The upper part is gray, mottled, firm silty clay loam, and the lower part is grayish brown, mottled, friable silty clay loam. The underlying material is gray, mottled silt loam that has thin strata of fine sandy loam. In places the dark color of the surface layer extends to a depth of less than 10 inches. In places the soil material in the upper 24 inches is silty clay. In a few areas the underlying material at a depth of 48 inches is glacial till.

Included with this soil in mapping are small areas of undrained soils, in woodlots or deep depressions in fields, that are wet most of the year and small areas of soils, in deep depressions, that have a thin surface layer of muck. Also included are small areas of very poorly drained Brookston soils, which have less silt than the Pella soil, on the edge of depressions and small areas of very poorly drained Houghton and Palms organic soils in deep depressions. The included soils make up 5 to 15 percent of the map unit.

The available water capacity of this soil is high. Permeability is moderate. The water table is at or above the surface in winter and spring. Surface runoff is very slow or is ponded. The surface layer has a high content of organic matter, and it is firm. Tilth is fair.

In most places this soil has been drained. It is used mainly for cultivated crops. In a few areas it is used for hay or pasture. The undrained areas are left wooded.

This soil is well suited to corn, soybeans, and small grains if it is adequately drained. Wetness is the major limitation, and ponding is a major hazard. Most crops grow poorly in the undrained areas. Where there are adequate outlets, shallow surface drains and subsurface drains can be used to remove excess water. In some places, if subsurface drains are installed below a depth of 3 feet, fine sand can flow into the drains and plug them. The surface layer is difficult to work into a suitable seedbed. If it is plowed when it is wet, hard clods that are difficult to break up form when the soil dries. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops reduce crusting, improve soil tilth, and increase water infiltration.

This soil is well suited to grasses and legumes for hay or pasture if it is adequately drained. Deep-rooted legumes such as alfalfa grow poorly in inadequately drained areas because they cannot tolerate a high water table or ponding. Legumes can be damaged even if the area is ponded for only a brief period. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is not rated for use as woodland. Drained areas are used for crops. In general, trees are planted only as windbreaks.

This soil generally is not suited to use as building sites or for sanitary facilities because of ponding. It is severely limited for roads because of ponding, low strength, and frost action. Constructing roads on raised and well

compacted fill material and providing side ditches and culverts for drainage help to prevent the damage caused by ponding and frost action.

This soil is in capability subclass IIw. It is not assigned to a woodland suitability subclass.

Pw—Pewamo silty clay loam. This is a nearly level, deep, very poorly drained soil in depressions and drainageways on upland till plains and moraines. In places it is often ponded by runoff from adjacent higher areas. The areas of this map unit are irregular in shape and range from 2 to 50 acres in size.

Typically, the surface layer is very dark gray silty clay loam about 9 inches thick. The subsoil is about 34 inches thick. The upper part is very dark gray and dark gray, mottled, firm silty clay, and the lower part is dark gray and gray, mottled, firm silty clay loam and clay loam. The underlying material to a depth of 60 inches is yellowish brown, mottled clay loam. In places the surface layer is lighter in color than is typical. In some of the deeper depressions there is a mantle of lake-deposited sediment as much as 30 inches thick.

Included with this soil in mapping are small areas of undrained soils in woodlots or deep depressions in fields. These soils are wet most of the year. Also included in mapping are small areas of somewhat poorly drained Blount and Haskins soils on convex parts of the landscape and moderately well drained Glynwood soils, which are more sloping than the Pewamo soil. The included soils make up 4 to 12 percent of the map unit.

The available water capacity of this soil is high. Permeability is moderately slow. The water table is at or above the surface in winter and early in spring. Surface runoff is very slow or is ponded. The surface layer has a high content of organic matter, and it is firm. Tilth is fair.

In most places this soil has been drained and is used for cultivated crops. In some areas it is used for hay or pasture. A few areas have been left as woodland, but most of these are being cleared for cultivation.

This soil is well suited to corn, soybeans, and small grains if it is adequately drained. Wetness is a major limitation, and ponding is a major hazard. Most crops grow poorly in undrained areas. Where there are adequate outlets, shallow surface drains and subsurface drains can be used to remove excess water. The silty clay loam surface layer is difficult to work into a suitable seedbed. If this soil is plowed when it is wet, hard clods that are difficult to break up form as the soil dries. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops reduce crusting, improve soil tilth, and increase water infiltration.

This soil is well suited to grasses and legumes for hay and pasture if it is adequately drained. Deep-rooted legumes such as alfalfa grow poorly in inadequately drained areas because they cannot tolerate ponding or a high water table. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is suited to trees. Plant competition, seedling mortality, a windthrow hazard, and equipment limitations are concerns in management. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying. Species that tolerate wetness should be favored. Replanting is often necessary to establish a good stand. Care in thinning or no thinning at all can help prevent windthrow. In harvesting, trees should not be left standing alone or widely spaced. Trees generally are harvested in dry weather or when the ground is frozen.

This soil generally is not suited to use as building sites or for sanitary facilities because of ponding. It is severely limited for roads because of ponding, low strength, and frost action. Constructing roads on raised and well compacted fill material and providing side ditches and culverts for drainage help to prevent the damage caused by ponding and frost action.

This soil is in capability subclass IIw and in woodland suitability subclass 2w.

Px—Pits, gravel. This map unit consists mainly of excavations on uplands, terraces, outwash plains, and bottom lands. Slopes are nearly level to steep. The material in the pits is well drained. The gravel pits range from 1 to 20 acres in size.

Typically, the soil material has been removed, and sand and gravel are exposed. Soil material has washed into some pits; this material supports sparse vegetation.

Included in mapping are small areas where the overburden has been piled; these areas support a cover of vegetation. In some of the small pits on the uplands, all the gravel has been removed, and the underlying glacial till is exposed. In some areas, water covers the lowest part of the pit.

Most areas have very little vegetative cover, and major land reclamation is needed before the soil can support adequate vegetation.

This map unit was not assigned to a capability class or to a woodland suitability subclass.

Py—Pits, quarry. This map unit consists of rock quarries on the limestone terrace along the Wabash River. Slopes range from nearly level on the quarry floor to nearly vertical on the quarry face (fig. 16). The areas range from 1 to 40 acres in size.

Typically, the soil material has been removed, and bedrock is exposed. Soil material has washed into some quarries, and sparse vegetation has emerged.

Included in mapping are small areas where the overburden has been piled; these areas support a cover of vegetation. Also included are areas where water covers the lowest part of the quarry.

Figure 16.—A rock quarry on the limestone terrace along the Wabash River.

Most areas have very little vegetative cover, and major land reclamation is needed before the soil can support adequate vegetation.

This map unit was not assigned to a capability class or to a woodland suitability subclass.

RaA—Randolph silt loam, 0 to 2 percent slopes. This is a nearly level, moderately deep, somewhat poorly drained soil on limestone terraces along the Wabash River. The areas are irregular in shape and range from 3 to 30 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 7 inches thick. The subsoil is about 18 inches thick. The upper part is gray, mottled, friable silt loam. The next part is yellowish brown, mottled, firm silty clay loam. The lower part is olive, mottled, firm and friable silty clay. The underlying material is pale yellow, mottled silt loam about 3 inches thick over limestone bedrock. In places the depth to bedrock is more than 40 inches, and in other places it is less than 20 inches. In places the subsoil is gravelly clay loam.

Included with this soil in mapping are small areas where stones and cobbles are on the surface or where there are outcrops of limestone bedrock. Also included are some areas of soils on short steep slopes at the edge of mapped areas or along drainageways, small areas of well drained Milton soils on rises, and small areas of very poorly drained Millsdale soils in depressions. The included soils make up 9 to 10 percent of the map unit.

The available water capacity of this soil is moderate. Permeability is moderately slow. The seasonal high water table is at a depth of 1 foot to 2.5 feet. Surface runoff is slow. The surface layer has a moderate content of organic matter, and it is friable. Tilth is good.

This soil is used mainly for cultivated crops. In a few areas it is used for hay, pasture, or woodland.

This soil is suited to corn, soybeans, and small grains. It has some cobbles, stones, or rock outcrops on or near the surface that can hinder farming operations. Subsurface drains can be used to remove excess water. The moderate depth to bedrock can hinder installation of subsurface drains. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops reduce crusting, improve soil tilth, and increase the infiltration of water.

This soil is well suited to grasses and legumes for hay and pasture. Deep-rooted legumes such as alfalfa grow poorly in undrained areas because they cannot tolerate a high water table. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

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

This soil is severely limited for use as building sites because of the moderate depth to bedrock, wetness, and the high shrink-swell potential. Foundations, footings, and basement walls should be strengthened and backfilled with coarser material to prevent structural damage caused by the shrinking and swelling of the soil. Footer drains help overcome wetness. Building a basement requires excavation of bedrock. This soil is severely limited for local roads and streets because of low strength, frost action, and the shrink-swell potential. Road ditches and subsurface drains are needed to remove excess water and help reduce frost action and shrinking and swelling. The base material for roads needs to be strengthened or replaced with more suitable material to support vehicular traffic. This soil is severely limited for septic tank absorption fields because of the depth to bedrock, wetness, and the moderately slow permeability. Filling or mounding the septic tank absorption field with suitable fill material and elevating the absorption field help offset the moderately slow permeability and moderate depth to bedrock. Drainage around the outer edge of the absorption field helps remove excess water.

This soil is in capability subclass IIIw and in woodland suitability subclass 3o.

RcA—Rawson sandy loam, 0 to 2 percent slopes. This is a nearly level, deep, moderately well drained soil on till plains and moraines. The areas are irregular in shape and range from 3 to 15 acres in size.

Typically, the surface layer is dark grayish brown sandy loam about 10 inches thick. The subsoil is about 31 inches thick. The upper part is yellowish brown, friable sandy clay loam. The lower part is yellowish brown, mottled, firm clay loam. The underlying material is yellowish brown, mottled, very firm clay loam. In some areas the surface layer is loamy fine sand. In some areas there is less than 20 inches of loamy outwash over till. In some areas there are layers in the upper part of the subsoil that are as much as 25 percent gravel. In places the surface layer and subsoil are more than 48 inches thick. In places the underlying material has less clay. In places the slope is more than 2 percent.

Included with this soil in mapping are small areas of well drained Metea soils on slight rises and somewhat poorly drained Blount and Haskins soils in narrow drainageways and in lower positions than those of the Rawson soil. The included soils make up 5 to 15 percent of the map unit.

The available water capacity of this soil is moderate. Permeability is moderate in the upper part of the soil. It is slow in the lower part of the subsoil and in the underlying material. The seasonal high water table is at a depth of 2.5 to 4 feet. Surface runoff is slow. The

surface layer has a moderate content of organic matter, and it is friable. Tilth is good.

This soil is used mainly for cultivated crops. In a few areas it is used for hay, pasture, and woodland.

This soil is well suited to corn, soybeans, and small grains. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help reduce evaporation and crusting and increase the infiltration of water.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing causes surface compaction and poor tilth. Pasture rotation and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main concern in management. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying.

This soil is suitable for dwellings without basements. It is moderately limited for dwellings with basements because of wetness and the shrink-swell potential. Subsurface drains can help lower the water table. Foundations, footings, and basement walls should be strengthened. Backfilling with coarser material helps prevent structural damage caused by the shrinking and swelling of the soil. This soil is moderately limited for local roads and streets because of low strength and frost action. Replacing or covering the upper layers of the soil with suitable base material helps prevent damage caused by low strength and frost action. This soil is severely limited for septic tank absorption fields because of wetness and slow permeability. Filling or mounding the septic tank absorption field with suitable fill material and elevating the absorption field help offset the slow permeability. Drainage around the outer edge of the absorption field helps remove excess water.

This soil is in capability class I and in woodland suitability subclass 2o.

RcB2—Rawson sandy loam, 2 to 6 percent slopes, eroded. This is a gently sloping, deep, moderately well drained soil on till plains and moraines. The areas are irregular in shape and range from 3 to 25 acres in size.

Typically, the surface layer is dark brown sandy loam about 9 inches thick. The subsoil is about 32 inches thick. The upper part of the subsoil is yellowish brown and brown, friable and firm sandy loam and sandy clay loam. The lower part of the subsoil is yellowish brown, mottled, firm clay loam. The underlying material to a depth of 60 inches is brown clay loam. In places the surface layer is loamy fine sand. In places the mantle of loamy outwash is less than 20 inches thick over till. In some places there are layers in the upper part of the subsoil that are as much as 25 percent gravel. In places the surface layer and subsoil are more than 48 inches thick. In places the underlying material has less clay. In places the slope is less than 2 percent or more than 6 percent.

Included with this soil in mapping are a few small areas where the soil is severely eroded and a few areas of soils on short steep slopes. Also included are small areas of well drained Metea soils on the crest of knobs and ridges and somewhat poorly drained Blount and Haskins soils in narrow drainageways and on foot slopes. The included soils make up 5 to 15 percent of the map unit.

The available water capacity of this soil is moderate. Permeability is moderate in the upper part of the soil. It is slow in the lower part of the subsoil and in the underlying material. The seasonal high water table is at a depth of 2.5 to 4 feet. Surface runoff is medium. The surface layer has a moderate content of organic matter, and it is friable. Tilth is good.

This soil is used mainly for cultivated crops. In a few areas it is used for hay, pasture, and woodland.

This soil is well suited to corn, soybeans, and small grains. Crop rotation, diversions, contour farming, grassed waterways, grade stabilization structures, and other conservation practices help control erosion and runoff if cultivated crops are grown. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help control erosion, reduce crusting, improve soil tilth, and increase the infiltration of water.

This soil is well suited to grasses and legumes for hay or pasture (fig. 17). Overgrazing causes surface compaction and poor tilth. Pasture rotation and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main concern in management. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying.

This soil is suitable for dwellings without basements and is moderately limited for dwellings with basements because of wetness and the shrink-swell potential. Subsurface drains can help lower the water table. Foundations, footings, and basement walls should be strengthened. Backfilling with coarser material helps prevent structural damage caused by the shrinking and swelling of the soil. Existing vegetation should be disturbed as little as possible during construction, and disturbed areas should be revegetated as soon as possible to reduce erosion. This soil is moderately limited for local roads and streets because of low strength and frost action. Replacing or covering the upper layers of the soil with suitable road base material help prevent damage caused by low strength and frost action. This soil is severely limited for septic tank absorption fields because of wetness and slow permeability. Filling or mounding the septic tank absorption field with suitable fill material and elevating the absorption field help offset the

Figure 17.—Rawson sandy loam, 2 to 6 percent slopes, eroded, is well suited to use as pasture.

slow permeability. Drainage around the outer edge of the absorption field helps remove excess water.

This soil is in capability subclass IIe and in woodland suitability subclass 2o.

RcC2—Rawson sandy loam, 6 to 12 percent slopes, eroded. This is a moderately sloping, deep, moderately well drained soil on till plains and moraines. The areas are irregular in shape and range from 3 to 20 acres in size.

Typically, the surface layer is dark brown sandy loam about 8 inches thick. The subsoil is about 23 inches thick. The upper part of the subsoil is yellowish brown, friable sandy clay loam. The lower part is dark yellowish brown, firm clay loam. The underlying material to a depth of 60 inches is brown clay loam. In some places the surface layer is loamy fine sand. In places the mantle of loamy outwash is less than 20 inches thick over till. In some areas there are layers in the upper part of the subsoil that are as much as 25 percent gravel. In places the underlying material has less clay. In places the slope is less than 6 percent or more than 12 percent.

Included with this soil in mapping are small areas where the soil is severely eroded and a few areas of soils on short steep slopes. Also included in mapping are small areas of well drained Metea soils on the crest of knobs and ridges and somewhat poorly drained Blount and Haskins soils in narrow drainageways and on foot slopes. The included soils make up 8 to 20 percent of the map unit.

The available water capacity of this soil is moderate. Permeability is moderate in the upper part of the soil and slow in the lower part of the subsoil and in the underlying material. The seasonal high water table is at a depth of 2.5 to 4 feet. Surface runoff is medium. The

surface layer has a moderate content of organic matter, and it is friable. Tilth is fair.

This soil is used mainly for cultivated crops. In a few areas it is used for hay, pasture, and woodland.

This soil is suited to corn, soybeans, and small grains. Crop rotation, diversions, contour farming, grassed waterways, grade stabilization structures, and other conservation practices help control erosion and reduce runoff if cultivated crops are grown. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help control erosion, reduce crusting, improve soil tilth, and increase the infiltration of water.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing causes surface compaction, increased runoff, and poor soil tilth. Pasture rotation and timely deferment of grazing help keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main concern in management. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying.

This soil is moderately limited for use as building sites because of wetness, slope, and the shrink-swell potential. Subsurface drains can help lower the water table. Land shaping and retaining walls can be used to modify the slope. Foundations, footings, and basement walls should be strengthened. Backfilling with coarser material helps prevent structural damage from the shrinking and swelling of the soil. Existing vegetation should be disturbed as little as possible during construction, and disturbed areas should be revegetated as soon as possible to reduce erosion. This soil is moderately limited for local roads and streets because of the slope, low strength, and frost action. Local roads should be constructed on the contour where possible. Land shaping can modify the slope. Replacing or covering the upper layers of the soil with suitable road base material helps prevent damage caused by the low strength and frost action. This soil is severely limited for septic tank absorption fields because of wetness and slow permeability. Filling or mounding the septic tank absorption field with suitable fill material and elevating the absorption field help offset the slow permeability. Drainage around the edge of the absorption field helps remove excess water.

This soil is in capability subclass IIIe and in woodland suitability subclass 2o.

Re—Rensselaer loam. This is a nearly level, deep, very poorly drained soil in depressions on river terraces and outwash plains. It is often ponded by runoff from adjacent higher areas. The areas of this map unit are irregular in shape and range from 3 to 35 acres in size.

Typically, the surface layer is black loam about 8 inches thick. The subsurface layer is black sandy clay loam about 9 inches thick. The subsoil is about 25 inches thick. The upper part is dark gray, mottled, friable sandy clay loam. The next part is gray, mottled, firm clay loam. The lower part is gray, mottled, friable, stratified sandy loam to silty clay loam. The underlying material is gray, mottled, stratified loamy fine sand to silty clay loam. In some places the underlying material is glacial till. In places the combined thickness of the surface and subsurface layers is only 8 inches. In places this soil has layers that are more than 15 percent fine gravel.

Included with this soil in mapping are small areas of undrained soils in woodlots or deep depressions in fields. These soils are wet most of the year. In small areas in the depressions the soils have a thin surface layer of muck. Also included are small areas of very poorly drained Martisco and Palms Variant organic soils in deep depressions and well drained Martinsville soils and somewhat poorly drained Whitaker soils on slight rises. The included soils make up 2 to 10 percent of the map unit.

The available water capacity of this soil is high. Permeability is moderate. The water table is often at or above the surface in winter and early in spring. Surface runoff is very slow or is ponded. The surface layer has a high content of organic matter, and it is friable. Tilth is good.

In most places this soil has been drained and is used for cultivated crops. In a few areas it is used for hay or pasture. In a few areas where the soil is undrained, it has been left as woodland.

This soil is well suited to corn, soybeans, and small grains if it is adequately drained. Wetness is the major limitation, and ponding is the major hazard. Most crops grow poorly in the undrained areas. Where there are adequate outlets, shallow surface drains and subsurface drains can be used to remove excess water. If subsurface drains are installed below a depth of 3 feet, fine sand can flow into the drains and plug them. In places the surface layer has more clay, which makes it difficult to prepare a seedbed. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops reduce crusting, improve soil tilth, and increase the infiltration of water.

This soil is well suited to grasses and legumes for hay or pasture if it is adequately drained. Deep-rooted legumes such as alfalfa grow poorly in inadequately drained areas because they cannot tolerate a high water table or ponding. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is suited to trees. Plant competition, seedling mortality, windthrow hazard, and equipment limitations are concerns in management. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying. Species that tolerate wetness should be favored. Replanting is often necessary to establish a

good stand. Care in thinning or no thinning at all can help prevent windthrow. In harvesting, trees should not be left standing alone or widely spaced. Trees generally are harvested in dry seasons or when the ground is frozen.

This soil generally is not suited to use as building sites or for sanitary facilities because of ponding. It is severely limited for roads because of ponding, low strength, and frost action. Constructing roads on raised and well compacted fill material and providing side ditches and culverts for drainage help to prevent the damage caused by ponding and frost action.

This soil is in capability subclass IIw and in woodland suitability subclass 2w.

RhA—Riddles loam, 0 to 2 percent slopes. This is a nearly level, deep, well drained soil on upland till plains and moraines. The areas are irregular in shape and range from 3 to 25 acres in size.

Typically, the surface layer is dark brown loam about 10 inches thick. The subsoil is about 33 inches thick. It is dark yellowish brown and brown, firm clay loam and loam. The underlying material to a depth of 60 inches is yellowish brown, firm loam. In places, some layers in the upper part of the subsoil are as much as 15 percent gravel. In some areas there is a layer of stratified sand and silt between the subsoil and the underlying till. In some places there is a loess mantle as much as 30 inches thick. In places the slope is more than 2 percent.

Included with this soil in mapping are small areas of somewhat poorly drained Crosier and Fincastle soils in narrow drainageways. The included soils make up 5 to 15 percent of the map unit.

The available water capacity of this soil is high. Permeability is moderate. Surface runoff is slow. The surface layer has a moderate content of organic matter, and it is friable. Tilth is good.

This soil is used mainly for cultivated crops. In a few areas it is used for hay, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grains. It has a few stones on or near the surface that can hinder farming operations. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops reduce crusting, improve soil tilth, and increase the infiltration of water.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Pasture rotation, timely deferment of grazing, and restricted use during wet periods help keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main concern in management. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying.

This soil is moderately limited for use as building sites because of the shrink-swell potential. Foundations, footings, and basement walls should be strengthened. Backfilling with coarser material helps prevent structural damage caused by the shrinking and swelling of the soil. This soil is moderately limited for local roads and streets because of low strength and frost action. The road base should be replaced with suitable material to reduce frost damage and support vehicular traffic. This soil is moderately limited for septic tank absorption fields because of moderate permeability. The absorption field should be enlarged to compensate for the moderate permeability.

This soil is in capability class I and in woodland suitability subclass 1o.

RhB2—Riddles loam, 2 to 6 percent slopes, eroded. This is a gently sloping, deep, well drained soil on upland till plains and moraines. The areas are irregular in shape and range from 3 to 30 acres in size.

Typically, the surface layer is dark brown loam about 8 inches thick. The subsoil is about 41 inches thick. The upper part is brown and dark yellowish brown, firm clay loam and sandy clay loam. The lower part is dark brown and yellowish brown, firm and friable loam. The underlying material to a depth of 60 inches is brown loam. In places the upper part of the subsoil is as much as 15 percent gravel. In some places there is a layer of stratified sand and silt between the subsoil and the underlying till. In some places there is a loess mantle as much as 30 inches thick. In places the slope is more than 6 percent.

Included with this soil in mapping are small areas where the soil is severely eroded and the surface layer is clay loam and areas on small breaks where the soils have slopes of more than 12 percent. Also included are small areas of somewhat poorly drained Crosier and Fincastle soils on foot slopes, along narrow drainageways, and on small flats and well drained Metea soils, which have more sand than the Riddles soil, on the crest of knobs and ridges. The included soils make up 4 to 12 percent of the map unit.

The available water capacity of this soil is high. Permeability is moderate. Surface runoff is medium. The surface layer has a moderate content of organic matter, and it is friable. Tilth is fair. I01This soil is used mainly for cultivated crops. In some areas it is used for hay or pasture, and in a few areas it has been left as woodland.

This soil is well suited to corn, soybeans, and small grains. It has a few stones on or near the surface that can hinder farming operations. Erosion is the major hazard. Crop rotation, terraces, diversions, contour farming, grassed waterways, grade stabilization structures, or other conservation practices help control erosion and reduce runoff if cultivated crops are grown. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help control erosion, reduce crusting, improve soil tilth, and increase the infiltration of water.

This soil is well suited to grasses and legumes for hay

or pasture. Overgrazing or grazing when the soil is wet causes surface compaction, excessive runoff, and poor tilth. Pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main concern in management. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying.

This soil is moderately limited for use as building sites because of the shrink-swell potential. Foundations, footings, and basement walls need to be strengthened. Backfilling with coarser material helps prevent structural damage from the shrinking and swelling of the soil. This soil is moderately limited for local roads and streets because of frost action and low strength. The road base should be replaced with suitable material to reduce frost damage and support vehicular traffic. This soil is moderately limited for septic tank absorption fields because of moderate permeability. Enlarging the absorption field helps offset the moderate permeability.

This soil is in capability subclass IIe and in woodland suitability subclass 1o.

RhC2—Riddles loam, 6 to 12 percent slopes, eroded. This is a moderately sloping, deep, well drained soil on upland till plains and moraines. The areas are irregular in shape and range from 3 to 10 acres in size.

Typically, the surface layer is brown loam about 8 inches thick. The subsoil is about 34 inches thick. It is yellowish brown and dark yellowish brown, firm clay loam and loam. The underlying material to a depth of 60 inches is yellowish brown loam. In places the upper part of the subsoil is as much as 15 percent gravel. In some places the slope is less than 6 percent, and in others it is more than 12 percent.

Included with this soil in mapping are small areas where the soil is severely eroded and the surface layer is clay loam and areas on small breaks where the soils have slopes of more than 18 percent. Also included are small areas of somewhat poorly drained Crosier soils on foot slopes and along small drainageways and well drained Metea soils, which have more sand than the Riddles soil, on the crest of knobs and ridges. The included soils make up 5 to 15 percent of the map unit.

The available water capacity of this soil is high. Permeability is moderate. Surface runoff is medium. The surface layer has a moderate content of organic matter, and it is friable. Tilth is fair.

This soil is used mainly for cultivated crops. In many areas it is used for hay or pasture, and in a few areas it has been left as woodland or is being left to reforest.

This soil is suited to corn, soybeans, and small grains. It has a few stones on or near the surface that can hinder farming operations. Erosion is the major hazard. Small grains and meadow in rotation, terraces, diversions, contour farming, grassed waterways, grade stabilization structures, and other conservation practices help control erosion and reduce runoff if cultivated crops are grown. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help control erosion, reduce crusting, improve soil tilth, and increase the infiltration of water.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing or grazing when the soil is wet causes surface compaction, excessive runoff, and poor tilth. Pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is well suited to trees. Plant competition is the main concern in management. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying.

This soil is moderately limited for use as building sites because of slope and the shrink-swell potential. Buildings should be designed to conform to the slope. Foundations, footings, and basement walls should be strengthened. Backfilling with coarser material helps prevent structural damage caused by the shrinking and swelling of the soil. This soil is moderately limited for local roads and streets because of slope, frost action, and low strength. Grading commonly is necessary. The road base should be replaced with suitable material to reduce damage caused by frost action and help support vehicular traffic. This soil is moderately limited for septic tank absorption fields because of the moderate permeability and slope. Absorption fields need to be enlarged and installed on the contour to offset the moderate permeability and to distribute the effluent evenly.

This soil is in capability subclass IIIe and in woodland suitability subclass 1o.

RmG—Rodman gravelly loam, 25 to 50 percent slopes. This is a steep to very steep, excessively drained soil on breaks between terraces and bottom lands and on side slopes of deeply cut drainageways. It is shallow over sand or gravelly sand. The areas are long and narrow and range from 2 to 15 acres in size.

Typically, the surface layer is very dark brown gravelly loam about 5 inches thick. The subsoil is dark yellowish brown, friable and very friable gravelly loam and gravelly sandy loam about 10 inches thick. The underlying material to a depth of 60 inches is brown gravelly loamy sand. In some areas the subsoil has more clay. In places the lower part of the slope is glacial till.

Included with this soil in mapping are small areas of soils that are severely eroded and small gravel pits. Also included are small areas of well drained Fox and Kosciusko soils on the less steep slopes. The included soils make up 2 to 10 percent of the map unit.

The available water capacity of this soil is low. Permeability is moderately rapid in the surface layer and

subsoil and very rapid in the underlying material. Surface runoff is very rapid. The surface layer has a moderate content of organic matter, and it is very friable.

This soil generally has been left wooded. In a few areas it is used as pasture. It is a probable source of sand and gravel.

This soil generally is not suited to cultivated crops. Erosion is a severe hazard. The steepness of slopes makes the use of standard farm machinery difficult.

This soil generally is not suited to grasses and legumes for pasture. It is droughty and produces little forage in summer. The steepness of slopes limits the use of equipment.

This soil is poorly suited to trees. Seedling mortality, the hazard of erosion, and equipment limitations are concerns in management. Replanting is often necessary to establish a good stand. The type of equipment that can be used safely is limited.

This soil generally is not suitable for use as building sites or for sanitary facilities because of the slope. It is severely limited for local roads also because of the slope. Cutting and filling are needed, and roads should be built on the contour where possible. Providing side ditches and culverts for drainage helps reduce erosion. Disturbed areas should be revegetated as soon as possible.

This soil is in capability subclass VIIs and in woodland suitability subclass 3s.

Se—Sebewa loam. This is a nearly level, very poorly drained soil in depressions on river terraces and outwash plains. It is moderately deep over sand and gravel. In places it is often ponded by runoff from adjacent higher areas. The areas of this map unit are irregular in shape and range from 2 to 30 acres in size.

Typically, the surface layer is very dark grayish brown loam about 11 inches thick. The subsurface layer is very dark gray loam about 3 inches thick. The subsoil is about 15 inches thick. The upper part is gray, friable gravelly clay loam, and the lower part is gray, very friable gravelly sandy loam. The underlying material to a depth of 60 inches is gray sand and gravelly sand. In places the subsoil is gravelly sandy loam throughout. In places the upper part of the subsoil is silty clay loam. In places the combined thickness of the surface and subsurface layers is less than 10 inches. In some areas the soil is deeper to sand and gravelly sand or has less gravel.

Included with this soil in mapping are undrained soils in small areas in woodlots or deep depressions in fields. These soils are wet most of the year. In some small areas in the deep depressions the soils have a surface layer of muck. Also included are a few areas of soils that have a thin layer of lighter colored soil material over the dark surface layer. Also included are well drained Fox and Kosciusko soils and somewhat poorly drained Homer soils in small areas on slight rises. The included soils make up 2 to 8 percent of the map unit.

The available water capacity of this soil is moderate. Permeability is moderate in the surface and subsoil and rapid in the underlying material. The water table is often at or above the surface in winter and early in spring. Surface runoff is very slow or ponded. The surface layer has a high content of organic matter, and it is friable. Tilth is good.

In most areas this soil has been drained and is used for cultivated crops. In a few areas it is used for hay or pasture. The undrained areas are left as woodland.

This soil is well suited to corn, soybeans, and small grains if it is adequately drained. Wetness is the major limitation, and ponding is a major hazard. Most crops grow poorly in undrained areas of this soil. Shallow surface drains and subsurface drains can be used to remove excess water. If this soil is excessively drained by artificial means, it tends to be droughty because of the moderate available water capacity. In places the surface layer has more clay and is difficult to work into a suitable seedbed. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops reduce crusting, improve soil tilth, and increase the infiltration of water.

This soil is well suited to grasses and legumes for hay or pasture if it is adequately drained. Deep-rooted legumes such as alfalfa grow poorly in inadequately drained areas because they cannot tolerate ponding or a high water table. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is suited to trees. Plant competition, seedling mortality, a windthrow hazard, and equipment limitations are concerns in management. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying. Species that tolerate wetness should be favored. Replanting is often needed to establish a good stand. Seedlings survive and do well if competing vegetation is controlled. Care in thinning or no thinning at all can help prevent windthrow. In harvesting, trees should not be left standing alone or widely spaced. Trees generally are harvested in dry seasons or when the ground is frozen.

This soil generally is not suited to use as building sites or for sanitary facilities because of ponding. It is severely limited for roads because of ponding and frost action. Constructing roads on raised and well compacted fill material and providing side ditches and culverts for drainage help to prevent the damage caused by ponding and frost action.

This soil is in capability subclass IIw and in woodland suitability subclass 2w.

Sf—Sebewa-Milford complex. These are nearly level, deep, very poorly drained soils in depressions on river

terraces, outwash plains, and uplands. The areas are irregular in shape and range from 3 to 25 acres in size.

The Sebewa soil makes up about 55 percent of the map unit. It is on foot slopes at the edge of depressions and on slight rises in the depressions. The Milford soil makes up about 35 percent of the map unit. It is on the bottom of the depressions. The soils are often ponded by runoff from adjacent higher areas.

Typically, the surface layer of the Sebewa soil is very dark brown sandy loam about 9 inches thick. The subsoil is about 23 inches thick. The upper part of the subsoil is black and dark gray, mottled, firm gravelly clay loam. The lower part is dark gray, mottled, very friable gravelly sandy loam. The underlying material to a depth of 60 inches is grayish brown gravelly sand. In a few areas the surface layer is fine loamy sand or gravelly sandy loam. In places the depth to sand and gravel is less than 20 inches or more than 40 inches. In places the subsoil does not have significantly more clay than the surface layer. In some areas that are adjacent to upland soils, the underlying material is glacial till. At the edge of some mapped areas, the slope is as much as 5 percent.

Typically, the surface layer of the Milford soil is black silty clay loam about 11 inches thick. The subsoil is about 26 inches thick. The upper part is very dark gray, mottled, firm silty clay. The lower part is dark gray, mottled, firm silty clay loam. The underlying material to a depth of 60 inches is grayish brown, mottled, stratified silt loam and fine loamy sand. In some areas there is a thin layer of muck on the surface. The underlying material becomes coarser with depth, ranging from silty clay loam to gravelly sand. In places sand and gravel are within 30 inches of the surface.

Included with these soils in mapping are small areas of soils that are underlain by low-grade marl, many areas of soils that are wet most of the year because they are not adequately drained, and some areas of soils that have a light colored surface layer that was deposited over the dark colored original surface layer. Also included in mapping are very poorly drained Houghton and Palms Variant organic soils in small areas in the lowest part of the depressions and somewhat poorly drained Homer soils on slight rises. The included soils make up about 10 percent of the map unit.

The available water capacity of the Sebewa soil is moderate, and permeability is moderate in the surface layer and subsoil and rapid in the underlying material. The available water capacity of the Milford soil is high, and permeability is moderately slow. The water table is at or above the surface in winter and early in spring. Surface runoff is very slow or is ponded. The surface layer of these soils has a high content of organic matter and is friable to firm. Tilth is good to fair.

In most areas, these soils have been drained and are used for cultivated crops. In a few areas the soils are used for hay and pasture or have been left as woodland.

The soils are suited to corn, soybeans, and small grains if they are adequately drained. Wetness is the major limitation, and ponding is a major hazard. Most crops grow poorly in undrained areas. Shallow surface drains and subsurface drains can be used to remove excess water, but adequate outlets are difficult to find in some areas. The Milford soil, because of the high content of clay in the surface layer, is difficult to work into a suitable seedbed. In areas that are excessively drained by artificial means, the Sebewa soil tends to be droughty because of its moderate available water capacity. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help control erosion, reduce crusting, improve soil tilth, and increase water infiltration.

The soils are well suited to grasses and legumes for hay or pasture if they are adequately drained. Deep-rooted legumes such as alfalfa grow poorly in inadequately drained areas because they cannot tolerate ponding or a high water table. Legumes can be damaged even if the area is ponded for only brief periods. Overgrazing or grazing when the soils are wet causes surface compaction and poor tilth. Pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soils in good condition.

The soils are suited to trees. Plant competition, seedling mortality, a windthrow hazard, and equipment limitations are concerns in management. Species that are tolerant of wetness should be favored. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying. Care in thinning or no thinning at all can help minimize the windthrow hazard. In harvesting, trees should not be left standing alone or widely spaced. Trees generally are harvested in dry seasons or when the ground is frozen.

The soils generally are not suited to use as building sites or for sanitary facilities because of ponding. These soils are severely limited for roads because of ponding, frost action, and low strength. Constructing roads on raised and well compacted fill material and providing side ditches and culverts for drainage help to prevent the damage caused by ponding and frost action.

These soils are in capability subclass IIw. The Sebewa soil is in woodland suitability subclass 2w. The Milford soil was not assigned to a woodland suitability subclass.

Sh—Shoals silt loam, occasionally flooded. This is a nearly level, deep, somewhat poorly drained soil on bottom lands. The areas are long and narrow and range from 3 to 90 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 10 inches thick. The subsurface layer is dark brown silt loam about 6 inches thick. The subsoil is about 32 inches thick. The upper part is dark grayish brown and grayish brown, mottled, friable silt loam and

loam. The lower part is grayish brown, mottled, friable, stratified loam and sandy loam. The underlying material to a depth of 60 inches is gray, mottled, stratified sandy loam and loamy sand. In some small creek bottoms, this soil is underlain by sand and gravelly sand within a depth of 24 inches. In a few places on bottom lands of the Wabash River and some of its small tributaries, limestone bedrock is within a depth of 40 inches.

Included with this soil in mapping are well drained Genesee soils, in small areas in slightly higher positions than those of the Shoals soil, and very poorly drained Sloan soils, in low-lying, slack water areas. The included soils make up 2 to 10 percent of the map unit.

The available water capacity of this soil is high. Permeability is moderate. The seasonal high water table is at a depth of 1 foot to 3 feet. Surface runoff is slow. The surface layer has a moderate content of organic matter, and it is friable. Tilth is good.

In many areas on the larger bottom lands, this soil is used for cultivated crops. On small, narrow bottom lands, this soil generally is used as pasture or has been left as woodland.

This soil is suited to corn, soybeans, and small grains. In some years planting may be delayed or replanting may be necessary because of spring flooding. Levees can be used to protect the soil against flooding. Subsurface drains can be used to remove excess water. In some areas, if subsurface drains are installed below a depth of 3 feet, fine sand can flow into the drains and plug them. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops help control scouring by floodwater, reduce crusting, improve soil tilth, and increase the infiltration of water.

This soil is suited to grasses for hay or pasture if it is protected against flooding and drained. Legumes grow poorly in areas that are not protected because they cannot tolerate flooding and a high water table. Branches and other debris left on fields by floodwater can hinder the harvest of hay. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth.

This soil is well suited to trees. Plant competition is the main concern in management. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying.

This soil generally is not suitable for use as building sites and for sanitary facilities because of flooding. It is severely limited for local roads because of flooding and frost action. Constructing roads on raised and well compacted fill material and providing side ditches and culverts for drainage help to prevent the damage caused by ponding and frost action.

This soil is in capability subclass IIw and in woodland suitability subclass 2o.

So—Sloan silty clay loam, frequently flooded. This is a nearly level, deep, very poorly drained soil on bottom lands. The areas are long and narrow and range from 3 to 80 acres in size.

Typically, the surface layer is very dark grayish brown silty clay loam about 8 inches thick. The subsurface layer is very dark grayish brown silty clay loam about 8 inches thick. The subsoil is dark grayish brown and dark gray, mottled, firm silty clay loam and loam about 16 inches thick. The underlying material to a depth of 60 inches is very dark gray, mottled, stratified loam, sandy loam, and loamy sand. In some small creek bottoms, this soil is underlain by sand and gravelly sand within a depth of 30 inches. In some areas on bottom lands of the Wabash River and its small tributaries, limestone bedrock is within a depth of 40 inches.

Included with this soil in mapping are areas of soils that are wet most of the year. Also included are small areas of well drained Genesee soils and somewhat poorly drained Shoals soils in higher positions near the stream channel. The included soils make up 2 to 8 percent of the map unit.

The available water capacity of this soil is high. Permeability is moderately slow. The water table is at or near the surface. Surface runoff is slow. The surface layer has a high content of organic matter, and it is friable. Tilth is fair.

On the larger bottom lands, this soil is used mainly for cultivated crops. On the small, narrow bottom lands, it is used as pasture or left as woodland.

This soil is suited to corn, soybeans, and small grains if it is protected from flooding and is adequately drained. In most years planting may be delayed or replanting may be necessary because of spring flooding. Levees can be used to protect this soil from flooding. Shallow surface drains and subsurface drains can be used to remove excess water if outlets are available. Adequate outlets are difficult to find in some areas. In some places, if subsurface drains are installed below a depth of 3 feet, fine sand can flow into the drains and plug them. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops reduce crusting, improve soil tilth, and increase the infiltration of water.

This soil is well suited to grasses for hay or pasture if it is protected from flooding and adequately drained. Deep-rooted legumes grow poorly in unprotected areas of this soil because they cannot tolerate flooding and a high water table. Branches and other debris left on fields by floodwater can hinder the harvest of hay. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth.

This soil is suited to trees. Plant competition, seedling mortality, a windthrow hazard, and equipment limitations are concerns in management. Species that tolerate wetness should be favored. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or

spraying. Replanting is often necessary to establish a good stand. Care in thinning or no thinning at all can help prevent windthrow. In harvesting, trees should not be left standing alone or widely spaced. Trees generally are harvested in dry weather or when the ground is frozen.

This soil generally is not suitable for use as building sites and for sanitary facilities because of flooding. It is severely limited for local roads because of flooding and low strength. Constructing roads on raised and well compacted fill material and providing side ditches and culverts for drainage help to prevent the damage caused by flooding and low strength.

This soil is in capability subclass IIIw and in woodland suitability subclass 2w.

Wc—Wallkill silt loam. This is a nearly level, deep, very poorly drained soil in deep depressions on uplands, outwash plains, and river terraces. It is often ponded by runoff from adjacent higher areas. The areas of this map unit are oval or irregular in shape and range from 3 to 10 acres in size.

Typically, the surface layer is very dark grayish brown silt loam about 9 inches thick. The underlying material is dark grayish brown silt loam about 16 inches thick. Below that, to a depth of 60 inches, there is a buried organic soil that is black and very dark brown muck. In places the overburden of mineral soil is less than 16 inches thick. In places this soil is underlain by sedimentary peat or sandy and gravelly material.

Included with this soil in mapping are areas of undrained soils that are wet most of the year. Also included are small areas of well drained Fox, Kosciusko, Miami, and Morley soils on the slopes that surround the depressions. The included soils make up 4 to 12 percent of the map unit.

The available water capacity of this soil is high. Permeability is moderate in the mineral material and moderately slow to moderately rapid in the organic material. The water table is often at or above the surface in winter and spring. Surface runoff is very slow or is ponded. The surface layer has a high content of organic matter, and it is friable. Tilth is good.

In most places this soil has been drained at one time and has been allowed to revert to marsh. In adequately drained areas this soil is used for cultivated crops. The areas that have been partly but inadequately drained are used mainly as pasture.

This soil is suited to corn, soybeans, and small grains if it is adequately drained. Wetness is a major limitation, and ponding is the major hazard. Most crops grow poorly in the undrained areas. This soil generally is difficult to drain. Many areas do not have an adequate drainage outlet. Clay and concrete tile drains installed in the organic material settle and fall out of alignment. The poor stability of the organic material causes ditchbanks to slough and block the ditch. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops reduce crusting, improve soil tilth, and increase the infiltration of water.

This soil is suited to grasses for hay and pasture if it is adequately drained. Deep-rooted legumes such as alfalfa grow poorly on this soil because they cannot tolerate ponding or a high water table. Legumes can be damaged even if the area is ponded only for a brief period. Overgrazing or grazing when the soil is wet causes surface compaction. Pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is poorly suited to trees. Plant competition, seedling mortality, a windthrow hazard, and equipment limitations are concerns in management. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying. Replanting is often necessary to establish a good stand. Species that tolerate wetness should be favored. Care in thinning or no thinning at all can help prevent windthrow. In harvesting, trees should not be left standing alone or widely spaced. Trees generally are harvested in dry seasons or when the ground is frozen.

This soil generally is not suited to use as building sites or for sanitary facilities because of ponding. It is severely limited for local roads because of ponding, low strength, and frost action. Constructing roads on raised and well compacted fill material and providing side ditches and culverts for drainage help to prevent the damage caused by ponding, low strength, and frost action.

This soil is in capability subclass IIIw and in woodland suitability subclass 4w.

Wh—Washtenaw silt loam. This is a nearly level, deep, very poorly drained soil in deep depressions and old glacial lakebeds on uplands, outwash plains, and river terraces. It is often ponded by runoff from adjacent higher areas. The areas of this map unit are oval or irregular in shape and range from 3 to 10 acres in size.

Typically, the surface layer is dark grayish brown silt loam about 10 inches thick. The underlying material is dark grayish brown and grayish brown, firm silt loam about 15 inches thick. Below the underlying material there is a buried surface layer of black silty clay loam about 13 inches thick and, below that to a depth of 60 inches, a buried subsoil of very dark grayish brown and dark gray, mottled, firm clay loam. In places the overburden is less than 20 inches thick. In places the buried soil has more clay and less sand.

Included with this soil in mapping are areas of undrained soils that are wet most of the year. Also included are small areas of well drained Fox, Kosciusko, Miami, and Morley soils on the slopes that surround the depressions. The included soils make up 5 to 15 percent of the map unit.

The available water capacity of this soil is high. Permeability is slow. The water table is often at or above

the surface in winter and spring. Surface runoff is very slow or is ponded. The surface layer has a moderate content of organic matter, and it is friable. Tilth is good.

In most places this soil is drained and is used for cultivated crops. In a few areas it is used for hay or pasture. The undrained areas are left as woodland or marsh.

This soil is suited to corn, soybeans, and small grains if it is adequately drained. Wetness is the major limitation, and ponding is a major hazard. Most crops grow poorly in the undrained areas. Shallow surface drains and subsurface drains can be used to remove excess water, but draining this soil is difficult in some areas because adequate outlets are not available. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops reduce crusting, improve soil tilth, and increase the infiltration of water.

This soil is suited to grasses for hay or pasture if it is adequately drained. Deep-rooted legumes such as alfalfa grow poorly in undrained areas because they cannot tolerate ponding or a high water table. Legumes can be damaged even if the area is ponded for only a brief period. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is suited to trees. Plant competition, seedling mortality, a windthrow hazard, and equipment limitations are concerns in management. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying. Replanting is often necessary to establish a good stand. Species that tolerate wetness should be favored. Care in thinning or no thinning at all can help prevent windthrow. In harvesting, trees should not be left standing alone or widely spaced. Trees generally are harvested in dry seasons or when the ground is frozen.

This soil generally is not suitable for building sites and sanitary facilities because of ponding. It is severely limited for local roads because of ponding, low strength, and frost action. Constructing roads on raised and well compacted fill material and providing side ditches and culverts for drainage help to prevent the damage caused by ponding, low strength, and frost action.

This soil is in capability subclass IIIs and in woodland suitability subclass 2w.

Ws—Westland loam. This is a nearly level, deep, very poorly drained soil in depressions on river terraces and outwash plains. In places it is ponded in wet periods by runoff from adjacent higher areas. The areas of this map unit are irregular in shape and range from 3 to 20 acres in size.

Typically, the surface layer is very dark grayish brown loam about 10 inches thick. The subsurface layer is very dark gray loam about 5 inches thick. The subsoil is about 31 inches thick. The upper part is dark gray, mottled, firm clay loam, and the lower part is grayish brown, mottled, friable gravelly sandy clay loam and gravelly sandy loam. The underlying material to a depth of 60 inches is grayish brown gravelly loamy sand. In places the combined thickness of the surface and subsurface layers is less than 10 inches. In places the underlying material is at a depth of less than 40 inches.

Included with this soil in mapping are small areas of undrained soils in woodlots or deep depressions in fields that have not been drained. These soils are wet most of the year. In some small areas in the deep depressions, there is a thin layer of muck on the surface. Also included are small areas of well drained Fox and Ockley soils in higher positions than those of the Westland soil. The included soils make up 2 to 10 percent of the map unit.

The available water capacity of this soil is high. Permeability is moderately slow in the subsoil and rapid in the underlying material. The water table is often at or above the surface in winter and early in spring. Surface runoff is very slow to ponded. The surface layer has a high content of organic matter, and it is friable. Tilth is good.

In most areas this soil has been drained and is used for cultivated crops. In a few areas it is used for hay or pasture. The undrained areas are left as woodland.

This soil is well suited to corn, soybeans, and small grains if it is adequately drained. Wetness is the major limitation, and ponding is a major hazard. Most crops grow poorly in undrained areas. Surface drains and subsurface drains can be used to remove excess water. In places the surface layer has more clay than is typical. In those places, preparing a seedbed is more difficult. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops reduce crusting, improve soil tilth, and increase the infiltration of water.

This soil is well suited to grasses and legumes for hay or pasture if it is adequately drained. Deep-rooted legumes such as alfalfa grow poorly in inadequately drained areas because they cannot tolerate ponding or a high water table. Grasses and legumes should be planted at the proper seeding rate. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is suited to trees. Plant competition, seedling mortality, a windthrow hazard, and equipment limitations are concerns in management. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying. Replanting is often necessary to establish a good stand. Species that tolerate wetness should be favored. Care in thinning or no thinning at all can help prevent windthrow. In harvesting, trees should not be left

standing alone or widely spaced. Trees generally are harvested in dry seasons or when the ground is frozen.

This soil generally is not suitable for building sites and sanitary facilities because of ponding. It is severely limited for local roads because of ponding and low strength. Constructing roads on raised and well compacted fill material and providing side ditches and culverts for drainage help to prevent the damage resulting from ponding and low strength.

This soil is in capability subclass IIw and in woodland suitability subclass 2w.

Wt—Whitaker loam. This is a nearly level, deep, somewhat poorly drained soil on slight swells on river terraces and outwash plains. The areas are irregular in shape and range from 3 to 35 acres in size.

Typically, the surface layer is dark grayish brown loam about 8 inches thick. The upper part of the subsoil is brown, friable loam 4 inches thick; the middle part is dark yellowish brown, firm loam and sandy clay loam 29 inches thick; and the lower part is grayish brown, friable loamy sand 8 inches thick. The subsoil is mottled throughout. The underlying material to a depth of 60 inches is brown, mottled fine sand. In some places the surface layer and subsoil are more than 60 inches thick. In some places where this soil is adjacent to upland soils, it is underlain by glacial till within a depth of 48 inches. In places there are gravelly layers in the subsoil that have a combined thickness of as much as 20 inches.

Included with this soil in mapping are small areas of well drained Martinsville soils on rises and very poorly drained Rensselaer soils in narrow drainageways and depressions. The included soils make up 2 to 8 percent of the map unit.

The available water capacity of this soil is high. Permeability is moderate. The seasonal high water table is at a depth of 1 foot to 3 feet. Surface runoff is slow. The surface layer has a moderate content of organic matter, and it is friable. Tilth is good.

This soil is used mainly for cultivated crops. In some areas it is used for hay or pasture. A few areas have been left as woodland, but many of these are being cleared for cultivation.

This soil is well suited to corn, soybeans, and small grains if it is adequately drained. Subsurface drains can be used to remove excess water. If subsurface drains are installed below a depth of 3 feet, fine sand can flow into the drains and plug them. Conservation tillage that leaves a protective amount of crop residue on the surface and cover crops reduce crusting, improve soil tilth, and increase the infiltration of water.

This soil is well suited to grasses and legumes for hay or pasture if it is adequately drained. Deep-rooted legumes such as alfalfa grow poorly in undrained areas because they cannot tolerate a high water table. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and soil in good condition.

This soil is suited to trees. Plant competition is the main concern in management. Seedlings survive and grow well if competing vegetation is controlled. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying.

This soil is severely limited for use as building sites because of wetness. Dwellings should be constructed without a basement. Subsurface drains can help lower the water table. This soil is severely limited for local roads and streets because of low strength and frost action. Providing drainage along roads helps prevent damage caused by frost action. The road base material needs to be replaced or strengthened with more suitable material to support vehicular traffic. This soil is severely limited for septic tank fields because of wetness. Filling or mounding the septic tank absorption field with suitable fill material, elevating the absorption field, and providing drainage around its outer edge help overcome wetness.

This soil is in capability subclass IIw and in woodland suitability subclass 3o.

prime farmland

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

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in providing the nation's short- and long-range needs for food and fiber. The acreage of high-quality farmland is limited, and the U.S. Department of Agriculture recognizes that government at local, state, and federal levels, as well as individuals, must encourage and facilitate the wise use of our nation's prime farmland.

Prime farmland soils, as defined by the U.S. Department of Agriculture, are soils that are best suited to producing food, feed, forage, fiber, and oilseed crops. Such soils have properties that are favorable for the economic production of sustained high yields of crops. The soils need only to be treated and managed using acceptable farming methods. The moisture supply, of course, must be adequate, and the growing season has to be sufficiently long. Prime farmland soils produce the highest yields with minimal inputs of energy and economic resources, and farming these soils results in the least damage to the environment.

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

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

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

About 188,000 acres, or nearly 70 percent of Wabash County, is prime farmland. Most areas of prime farmland are in map units 1, 2, 3, 4, 8, and 9 on the general soil map. Many areas throughout the rest of the county are also prime farmland.

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

The following map units, or soils, make up prime farmland in Wabash County. On some soils included in the list, appropriate measures have been applied to overcome a hazard or limitation, such as wetness. The location of each map unit is shown on the detailed soil maps at the back of this publication. The extent of each unit is given in table 5. The soil qualities that affect use and management are described in the section "Detailed soil map units." This list does not constitute a recommendation for a particular land use.

BaA	Blount silt loam, 0 to 2 percent slopes (where drained)
BaB2	Blount silt loam, 1 to 4 percent slopes, eroded (where drained)
Br	Brookston loam (where drained)
CrA	Crosby silt loam, 0 to 3 percent slopes (where drained)
CsA	Crosier loam, 0 to 3 percent slopes (where drained)
Cy	Cyclone silt loam (where drained)
FnA	Fincastle silt loam, 0 to 2 percent slopes (where drained)
FsA	Fox loam, 0 to 2 percent slopes
FsB2	Fox loam, 2 to 6 percent slopes, eroded
Ge	Genesee loam, occasionally flooded
HaA	Haskins loam, 0 to 3 percent slopes (where drained)
Ho	Homer loam (where drained)
KaA	Kalamazoo sandy loam, 0 to 2 percent slopes
KaB	Kalamazoo sandy loam, 2 to 6 percent slopes
KsA	Kosciusko sandy loam, 0 to 2 percent slopes
KsB	Kosciusko sandy loam, 2 to 6 percent slopes
MbA	Martinsville loam, 0 to 2 percent slopes

MbB	Martinsville loam, 2 to 6 percent slopes
MeB	Metea loamy sand, 2 to 6 percent slopes
MfB2	Miami loam, 2 to 6 percent slopes, eroded
MhB2	Miami silt loam, 2 to 6 percent slopes, eroded
Mm	Milford silty clay loam (where drained)
Mp	Millsdale silty clay loam (where drained)
MsA	Milton silt loam, 0 to 2 percent slopes
MsB2	Milton silt loam, 2 to 6 percent slopes, eroded
OcA	Ockley loam, 0 to 2 percent slopes
OcB2	Ockley loam, 2 to 6 percent slopes, eroded
Pt	Pella silty clay loam, (where drained)
Pw	Pewamo silty clay loam (where drained)
RaA	Randolph silt loam, 0 to 2 percent slopes (where drained)
RcA	Rawson sandy loam, 0 to 2 percent slopes
RcB2	Rawson sandy loam, 2 to 6 percent slopes, eroded
Re	Rensselaer loam (where drained)
RhA	Riddles loam, 0 to 2 percent slopes
RhB2	Riddles loam, 2 to 6 percent slopes, eroded
Se	Sebewa loam (where drained)
Sf	Sebewa-Milford complex (where drained)
Sh	Shoals silt loam, occasionally flooded (where drained)
Wc	Wallkill silt loam (where drained)
Wh	Washtenaw silt loam (where drained)
Ws	Westland loam (where drained)
Wt	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

Joe R. Peden, conservation agronomist, Soil Conservation Service, helped prepare this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed soil map units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

More than 186,000 acres in the county is used for crops and pasture (*5*). Harvested cropland totals 166,000 acres, and pasture totals 20,000 acres. Woodland takes up an additional 23,000 acres. Acreage in crops and pasture is gradually decreasing as more land is being used for urban development. In the period 1969 through 1974 more than 11,500 acres was taken out of farm use. The use of the soil survey to help make land use decisions is discussed in the sections "General soil map units" and "Broad land use considerations."

Soil drainage is the major problem on about 65 percent of the cropland and pasture in Wabash County. Most of the very poorly drained soils, such as Cyclone and Pewamo soils, are satisfactorily drained for agricultural production. Subsurface drains, drainage ditches, and shallow surface drains are used to remove excess water. In a few areas, the soils cannot be economically drained. These soils are in deep depressions where adequate outlets are not available. Most of the somewhat poorly drained soils, such as Blount and Fincastle soils, have not been adequately drained. The drainage problem is not so evident as in the very poorly drained soils, but a seasonal high water table can reduce crop yields, shorten the period when the soil can be tilled, and delay harvesting. Subsurface drains are the best way to remove excess water from these soils.

The well drained soils have adequate natural drainage for crop production and do not normally require artificial drainage. Many of the well drained upland soils, such as Morley soils, do tend to dry out slowly after rains. In many areas of well drained soils there are small areas of wetter soils, which may need some artificial drainage, along drainageways or foot slopes or in small depressions. In most areas, the very poorly drained soils need a combination of surface and subsurface drainage. In some areas it is difficult to find an adequate drainage outlet. Lateral tile drains need to be spaced more closely in slowly permeable soils than in the more permeable

soils. Well drained, rolling upland soils need a combination of grassed waterways to control runoff and subsurface drains to remove excess ground water.

Organic soils, such as Houghton muck, oxidize and subside when they are drained. Special systems are needed to control the depth and period of drainage. The water table is lowered during the growing season for crop production and raised to the surface at all other times to minimize oxidation and subsidence. Information on drainage for each type of soil in the county is available at the local office of the Soil Conservation Service.

Soil erosion is a major problem on about 55 percent of the cropland and pasture in Wabash County. Loss of the surface layer by erosion reduces the capability of a soil for producing a crop. As the natural surface layer is eroded away, much of the organic matter and fertility is lost. Erosion is a problem on most of the soils that have a clayey subsoil; for example, Morley soils. As the surface layer is eroded away, plowing mixes more clayey material from the subsoil with the remaining surface layer. The higher content of clay in the surface layer impairs tilth and makes the soil difficult to work into a good seedbed. The clay holds more moisture in the surface layer; consequently, the soil stays wet longer after rain. More power is required to pull tillage equipment through soils that have a clayey surface layer. The loss of the surface layer also reduces the rooting zone and lowers the available water capacity of the soil.

Sediment results from erosion. Sediment reduces the capacity of streams and ditches to carry water. Streams and rivers that are choked by sediment flood more often. Sediment is the main pollutant, by volume, of lakes and streams. It lowers the water quality for municipal use, for recreation, and for fish and wildlife.

The primary cause of erosion is the raindrop. The force with which the rain hits bare ground does most of the damage. Soil particles are dislodged and washed away, and the soil surface becomes compacted and sealed. This reduces infiltration and produces more runoff, which carries more soil particles away. A good vegetative cover checks the force of the rain as it hits the ground, thus eliminating the main cause of erosion.

Some practices that provide vegetative cover are conservation tillage, cover crops, proper use of crop residue, stripcropping, and crop rotation. These practices can be used on most of the soils in the county.

Several structural measures can reduce erosion. Grassed waterways can be constructed to intercept runoff. The permanent grass cover reduces erosion in the waterway. Many grassed waterways have tile drains installed alongside to remove excess subsurface water.

Diversions and parallel tile outlet terraces help control erosion and prevent flooding of lowlands by shortening the length of the slope and diverting the water into a safe outlet. Diversions divert water into a grassed waterway which runs to a suitable outlet. Tile outlet terraces temporarily store water behind the terraces. The water enters an inlet pipe and then runs through a subsurface drain to a suitable outlet. These structures are most practical on deep, gently sloping and moderately sloping soils that are susceptible to erosion.

Grade stabilization structures are used on surface drains and open ditches that have too much grade. The more grade a drain has, the faster the water moves and the harder it is to control erosion. Grade stabilization structures reduce the grade of the drain and slacken the flow by dropping the water from one level to another.

Wind erosion is a hazard on a few of the soils in Wabash County. The soils that are most susceptible to wind erosion are the drained muck soils and the very sandy soils. The other soils are susceptible to wind erosion to some extent, especially if they have been fall plowed. Maintaining a plant cover, mulching, and establishing windbreaks are some of the ways to minimize wind erosion.

Soil erosion is difficult to stop completely, but it can be controlled to the point where it does not effectively diminish the productive capacity of the soils. No single erosion control practice can solve all the erosion problems in Wabash County, because there are too many factors to take into account. Some of these factors are the type of farming operation, the kind of soil, the steepness of slopes, the length of slopes, and the weather pattern. A system of two or more erosion control practices may be needed to effectively control erosion on one field. Help in designing an effective erosion control system can be obtained from the local Soil and Water Conservation District or the local office of the Soil Conservation Service.

Soil fertility refers to the amount of nutrients available to plants. The natural fertility of soils varies depending on their physical and chemical properties. Most of the soils on uplands and terraces have low natural fertility because the nutrients have been leached away and the soils are acid. The soils in depressions and on bottom lands have high natural fertility because they receive runoff from adjacent soils, they have undergone less leaching of nutrients, and they are neutral.

The natural fertility of soils can be changed. Additions of fertilizer and lime increase the available nutrients and raise the pH of the soil. On the other hand, if crops are continually harvested from the soil and no fertilizer is added, the available nutrients decrease and the pH is lowered. On all soils, additions of lime and fertilizer should be based on the results of soil tests, on the needs of the crop, and on the expected level of yields. The Cooperative Extension Service can help in determining the kind and amount of fertilizer and lime to apply.

Soil tilth is important to the preparation of a seedbed, the germination of seeds, and the infiltration of water into the soil. Soils that have good tilth have good granular structure and are friable and porous. Soils that

have poor tilth are difficult to work into a good seedbed. They are cloddy and tend to dry out more slowly, and when they do dry out they become hard. Because of the poor soil structure, intense rainfall causes surface sealing, which reduces infiltration and increases runoff. The sealed surface becomes a hard crust when it dries. This crust makes it very difficult for germinating seeds to break through the surface.

Soil tilth can be maintained or improved by adding crop residue, manure, or other organic materials to the soil. Conservation tillage and working the soil when moisture conditions are favorable minimize the harm to soil structure. Fall plowing does not improve the tilth of most of the soils in Wabash County, and the hazard of erosion increases if the soil is left bare through the winter and early spring. The few soils that benefit from fall plowing are the dark, nearly level soils in depressions, such as Milford and Pella soils, which are high in clay. Freezing and thawing tends to improve the tilth of these soils and allows them to warm up earlier in the spring.

The action of chemical herbicides can be affected by the type of soil. As the use of herbicides increases, it becomes more important to know how these chemicals react on different soils. The content of organic matter of the soil affects the ability of many chemicals to control weeds. Some chemicals deteriorate slowly on clayey soil; consequently, they can cause damage to crops in the following year. Information on how the chemicals react can be obtained from a dealer or the Cooperative Extension Service.

Field crops that are suited to the soils and climate in Wabash County include many that are not commonly grown. Corn, soybeans, and wheat are the main crops. Some oats and sunflowers are grown (fig. 18). Seed can be produced for legumes such as red clover and crownvetch and grasses such as bluegrass, bromegrass, fescue, or redtop.

Forage crops for hay or pasture are suited to the soils and climate in Wabash County. Alfalfa and red clover are the legumes commonly grown in the county. They are well suited to the well drained, sloping Miami and Morley soils and can be grown on the very poorly drained Brookston and Pewamo soils if surface and subsurface drains are provided to remove excess water. Tall fescue, timothy, and orchardgrass are the grasses commonly grown on the well drained soils. Reed canarygrass can be grown on the poorly drained soils.

Specialty crops are of limited commercial importance in Wabash County. Only a small acreage is used for popcorn, sweet corn, tomatoes, and orchards.

Many of the well drained soils on terraces, such as Kosciusko and Fox soils, and the Houghton muck soils that have been drained have excellent potential for specialty crops. These soils generally are near a suitable source of water for irrigation.

Information and suggestions on growing specialty 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 for those crops.

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

Figure 18.—Sunflowers are suited to the soils in Wabash County. This crop, on Fox loam, 0 to 2 percent slopes, was planted after wheat was harvested.

class and subclass are used in this survey. These levels are defined in the following paragraphs.

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

Class I soils have few limitations that restrict their use.

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

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

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

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

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

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

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

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or

cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

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

Mitchell G. Hassler, forester, Soil Conservation Service, helped prepare this section.

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

In table 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 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 few trees may be blown down by strong 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 tall-growing broadleaf and coniferous trees and shrubs provide the most protection.

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

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

Table 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; the Division of Forestry, Indiana Department of Natural Resources; 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. 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

James D. McCall, biologist (wildlife), Soil Conservation Service, helped prepare this section.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 11, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or

maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, soybeans, 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 bluegrass, bromegrass, timothy, 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 ragweed, goldenrod, wild carrot, foxtail, and dock.

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, maple, wild cherry, beech, apple, black walnut, hawthorn, dogwood, hickory, blackberry, raspberry, and mulberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are 'Cardinal' autumn-olive, silky dogwood, and crabapple.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, and cedar.

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, spikerush, wild millet, wildrice, cattail, rushes, water plantain, arrowhead, 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 quail, mourning dove, meadowlark, killdeer, field sparrow, cottontail, woodchuck, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include blue jay, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and white-tailed deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas (fig. 19). Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Edge habitat is the transition zone between one primary land use or cover type and another. Although it is not rated in table 11, it is of prime importance to birds and mammals, from the smallest songbird to Indiana's largest surviving game animal, the white-tailed deer. Many animals that inhabit open land or woodland also frequent edge habitat, and the variety of plant species in areas of edge habitat is disproportionately large. Edge habitat is consistently used by more birds and other animals than is an area of equal size in the center of a large tract of woodland or cropland. An example of edge habitat that is particularly favorable to wildlife is the border between a no-till field of corn and the outer edge of dense woodland. An irregular or deeply indented border is even more favorable to wildlife.

engineering

Max L. Evans, state conservation engineer, Soil Conservation Service, helped prepare this section.

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

Figure 19.—Habitat for wetland wildlife in an area of Palms muck, undrained.

Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-

swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

building site development

Table 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 or to a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to ponding and 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, large stones, ponding, 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, a high water table, ponding, 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, and the available water capacity in the upper 40 inches affect plant growth. Flooding, ponding, 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 the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 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, and flooding affect absorption of the effluent. Large stones and bedrock 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 filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 13 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock, 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 and bedrock 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, a high water table, ponding, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, and soil reaction affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock 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 or stones, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel or stones, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

water management

Table 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. 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 or of organic matter. A high water table affects the amount of usable material. It also affects trafficability.

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

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock 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, 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. 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 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 affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

soil properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

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

engineering index properties

Table 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 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.

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 ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

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 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 is not considered flooding, nor is water in swamps and marshes.

Table 18 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs, on the average, no more than once in 2 years; and *frequent* that it occurs, on the average, more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 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 specified as either soft or hard. If the rock is soft or fractured, excavations 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 excavation.

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 (*4*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 19 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. 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 (*3*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*4*). 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."

Blount series

The Blount series consists of deep, somewhat poorly drained, slowly permeable soils on slight rises on till plains and in gently sloping areas on upland moraines. The soils formed in clay loam glacial till. Slopes range from 0 to 4 percent.

Blount soils are similar to Crosby, Fincastle, and Haskins soils. They are adjacent to Glynwood, Morley, and Pewamo soils. Crosby soils have less clay in the lower part of the subsoil and in the underlying material. Fincastle soils have less clay and more silt in the upper part of the subsoil and have a thicker solum. Haskins

soils have less clay and more sand in the upper part of the subsoil. Glynwood and Morley soils have less mottling in the upper part of the subsoil and are more sloping than Blount soils. Pewamo soils have a thicker and darker surface layer, are dominantly gray in the subsoil, and are in depressions and drainageways.

Typical pedon of Blount silt loam, 1 to 4 percent slopes, eroded, in a cultivated field, 285 feet west and 1,310 feet north of the southeast corner of sec. 3, T. 28 N., R. 7 E.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; common very fine roots; neutral; abrupt smooth boundary.

B21t—9 to 12 inches; dark yellowish brown (10YR 4/4) clay loam; common fine distinct dark grayish brown (10YR 4/2) mottles; moderate fine subangular blocky structure; firm; common very fine roots; thin discontinuous dark brown (10YR 4/3) clay films on faces of peds; thin discontinuous grayish brown (10YR 5/2) silt coatings on faces of peds; few glacial pebbles; neutral; clear wavy boundary.

B22t—12 to 19 inches; dark brown (10YR 4/3) clay loam; common fine distinct grayish brown (10YR 5/2) mottles; strong medium subangular blocky structure; firm; few very fine roots; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; few glacial pebbles; neutral; clear wavy boundary.

B3t—19 to 23 inches; dark yellowish brown (10YR 4/4) clay loam; few fine faint grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; firm; few very fine roots; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; few glacial pebbles; slight effervescence; mildly alkaline; clear wavy boundary.

C—23 to 60 inches; yellowish brown (10YR 5/4) clay loam; few fine faint grayish brown (10YR 5/2) mottles; massive; very firm; thin discontinuous grayish brown (10YR 5/2) calcium carbonate coatings in vertical cracks; few glacial pebbles; strong effervescence; moderately alkaline.

The solum is 22 to 45 inches thick.

The Ap horizon is dark gray (10YR 4/1) or dark grayish brown (10YR 4/2). In areas that have not been cultivated, the A1 horizon is very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2). The A2 horizon, where present, has hue of 10YR, value of 4 or 5, and chroma of 1 to 6. The A horizon is dominantly silt loam, but the range includes loam. The A horizon is neutral to medium acid.

The B2t horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 6, and it is mottled. It is clay loam, silty clay loam, or silty clay and is neutral to medium acid. The B3 horizon is neutral to mildly alkaline.

The C horizon is brown (10YR 5/3) or yellowish brown (10YR 5/4), mottled clay loam or silty clay loam.

Brookston series

The Brookston series consists of deep, very poorly drained, moderately permeable soils in depressions on upland till plains and moraines. The soils formed in silty and loamy glacial material. Slopes range from 0 to 2 percent.

Brookston soils are similar to Cyclone and Rensselaer soils and are adjacent on the landscape to Crosby, Crosier, Milford, and Pella soils. Cyclone soils have less sand in the upper part of the subsoil than Brookston soils. Rensselaer soils are more stratified in the lower part of the subsoil and in the underlying material. Crosby and Crosier soils do not have a thick dark surface layer, are dominantly brown in the subsoil, and are in higher positions. Milford and Pella soils have less sand in the lower part of the subsoil, are more stratified in the underlying material, and are in deep depressions.

Typical pedon of Brookston loam, in a cultivated field, 175 feet north and 1,625 feet east of the southwest corner of sec. 1, T. 28 N., R. 6 E.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

A12—10 to 16 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; few fine faint dark brown (10YR 4/3) mottles; weak fine subangular blocky structure; friable; common fine roots; slightly acid; clear wavy boundary.

B21tg—16 to 25 inches; gray (10YR 5/1) clay loam; common fine and medium distinct dark brown (10YR 4/3) mottles; moderate medium prismatic structure parting to moderate fine subangular blocky; firm; common fine roots; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; thin patchy very dark grayish brown (10YR 3/2) organic coatings on faces of peds; few glacial pebbles; slightly acid; clear wavy boundary.

B22tg—25 to 37 inches; grayish brown (10YR 5/2) clay loam; many fine and medium distinct dark yellowish brown (10YR 3/6) mottles; moderate medium prismatic structure parting to moderate fine subangular blocky; firm; few very fine roots; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; few glacial pebbles; neutral; clear wavy boundary.

B23tg—37 to 44 inches; grayish brown (10YR 5/2) clay loam; many coarse distinct dark yellowish brown (10YR 3/6) mottles; weak coarse prismatic structure; firm; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; few glacial pebbles; neutral; clear irregular boundary.

B3—44 to 49 inches; brown (10YR 5/3) clay loam; few fine and medium distinct gray (10YR 5/1) and dark yellowish brown (10YR 3/6) mottles; weak coarse prismatic structure; very firm; thin patchy dark grayish brown (10YR 4/2) clay films in vertical cracks and root channels; few glacial pebbles; strong effervescence; moderately alkaline; clear wavy boundary.

C—49 to 60 inches; brown (10YR 5/3) loam; few fine and medium distinct gray (10YR 5/1) and dark yellowish brown (10YR 3/6) mottles; massive; very firm; few glacial pebbles; strong effervescence; moderately alkaline.

The solum is 40 to 60 inches thick.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It commonly is silt loam or loam and less commonly silty clay loam or clay loam. It is neutral or slightly acid.

The B2tg horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2, and it is mottled. It is dominantly clay loam, but the range includes silty clay loam, sandy clay loam, and loam. The B2tg horizon is slightly acid or neutral.

The B3 horizon has hue of 10YR, value of 4 or 5, and chroma of 1 to 4. It is clay loam or loam and is neutral to moderately alkaline.

The C horizon is brown (10YR 5/3) or yellowish brown (10YR 5/4), mottled loam or clay loam.

Chelsea series

The Chelsea series consists of deep, excessively drained, rapidly permeable soils on side slopes and ridges on uplands and river terraces. The soils formed in windblown sand. Slopes range from 4 to 15 percent.

Chelsea soils are similar to Ormas soils and commonly are adjacent on the landscape to Fox, Kosciusko, Martinsville, Metea, and Miami soils. Unlike Chelsea soils, all of these soils have a continuous B horizon; the B2 horizon of these soils is thicker and has more clay than the corresponding part of Chelsea soils.

Typical pedon of Chelsea fine sand, 4 to 15 percent slopes, in a cultivated field, 2,250 feet east and 1,900 feet north of the southwest corner of sec. 35, T. 30 N., R. 5 E.

Ap—0 to 7 inches; dark brown (10YR 4/3) fine sand, yellowish brown (10YR 5/4) dry; weak fine granular structure; very friable; common fine roots; medium acid; abrupt smooth boundary.

A21—7 to 15 inches; yellowish brown (10YR 5/6) fine sand; single grain; loose; few fine roots; slightly acid; gradual smooth boundary.

A22—15 to 23 inches; light yellowish brown (10YR 6/4) loamy fine sand; single grain; loose; few fine roots; medium acid; gradual smooth boundary.

A23—23 to 30 inches; very pale brown (10YR 7/4) fine sand; single grain; loose; few very fine roots; medium acid; abrupt wavy boundary.

A24—30 to 40 inches; very pale brown (10YR 8/4) fine sand; single grain; loose; few very fine roots; medium acid; abrupt wavy boundary.

A&B—40 to 71 inches; very pale brown (10YR 8/4) fine sand (A part); single grain; loose; medium acid; bands (lamellae) of dark brown (7.5YR 4/4) fine sandy loam (B part); massive; very friable; bands are 1/4 inch to 2 inches thick, are spaced 2 to 6 inches apart, and have a combined thickness of 5 inches; reddish brown (5Y 4/4) clay bridging between sand grains; strongly acid; abrupt wavy boundary.

C—71 to 80 inches; very pale brown (10YR 8/4) fine sand; single grain; loose; slightly acid.

The solum is more than 60 inches thick. It is slightly acid to strongly acid.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2 to 4. It generally is fine sand but ranges to loamy fine sand. In wooded areas the A1 horizon has hue of 10YR, value of 3, and chroma of 1 or 2. The A2 horizon has hue of 10YR, value of 4 to 8, and chroma of 3 to 6.

The A part of the A&B horizon has hue of 10YR, value of 6 to 8, and chroma of 3 or 4. It is loamy fine sand or fine sand. The B part of the A&B horizon has hue of 5YR to 10YR, value of 3 or 4, and chroma of 3 or 4. It is loamy fine sand or fine sandy loam. It has weak fine subangular blocky structure or is massive. The B bands in the A&B horizon are 1/4 inch to 2 inches thick and are spaced 2 to 10 inches apart. They have a combined thickness of 2 to 6 inches within a depth of 60 inches. The uppermost band is at a depth of 30 to 46 inches.

The C horizon, where present, has hue of 10YR or 7.5YR, value of 5 to 8, and chroma of 3 or 4. It is fine sand to gravelly sand. It is strongly acid to moderately alkaline.

Crosby series

The Crosby series consists of deep, somewhat poorly drained, slowly permeable soils on slight rises on upland till plains. The soils formed in loam glacial till. Slopes range from 0 to 3 percent.

Crosby soils are similar to Blount, Crosier, and Fincastle soils and are commonly adjacent on the landscape to Brookston and Miami soils. Blount soils have more clay in the lower part of the subsoil and in the underlying material. Crosier soils have less clay and more sand in the subsoil. Fincastle soils have more silt and less sand in the upper part of the subsoil. Brookston soils have a thicker and darker surface layer, are dominantly gray in the subsoil, and are in depressions and drainageways. Miami soils do not have mottling in

the upper part of the subsoil and are in more sloping areas.

Typical pedon of Crosby silt loam, 0 to 3 percent slopes, in a cultivated field, 400 feet south, and 1,830 feet east of the northwest corner of sec. 1, T. 28 N., R. 6 E.

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

A2—10 to 13 inches; light brownish gray (10YR 6/2) silt loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; friable; common fine roots; thin continuous light gray (10YR 7/2) silt coatings on faces of peds; neutral; clear irregular boundary.

B2t—13 to 22 inches; brown (10YR 4/3) clay loam; common fine distinct grayish brown (10YR 5/2) mottles; strong medium prismatic structure parting to moderate fine subangular blocky; firm; few fine roots; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; few glacial pebbles; neutral; clear wavy boundary.

B3—22 to 25 inches; brown (10YR 5/3) clay loam; few fine faint grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; firm; few very fine roots; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; few glacial pebbles; neutral; clear wavy boundary.

C—25 to 60 inches; yellowish brown (10YR 5/4) loam; few fine faint grayish brown (10YR 5/2) mottles; massive; very firm; thin discontinuous light brownish gray (10YR 6/2) calcium carbonate coatings in vertical cracks and root channels; few glacial pebbles; strong effervescence; moderately alkaline.

The solum is 20 to 40 inches thick.

The Ap horizon is dark grayish brown (10YR 4/2) or grayish brown (10YR 5/2). In undisturbed areas the A1 horizon is very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2). The A2 horizon, where present, is grayish brown (10YR 5/2) or light grayish brown (10YR 6/2) and is mottled. The A horizon is silt loam or loam. It is neutral to medium acid.

The B2 horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 6, and it is mottled. The upper part is silty clay loam or clay loam, and the lower part is dominantly clay loam but ranges to loam and sandy clay loam. The B2 horizon is neutral to medium acid. The B3 horizon is neutral to mildly alkaline.

The C horizon is brown (10YR 5/3) or yellowish brown (10YR 5/4), mottled loam or sandy loam.

Crosier series

The Crosier series consists of deep, somewhat poorly drained, moderately slowly permeable soils on slight rises on upland till plains. The soils formed in loam glacial till. Slopes range from 0 to 3 percent.

Crosier soils are similar to Crosby, Haskins, and Whitaker soils and are commonly adjacent on the landscape to Brookston, Miami, and Riddles soils. Crosby and Fincastle soils have less sand in the upper part of the subsoil than Crosier soils. Haskins soils have more clay in the lower part of the subsoil and in the underlying material. Whitaker soils are stratified in the lower part of the solum and in the underlying material. Brookston soils have a thicker and darker surface layer, are dominantly gray in the subsoil, and are in depressions and drainageways. Miami and Riddles soils do not have mottling in the upper part of the subsoil and are more sloping than Crosier soils.

Typical pedon of Crosier loam, 0 to 3 percent slopes, in a cultivated field, 2,300 feet west and 240 feet south of the northeast corner of sec. 35, T. 30 N., R. 6 E.

Ap—0 to 11 inches; dark grayish brown (10YR 4/2) loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; few fine roots; few glacial pebbles; slightly acid; abrupt smooth boundary.

B21t—11 to 19 inches; yellowish brown (10YR 5/6) loam; many medium distinct grayish brown (10YR 5/2) mottles; moderate fine subangular blocky structure; firm; few fine roots; thin patchy dark grayish brown (10YR 4/2) clay films on faces of peds; few glacial pebbles; slightly acid; clear wavy boundary.

B22t—19 to 26 inches; dark yellowish brown (10YR 4/4) clay loam; many medium distinct grayish brown (10YR 5/2) 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 glacial pebbles; neutral; clear wavy boundary.

B3—26 to 32 inches; yellowish brown (10YR 5/4) loam; common fine faint grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; few fine roots; few glacial pebbles; strong effervescence; moderately alkaline; gradual wavy boundary.

C—32 to 60 inches; yellowish brown (10YR 5/4) loam; few fine distinct gray (10YR 5/1) mottles; massive; firm; few glacial pebbles; strong effervescence; moderately alkaline.

The solum is 24 to 40 inches thick.

The Ap horizon is dark grayish brown (10YR 4/2) or grayish brown (10YR 5/2). In undisturbed areas the A1 horizon is very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2). The A2 horizon, where present, is grayish brown (10YR 5/2) or light grayish brown (10YR 6/2) and has few to common mottles. The A horizon is loam or sandy loam. It is neutral to medium acid.

The B2 horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 6 and has common to many mottles. The upper part is loam, clay loam, sandy clay loam, or sandy loam, and the lower part is dominantly clay loam but ranges to loam and sandy clay loam. The B2 horizon is neutral to medium acid. The B3 horizon is neutral to moderately alkaline.

The C horizon is brown (10YR 5/3) or yellowish brown (10YR 5/4), mottled loam or sandy loam.

Cyclone series

The Cyclone series consists of deep, very poorly drained, moderately slowly permeable soils in depressions on nearly level upland till plains. The soils formed in a mantle of loess and the underlying loam glacial till. Slopes range from 0 to 2 percent.

Cyclone soils are similar to Brookston, Milford, and Pella soils and are adjacent on the landscape to Fincastle soils. Brookston soils have more sand in the upper part of the subsoil than Cyclone soils. Milford soils have more clay in the subsoil. Milford and Pella soils have stratified silt and sand in the lower part of the solum and in the underlying material. Fincastle soils do not have a thick dark surface layer and are on higher, convex parts of the landscape.

Typical pedon of Cyclone silt loam, in a cultivated field, 150 feet east and 2,250 feet north of the center of sec. 35, T. 27 N., R. 6 E.

Ap—0 to 10 inches; very dark gray (10YR 3/1) silt loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

B21tg—10 to 14 inches; very dark gray (10YR 3/1) silty clay loam; few fine distinct yellowish brown (10YR 5/4) mottles; moderate fine subangular blocky structure; firm; few fine roots; thin patchy very dark grayish brown (10YR 3/2) clay films on faces of peds; neutral; clear wavy boundary.

B22tg—14 to 23 inches; dark gray (10YR 4/1) silty clay loam; many medium distinct yellowish brown (10YR 5/4 and 5/6) mottles; moderate fine subangular blocky structure; firm; few fine roots; thin discontinuous very dark grayish brown (10YR 3/2) clay films on vertical faces of peds; neutral; clear wavy boundary.

B23tg—23 to 34 inches; gray (10YR 5/1) silty clay loam; many medium distinct yellowish brown (10YR 5/4) and brown (7.5YR 4/4) mottles; moderate medium subangular blocky structure; firm; few fine roots; thin continuous dark grayish brown (10YR 4/2) clay films on vertical faces of peds; neutral; gradual wavy boundary.

B24tg—34 to 52 inches; gray (10YR 5/1) silty clay loam; common medium distinct yellowish brown (10YR 5/4 and 5/6) mottles; weak coarse subangular blocky structure; firm; few fine roots; thin discontinuous dark gray (10YR 4/1) clay films on vertical faces of peds; neutral; clear wavy boundary.

IIB24tg—52 to 63 inches; gray (10YR 5/1) clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; thin patchy dark gray (10YR 4/1) clay films on vertical faces of peds; few glacial pebbles; neutral; clear wavy boundary.

IIB3g—63 to 68 inches; yellowish brown (10YR 5/6) clay loam; many medium distinct gray (10YR 5/1) mottles; weak coarse subangular blocky structure; firm; thin patchy dark gray (10YR 4/1) clay films on vertical faces of peds; few glacial pebbles; neutral; gradual wavy boundary.

IIC—68 to 75 inches; yellowish brown (10YR 5/4) loam; common medium grayish brown (10YR 5/2) mottles; massive; firm; few glacial pebbles; strong effervescence; moderately alkaline.

The solum is 55 to 75 inches thick. The loess is 40 to 60 inches thick. The mollic epipedon is 10 to 18 inches thick.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is silt loam or silty clay loam. It is neutral or slightly acid.

The B horizon has hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 1 or 2. The B2tg horizon is silty clay loam. The IIB is clay loam or loam. The B2tg and IIB2tg horizons are neutral or slightly acid. The IIB3 horizon is neutral to mildly alkaline.

The IIC horizon has hue of 10YR, value of 5, and chroma of 2 or 3.

Fincastle series

The Fincastle series consists of deep, somewhat poorly drained, moderately slowly permeable soils on slight rises on the nearly level upland till plains. The soils formed in a mantle of loess and the underlying loam glacial till. Slopes range from 0 to 2 percent.

Fincastle soils are similar to Blount and Crosby soils. They are adjacent on the landscape to Cyclone, Miami, and Riddles soils. Blount and Crosby soils have more clay in the upper part of the subsoil than Fincastle soils, and they have a thinner solum. Crosby soils have more sand in the upper part of the subsoil. Cyclone soils have a thicker and darker surface layer, are dominantly gray in the subsoil, and are in depressions and drainageways. Miami and Riddles soils do not have mottling in the upper part of the subsoil and are more sloping.

Typical pedon of Fincastle silt loam, 0 to 2 percent slopes, in a cultivated field, 500 feet south and 630 feet east of the northwest corner of sec. 16, T. 26 N., R. 6 E.

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

B1—10 to 13 inches; grayish brown (10YR 5/2) silt loam; few fine faint brown (10YR 5/3) mottles; moderate very fine subangular blocky structure; friable; common fine roots; thin discontinuous very dark grayish brown (10YR 3/2) organic coatings on faces of peds; slightly acid; clear wavy boundary.

B21t—13 to 17 inches; dark grayish brown (10YR 4/2) silty clay loam; common medium distinct yellowish brown (10YR 5/4) mottles; moderate fine subangular blocky structure; firm; common fine roots; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; thin discontinuous gray (10YR 6/1) silt coatings on vertical faces of peds; medium acid; clear wavy boundary.

B22t—17 to 22 inches; grayish brown (10YR 5/2) silty clay loam; many fine distinct yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; firm; few fine roots; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; few black (10YR 2/1) iron and manganese oxide accumulations; slightly acid; clear wavy boundary.

B23t—22 to 31 inches; yellowish brown (10YR 5/6) silty clay loam; many medium and fine distinct grayish brown (10YR 5/2) mottles; moderate coarse subangular blocky structure; firm; few fine roots; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; thin continuous very dark grayish brown (10YR 3/2) organic stains on vertical faces of peds; few black (10YR 2/1) iron and manganese oxide accumulations; neutral; clear wavy boundary.

IIB24t—31 to 37 inches; yellowish brown (10YR 5/6) clay loam; many medium and fine distinct grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; few very fine roots; thin continuous grayish brown (10YR 5/2) clay films on faces of peds; few black (10YR 2/1) iron and manganese oxide accumulations; few glacial pebbles; neutral; clear wavy boundary.

IIB3—37 to 42 inches; yellowish brown (10YR 5/6) loam; many medium and fine distinct gray (10YR 5/1) mottles; moderate coarse subangular blocky structure; firm; few very fine roots; thin discontinuous grayish brown (10YR 5/2) clay films on vertical faces of peds; few black (10YR 2/1) iron and manganese oxide accumulations; few glacial pebbles; neutral; gradual irregular boundary.

IIC—42 to 60 inches; yellowish brown (10YR 5/4) loam; few fine faint grayish brown (10YR 5/2) mottles; massive; very firm; few glacial pebbles; strong effervescence; moderately alkaline.

The solum is 40 to 60 inches thick. The loess is 20 to 40 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2. In undisturbed areas the A1 horizon has hue of 10YR, value of 3 or 4, and chroma of 2. The A2 horizon, where present, has hue of 10YR, value of 5 or 6, and chroma of 2. The A horizon is neutral to medium acid.

The B2t horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 6. It is silty clay loam or silt loam. It is neutral to medium.

The IIB2t horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 6. It is dominantly clay loam but ranges to loam. It is neutral to medium acid.

The IIB3 horizon is clay loam or loam. It is slightly acid to mildly alkaline.

The IIC horizon has hue of 10YR, value of 5, and chroma of 3 or 4.

Fox series

The Fox series consists of well drained soils on river terraces and outwash plains. The soils are moderately deep over sand and gravelly sand. They are moderately permeable in the solum and rapidly permeable in the underlying material. The soils formed in loamy outwash and the underlying sand and gravel. Slopes range from 0 to 20 percent.

Fox soils are similar to Kalamazoo, Kosciusko, and Ockley soils. They are adjacent on the landscape to Homer, Rodman, Sebewa, and Westland soils. Kalamazoo and Ockley soils have a thicker solum than Fox soils. Kosciusko soils have less clay in the lower part of the solum. Homer, Sebewa, and Westland soils have mottling in the upper part of the subsoil, and they are in depressions. Rodman soils have less clay in the subsoil, have a thinner solum, and are on steep slopes.

Typical pedon of Fox loam, 0 to 2 percent slopes, in a cultivated field, 750 feet west and 4,640 feet north of the southeast corner of sec. 36, T. 26 N., R. 6 E.

Ap—0 to 9 inches; dark brown (10YR 4/3) loam, brown (10YR 5/3) dry; moderate medium granular structure; friable; many fine roots; thin patchy very dark grayish brown (10YR 3/2) organic coatings on faces of peds; 5 percent coarse fragments; slightly acid; abrupt smooth boundary.

A2—9 to 12 inches; dark yellowish brown (10YR 4/4) loam; moderate medium subangular blocky structure; friable; common fine roots; thin patchy very dark grayish brown (10YR 3/2) organic coatings on faces of peds; 7 percent coarse fragments; slightly acid; clear wavy boundary.

IIB21t—12 to 21 inches; dark yellowish brown (10YR 4/4) gravelly clay loam; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; thin continuous dark brown (7.5YR 4/2) clay films on faces of peds and around pebbles; 20 percent coarse fragments; medium acid; clear wavy boundary.

IIB22t—21 to 25 inches; dark yellowish brown (10YR 4/4) gravelly sandy clay loam; weak medium prismatic structure parting to weak fine subangular blocky; firm; few fine roots; thin continuous dark brown (7.5YR 4/2) clay films on faces of peds and on surface of pebbles; 25 percent coarse fragments; medium acid; clear irregular boundary.

IIB23t—25 to 27 inches; dark yellowish brown (10YR 4/4) gravelly sandy clay loam; weak medium subangular blocky structure; firm; few fine roots; thin continuous dark brown (7.5YR 3/2) clay films on faces of peds and on surface of pebbles; 25 percent coarse fragments; slightly acid; abrupt irregular boundary.

IIC—27 to 60 inches; yellowish brown (10YR 5/4) stratified sand and gravelly sand; single grain; loose; strong effervescence; moderately alkaline.

The solum is 24 to 40 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. In undisturbed areas the A1 horizon is very dark brown (10YR 2/2) or very dark grayish brown (10YR 3/2). The A2 horizon, where present, is grayish brown (10YR 5/2), brown (10YR 5/3), or dark yellowish brown (10YR 4/4). The A horizon is loam, clay loam, sandy loam, or silt loam. It is slightly acid or medium acid.

The B2 horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 3 or 4. It is clay loam, sandy clay loam, or loam or the gravelly analogs. It is slightly acid or medium acid.

The C horizon has hue of 10YR, value of 5, and chroma of 3 or 4.

Genesee series

The Genesee series consists of deep, well drained, moderately permeable soils on bottom lands. The soils formed in loamy alluvium. Slopes range from 0 to 2 percent.

Genesee soils are adjacent on the landscape to Shoals and Sloan soils. Unlike Genesee soils, Shoals and Sloan soils have mottling in the upper part of the solum and are in low-lying and slack-water areas on the bottom lands.

Typical pedon of Genesee loam, occasionally flooded, in a cultivated field, 700 feet east and 3,060 feet south of the northwest corner of sec. 12, T. 27 N., R. 6 E.

Ap—0 to 10 inches; brown (10YR 4/3) loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; few fine roots; thin continuous dark brown (10YR 3/3) coatings on faces of peds; neutral; abrupt smooth boundary.

B21—10 to 19 inches; dark brown (10YR 4/3) loam; weak fine subangular blocky structure; friable; few fine roots; thin continuous dark yellowish brown (10YR 4/4) coatings on faces of peds; neutral; clear smooth boundary.

B22—19 to 35 inches; dark yellowish brown (10YR 4/4) loam; weak fine subangular blocky structure; friable; few very fine roots; thin discontinuous dark brown (10YR 4/3) coatings on faces of peds; neutral; clear smooth boundary.

C—35 to 60 inches; brown (10YR 4/3) sandy loam; thin strata of loamy very fine sand; massive; very friable; few shells; slight effervescence; mildly alkaline.

The depth to free carbonates is 10 to 40 inches;

The A horizon has hue of 10YR, value of 3 or 5, and chroma of 2 or 3. It commonly is loam or silt loam but ranges to silty clay loam and sandy loam. It is slightly acid to mildly alkaline.

The B horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It ranges from silty clay loam to sandy loam. It is neutral or mildly alkaline.

The C horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It is stratified. It ranges from silt loam to fine sand.

Glynwood series

The Glynwood series consists of deep, moderately well drained, slowly permeable soils on upland moraines and till plains. The soils formed in clay loam glacial till. Slopes range from 4 to 12 percent.

Glynwood soils are similar to Morley and Rawson soils and are adjacent on the landscape to Blount, Haskins, and Pewamo soils. Unlike Glynwood soils, Morley soils do not have mottles of low chroma in the subsoil. Rawson soils have more sand and less clay in the upper part of the solum than Glynwood soils. Blount, Haskins, and Pewamo soils have more gray in the upper part of the subsoil. Blount and Haskins soils are on foot slopes and are less sloping than Glynwood soils. Pewamo soils are in depressions.

Typical pedon of Glynwood silt loam, 4 to 7 percent slopes, eroded, in a cultivated field, 910 feet east and 1,270 feet south of the center of sec. 9, T. 28 N., R. 7 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

B21t—8 to 15 inches; dark yellowish brown (10YR 4/4) clay; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; common fine roots; thin discontinuous dark grayish brown (10YR 4/2) clay films on vertical faces of peds; few glacial pebbles; neutral; clear wavy boundary.

B22t—15 to 22 inches; dark yellowish brown (10YR 4/4) clay; few fine distinct dark grayish brown (10YR 4/2) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; few glacial pebbles; neutral; clear wavy boundary.

B3—22 to 26 inches; yellowish brown (10YR 5/4) clay; few fine faint grayish brown (10YR 5/2) mottles; moderate medium blocky structure parting to weak medium subangular blocky; firm; few fine roots; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; few glacial pebbles; slight effervescence; mildly alkaline; clear wavy boundary.

C—26 to 60 inches; brown (10YR 5/3) clay loam; few fine faint grayish brown (10YR 5/2) and dark yellowish brown (10YR 4/6) mottles; massive; very firm; few glacial pebbles; strong effervescence; moderately alkaline.

The solum is 22 to 36 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. Undisturbed areas have an A1 horizon that has hue of 10YR, value of 3, and chroma of 1 or 2. The A2 horizon, where present, has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. The A horizon is silt loam or loam, but in severely eroded areas it is clay loam or silty clay loam. It is neutral to medium acid.

The B2t horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 6. In some places it is mottled. It is clay or silty clay. It is neutral to medium acid. The B3 horizon is clay loam or silty clay loam. It is slightly acid to moderately alkaline.

The C horizon has hue of 10YR, value of 5, and chroma of 3 or 4. It is clay loam or silty clay loam.

Haskins series

The Haskins series consists of deep, somewhat poorly drained soils on upland till plains and moraines. The soils are moderately permeable in the upper part and slowly permeable in the lower part. They formed in loamy glacial outwash and the underlying clay loam glacial till. Slopes range from 0 to 3 percent.

Haskins soils are similar to Blount and Crosier soils and commonly are adjacent on the landscape to Glynwood, Pewamo, and Rawson soils. Blount soils have less sand in the upper part of the subsoil than Haskins soils. Crosier soils have less clay in the lower part of the subsoil and in the underlying material. Pewamo soils have a thicker and darker surface layer than Haskins soils and are in depressions and drainageways. Glynwood and Rawson soils do not have mottling in the upper part of the subsoil and are more sloping than Haskins soils.

Typical pedon of Haskins loam, 0 to 3 percent slopes, in a cultivated field, 800 feet south and 1,220 feet east of the center of sec. 9, T. 28 N., R. 7 E.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; common fine roots; slightly acid; abrupt smooth boundary.

A2—9 to 12 inches; brown (10YR 5/3) sandy loam; common medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; friable; common fine roots; thin discontinuous light brownish gray (10YR 6/2) silt coatings on faces of peds; medium acid; clear wavy boundary.

B21t—12 to 25 inches; yellowish brown (10YR 5/4) loam; common medium distinct grayish brown (10YR 5/2) and dark yellowish brown (10YR 4/4) mottles; weak coarse subangular blocky structure; friable; few fine roots; thin patchy dark brown (10YR 4/3) clay films on faces of peds; thin discontinuous light brownish gray (10YR 6/2) silt coatings on faces of peds; slightly acid; clear wavy boundary.

IIB22t—25 to 30 inches; brown (10YR 4/3) clay loam; few fine faint grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; few very fine roots; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; few glacial pebbles; neutral; clear wavy boundary.

IIC—30 to 60 inches; brown (10YR 5/3) clay loam; few fine faint grayish brown (10YR 5/2) mottles; massive; very firm; few glacial pebbles; strong effervescence; moderately alkaline.

The solum is 25 to 48 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2. Undisturbed areas have an A1 horizon that is very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2). The A2 horizon, where present, is grayish brown (10YR 5/2), brown (10YR 5/3), or light brownish gray (10YR 6/2). The A horizon is loam or sandy loam. It is neutral to medium acid.

The B2 horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The B2t horizon is loam, sandy loam, sandy clay loam, or clay loam. The IIB2t horizon is clay loam or silty clay loam. The B2 horizon is neutral to medium acid. The B3 horizon, where present, is neutral to moderately alkaline.

The IIC horizon has hue of 10YR, value of 5, and chroma of 3 or 4. It is clay loam or silty clay loam.

Hennepin series

The Hennepin series consists of deep, well drained, moderately slowly permeable soils on sharp breaks between uplands and bottom lands or terraces and on the sides of deeply cut drainageways. The soils formed in loam and clay loam glacial till. Slopes range from 25 to 50 percent.

Hennepin soils are adjacent on the landscape to Miami and Morley soils. Miami and Morley soils have a thicker solum, have more clay in the subsoil, and are less sloping than Hennepin soils.

Typical pedon of Hennepin loam, 25 to 50 percent slopes, in a woodlot, 370 feet north and 250 feet west of the southeast corner of sec. 31, T. 28 N., R. 8 E.

A1—0 to 3 inches; dark grayish brown (10YR 4/2) loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; many fine and medium roots; neutral; clear wavy boundary.
B2—3 to 13 inches; brown (10YR 4/3) loam; weak fine subangular blocky structure; firm; common fine and medium roots; few glacial pebbles; neutral; clear wavy boundary.
C—13 to 60 inches; yellowish brown (10YR 5/4) loam; massive; firm; few fine roots; few glacial pebbles; strong effervescence; moderately alkaline.

The solum is 8 to 20 inches thick.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. It is loam, silt loam, or clay loam. It is neutral or mildly alkaline.

The B horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is loam or clay loam. It is neutral or mildly alkaline.

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

Homer series

The Homer series consists of somewhat poorly drained soils on river terraces and outwash plains. The soils are moderately deep over sand, loamy sand, or gravelly sand. They are moderately permeable in the solum and rapidly permeable in the underlying material. The soils formed in loamy glacial outwash and the underlying sand and gravel. Slopes range from 0 to 2 percent.

The Homer soil in this survey area has higher chroma in the upper part of the subsoil than is definitive for the Homer series, but this difference does not alter its use or behavior.

Homer soils are commonly adjacent on the landscape to Fox, Kosciusko, and Sebewa soils. Fox and Kosciusko soils do not have mottling in the upper part of the subsoil and are in higher positions than Homer soils. Sebewa soils have a thicker and darker surface layer than Homer soils, are dominantly gray in the subsoil, and are in depressions.

Typical pedon of Homer loam, in a cultivated field, 2,520 feet south and 1,150 feet west of the northeast corner of sec. 12, T. 29 N., R. 6 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) loam, light brownish gray (10YR 6/2) dry; weak very fine granular structure; friable; common fine roots; neutral; abrupt smooth boundary.
A2—8 to 11 inches; brown (10YR 5/3) loam; weak fine subangular blocky structure; friable; few fine roots; thin discontinuous light brownish gray (10YR 6/2) silt coatings on faces of peds; few very dark grayish brown (10YR 3/2) worm casts; slightly acid; clear wavy boundary.
B21t—11 to 15 inches; dark yellowish brown (10YR 4/4) clay loam; common fine distinct grayish brown (10YR 5/2) mottles; moderate fine subangular blocky structure; firm; few fine roots; thin continuous dark brown (10YR 4/3) clay films on faces of peds; few pebbles; slightly acid; clear wavy boundary.
B22t—15 to 24 inches; dark brown (10YR 4/3) gravelly sandy clay loam; common medium distinct dark yellowish brown (10YR 3/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; 18 percent coarse fragments; medium acid; gradual wavy boundary.
B23t—24 to 30 inches; dark brown (10YR 4/3) gravelly sandy clay loam; common fine and medium distinct dark yellowish brown (10YR 3/4) mottles; weak medium subangular blocky structure; firm; few fine roots; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; 20 percent coarse fragments; slightly acid; clear wavy boundary.
B3—30 to 35 inches; grayish brown (10YR 5/2) gravelly sandy loam; common fine distinct dark yellowish brown (10YR 4/6) mottles; weak fine subangular blocky structure; firm; thin patchy dark grayish brown (10YR 4/2) clay films on faces of peds; 27 percent coarse fragments; neutral; clear irregular boundary.
IIC—35 to 60 inches; brown (10YR 5/3) stratified loamy sand and gravelly sand; single grain; loose; strong effervescence; moderately alkaline.

The solum is 24 to 40 inches thick.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. The A2 horizon, where present, has hue of 10YR, value of 5, and chroma of 2 or 3. The A horizon is loam, silt loam, or sandy loam. It is neutral or slightly acid.

The B2 horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 4. It is dominantly clay loam, but the range includes loam, sandy loam, and sandy clay loam and the gravelly analogs. The B2 horizon is slightly acid

to strongly acid. The B3 horizon is slightly acid to moderately alkaline.

Houghton series

The Houghton series consists of deep, very poorly drained, moderately slowly permeable to moderately rapidly permeable soils in deep depressions on uplands, outwash plains, and terraces. The soils formed in deep deposits of organic material. Slopes range from 0 to 2 percent.

Houghton soils are similar to Palms soils. They are adjacent on the landscape to Milford, Pella, and Sebewa soils. Palms soils have a thinner layer of organic material than Houghton soils. Milford, Pella, and Sebewa soils are mineral soils and are in higher positions.

Typical pedon of Houghton muck, undrained, in a formerly cultivated field, 560 feet south and 1,750 feet west of the northeast corner of sec. 35, T. 30 N., R. 5 E.

Oap—0 to 8 inches; black (10YR 2/1) broken face, rubbed, and pressed sapric material; about 3 percent fiber, less than 1 percent rubbed; weak fine granular structure; very friable; many fine roots; fibers are herbaceous; 40 percent mineral material; neutral; abrupt smooth boundary.

Oa2—8 to 25 inches; black (10YR 2/1) broken face, rubbed, and pressed sapric material; about 50 percent fiber, less than 8 percent rubbed; massive; very friable; common fine roots; fibers are herbaceous; 10 percent mineral material; neutral; gradual wavy boundary.

Oa3—25 to 37 inches; black (10YR 2/1) broken face, rubbed, and pressed sapric material; about 25 percent fiber, less than 5 percent rubbed; massive; very friable; few fine roots; fibers are herbaceous; 8 percent mineral material; neutral; gradual wavy boundary.

Oa4—37 to 49 inches; black (10YR 2/1) broken face, rubbed, and pressed sapric material; about 18 percent fiber, less than 10 percent rubbed; massive; very friable; few fine roots; fibers are herbaceous; 4 percent mineral material; neutral; gradual wavy boundary.

Oa5—49 to 60 inches; black (10YR 2/1) broken face, rubbed, and pressed sapric material; about 14 percent fiber, 4 percent rubbed; massive; very friable; few fine roots; fibers are herbaceous; 23 percent mineral material; neutral.

The organic layers are more than 51 inches thick.

The organic layers have hue of 10YR or 7.5YR, value of 2 or 3, and chroma of 0 to 2. They are dominantly sapric material but include some thin layers of hemic material. The layers of hemic material are 2 to 6 inches thick and have a combined thickness of less than 10 inches. The organic layers are slightly acid to mildly alkaline.

Kalamazoo series

The Kalamazoo series consists of deep, well drained soils on river terraces and outwash plains. They are moderately permeable in the solum and rapidly permeable in the underlying material. The soils formed in loamy outwash and the underlying sand and gravel. Slopes range from 0 to 6 percent.

Kalamazoo soils are similar to Fox, Kosciusko, and Ockley soils. They are adjacent on the landscape to Sebewa soils. Fox and Kosciusko soils have a thinner solum than Kalamazoo soils. Ockley soils have more clay in the lower part of the solum. Sebewa soils have mottling in the upper part of the subsoil and are in low positions or in depressions.

Typical pedon of Kalamazoo sandy loam, 0 to 2 percent slopes, in a cultivated field, 1,920 feet west and 875 feet south of the northeast corner of sec. 22, T. 29 N., R. 6 E.

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) sandy loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

A2—10 to 12 inches; brown (10YR 5/3) sandy loam; weak medium platy structure; friable; common fine roots; neutral; clear wavy boundary.

B1t—12 to 15 inches; yellowish brown (10YR 5/4) sandy loam; weak fine subangular blocky structure; friable; few fine roots; thin patchy dark yellowish brown (10YR 3/4) clay films on faces of peds; slightly acid; clear wavy boundary.

B21t—15 to 23 inches; brown (7.5YR 4/4) gravelly sandy clay loam; moderate medium subangular blocky structure; firm; few fine roots; thin continuous dark yellowish brown (10YR 3/4) clay films on faces of peds; 17 percent coarse fragments; slightly acid; clear wavy boundary.

B22t—23 to 30 inches; dark brown (7.5YR 4/2) sandy loam; weak coarse subangular blocky structure; friable; thin continuous dark yellowish brown (10YR 3/4) clay films on faces of peds; 9 percent coarse fragments; slightly acid; gradual irregular boundary.

IIB31—30 to 40 inches; strong brown (7.5YR 5/6) loamy sand; weak coarse subangular blocky structure; very friable; thin continuous dark brown (7.5YR 4/2) clay films on faces of peds; 4 percent coarse fragments; medium acid; clear wavy boundary.

IIB32—40 to 49 inches; brown (7.5YR 4/2) gravelly sandy loam; massive; friable; thin discontinuous dark brown (7.5YR 4/2) clay films on surface of pebbles; 18 percent coarse fragments; slightly acid; abrupt wavy boundary.

IIC—49 to 60 inches; brown (10YR 5/3) gravelly sand; single grain; loose; 22 percent coarse fragments; strong effervescence; moderately alkaline.

The solum is 40 to 72 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. Undisturbed areas have an A1 horizon that has hue of 10YR, value of 3, and chroma of 2 or 3. The A2 horizon, where present, has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The A horizon is sandy loam or loam. It is neutral to medium acid.

The B2t horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 2 to 4. It is clay loam, sandy clay loam, loam, or sandy loam or the gravelly analogs. It is slightly acid to strongly acid.

The IIB3 horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 2 to 6. It is loamy sand or sandy loam or the gravelly analogs. It is medium acid to mildly alkaline.

The IIC horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. It is sand or gravelly sand.

Kosciusko series

The Kosciusko series consists of deep, well drained soils on river terraces and outwash plains. The soils are moderately permeable in the solum and very rapidly permeable in the underlying material. They formed in loamy outwash and the underlying gravelly sand. Slopes range from 0 to 12 percent.

Kosciusko soils are similar to Fox and Kalamazoo soils. They are adjacent on the landscape to Homer, Rodman, and Sebewa soils. Fox soils have more clay in the lower part of the solum than Kosciusko soils. Kalamazoo soils have a thicker solum. Homer and Sebewa soils have mottling in the upper part of the subsoil and are on lower levels or in depressions. Rodman soils have a thinner solum and less clay in the subsoil, and they are on steep breaks.

Typical pedon of Kosciusko sandy loam, 2 to 6 percent slopes, in a cultivated field, 55 feet east and 1,750 feet north of the southwest corner of sec. 26, T. 30 N., R. 7 E.

Ap—0 to 9 inches; brown (10YR 4/3) sandy loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; few fine roots; neutral; abrupt smooth boundary.

B21t—9 to 13 inches; brown (7.5YR 4/4) sandy clay loam; weak fine subangular blocky structure; firm; few fine roots; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds; neutral; clear wavy boundary.

B22t—13 to 19 inches; brown (7.5YR 4/4) gravelly sandy clay loam; weak medium subangular blocky structure; firm; few fine roots; thin continuous dark brown (7.5YR 4/2) clay films on faces of peds and on surface of pebbles; 18 percent coarse fragments; neutral; clear wavy boundary.

IIB31—19 to 26 inches; dark yellowish brown (10YR 3/4) gravelly sandy loam; weak fine subangular blocky structure; friable; few very fine roots; thin discontinuous dark brown (7.5YR 4/2) clay films on faces of peds and on surface of pebbles; 15 percent coarse fragments; slightly acid; clear wavy boundary.

IIB32—26 to 38 inches; dark brown (7.5YR 4/2) gravelly sandy loam; massive; very friable; few very fine roots; 23 percent coarse fragments; medium acid; clear irregular boundary.

IIC—38 to 60 inches; yellowish brown (10YR 5/4) gravelly sand; single grain; loose; strong effervescence; 25 percent coarse fragments; moderately alkaline.

The solum is 24 to 40 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The A2 horizon, where present, is brown (10YR 4/3 or 5/3). The A horizon is sandy loam or loam. It is neutral to medium acid.

The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. It is clay loam, gravelly clay loam, sandy clay loam, or gravelly sandy clay loam. It is neutral to strongly acid.

The IIB3 horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 2 to 6. It is loamy sand, gravelly sandy loam, or gravelly loamy sand. It is medium acid to mildly alkaline. The C horizon is gravelly sand or sand.

Martinsville series

The Martinsville series consists of deep, well drained, moderately permeable soils on river terraces and outwash plains. The soils formed in stratified loamy, sandy, and silty glacial sediments. Slopes range from 0 to 12 percent.

Martinsville soils are similar to Ockley and Riddles soils. They are commonly adjacent on the landscape to Rensselaer and Whitaker soils. Ockley soils have more gravel in the subsoil and underlying material. Riddles soils have less sand in the lower part of the subsoil and are not stratified in the underlying material. Rensselaer and Whitaker soils have mottles in the upper part of the subsoil. Rensselaer soils are in depressions. Whitaker soils are in lower positions on the landscape than the Martinsville soils.

Typical pedon of Martinsville loam, 0 to 2 percent slopes, in a cultivated field, 1,200 feet east and 1,140 feet south of the center of sec. 24, T. 30 N., R. 7 E.

Ap—0 to 8 inches; dark brown (10YR 4/3) loam, brown (10YR 5/3) dry; weak fine granular structure; friable; few fine roots; few pebbles; neutral; abrupt smooth boundary.

A2—8 to 12 inches; yellowish brown (10YR 5/4) loam; moderate medium granular structure; friable; few fine roots; few pebbles; neutral; clear wavy boundary.

B21t—12 to 20 inches; dark yellowish brown (10YR 4/4) clay loam; weak very fine subangular blocky structure; firm; few fine roots; thin patchy dark yellowish brown (10YR 3/4) clay films on faces of peds and on surface of pebbles; few pebbles; medium acid; gradual wavy boundary.

B22t—20 to 29 inches; brown (7.5YR 4/4) sandy clay loam; weak medium subangular blocky structure; firm; few fine roots; thin discontinuous dark yellowish brown (10YR 3/4) clay films on faces of peds and on surface of pebbles; 5 percent gravel; medium acid; abrupt wavy boundary.

B23t—29 to 34 inches; brown (7.5YR 4/4) sandy loam; weak medium subangular blocky structure; friable; few very fine roots; thin discontinuous dark yellowish brown (10YR 3/4) clay films on surface of pebbles; few pebbles; strongly acid; abrupt wavy boundary.

B31—34 to 48 inches; brown (7.5YR 4/4) loamy sand; massive; very friable; few very fine roots; medium acid; clear wavy boundary.

B32—48 to 53 inches; brown (7.5YR 4/4) sandy loam; weak medium subangular blocky structure; friable; thin discontinuous dark yellowish brown (10YR 3/4) clay films on faces of peds; slightly acid; abrupt wavy boundary.

C—53 to 60 inches; yellowish brown (10YR 5/4) stratified sand, loamy fine sand, and silt loam; single grain and massive; very friable; strong effervescence; moderately alkaline.

The solum is 42 to 60 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. Undisturbed areas have an A1 horizon that has hue of 10YR, value of 3 or 4, and chroma of 2 to 4. The A2 horizon, where present, has hue of 10YR, value of 5 or 6, and chroma of 2 to 4. The A horizon is loam, silt loam, or sandy loam. It is neutral to medium acid.

The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is dominantly clay loam or sandy clay loam, but individual subhorizons range from silty clay loam to sandy loam. It is strongly acid to slightly acid. The B3 horizon has hue of 10YR, or 7.5YR, value of 4 or 5, and chroma of 2 to 6. It commonly is sandy loam or loamy sand, but the range includes loam. It is neutral to medium acid.

The C horizon is stratified. It ranges from sand to silt loam.

Martisco series

The Martisco series consists of deep, very poorly drained soils in deep depressions on uplands, outwash plains, and terraces. Permeability is moderate or moderately rapid in the organic material and slow in the underlying marl. The soils formed in organic material and marl over sandy outwash. Slopes range from 0 to 2 percent.

Martisco soils are similar to Palms Variant soils and are commonly adjacent on the landscape to Milford and Rensselaer soils. Unlike Martisco soils, Palms Variant soils do not have marl below the muck surface layer. Milford and Rensselaer soils have a mineral surface layer, do not have a marl layer, and are in slightly higher positions on the edge of the depressions.

Typical pedon of Martisco muck, sandy substratum, in a cultivated field, 1,070 feet north and 100 feet west of the southeast corner of sec. 29, T. 30 N., R. 7 E.

Oap—0 to 8 inches; black (10YR 2/1) broken face, rubbed and pressed sapric material; about 5 percent fiber, less than 2 percent rubbed; moderate fine granular structure; very friable; many fine roots; fibers are herbaceous; 40 percent mineral material; neutral; abrupt smooth boundary.

Oa2—8 to 13 inches; black (10YR 2/1) broken face, rubbed, and pressed sapric material; about 8 percent fiber, less than 2 percent rubbed; moderate medium granular structure; very friable; common fine roots; fibers are herbaceous; 50 percent mineral material; neutral; abrupt smooth boundary.

IILca1—13 to 15 inches; light gray (10YR 7/1) marl; few fine distinct yellowish brown (10YR 5/4) mottles along old root channels; massive; friable; few fine roots; common shells; violent effervescence; moderately alkaline; clear wavy boundary.

IILca2—15 to 21 inches; white (10YR 8/1) marl; few fine prominent light olive brown mottles along old root channels; massive; friable; few fine roots; common shells; violent effervescence; moderately alkaline; gradual wavy boundary.

IILca3—21 to 26 inches; light gray (10YR 6/1) marl; few fine distinct yellowish brown (10YR 5/6) mottles along old root channels; massive; friable; few fine roots; common shells; violent effervescence; moderately alkaline; clear wavy boundary.

IILca4—26 to 56 inches; gray (10YR 5/1) marl; massive; firm; few fine roots; strong effervescence; moderately alkaline; abrupt smooth boundary.

IIICg—56 to 60 inches; gray (10YR 5/1) loamy sand; single grain; loose; strong effervescence; moderately alkaline.

The organic tier is 8 to 16 inches thick. The marl is 30 to 60 inches thick.

The Oa horizon has hue of 10YR or 2.5Y, value of 1 or 2, and chroma of 1 or 2, or it is neutral and has value of 1 or 2. It is dominantly sapric material. The mineral content ranges from 20 to 80 percent. The Oa horizon ranges from slightly acid to moderately alkaline.

The Lca horizon has hue of 10YR to 5Y, value of 5 to 8, and chroma of 0 to 2. The C horizon ranges from sandy loam to fine sand.

Metea series

The Metea series consists of deep, well drained soils on knolls and ridges on upland moraines and till plains. Permeability is rapid in the upper part of the solum and moderate in the lower part of the solum and in the underlying material. The soils formed in sandy material and the underlying loam glacial till. Slopes range from 2 to 12 percent.

Metea soils commonly are adjacent on the landscape to Chelsea, Miami, Rawson, and Riddles soils. Chelsea soils have more sand and less clay in the lower part of the solum than the Metea soils. Miami, Rawson, and Riddles soils do not have sand and loamy sand in the upper part of the solum and are on side slopes or adjacent hills.

Typical pedon of Metea loamy sand, 2 to 6 percent slopes, in a cultivated field, 1,270 feet north and 180 feet west of the southeast corner of sec. 25, T. 30 N., R. 5 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; 7 percent gravel; medium acid; abrupt smooth boundary.

B1—10 to 25 inches; strong brown (7.5YR 5/6) loamy sand; single grain; loose; few fine roots; 7 percent gravel; slightly acid; clear wavy boundary.

B21t—25 to 31 inches; brown (7.5YR 4/4) fine sandy loam; weak medium subangular blocky structure; very friable; few fine roots; thin discontinuous dark yellowish brown (10YR 4/4) clay films and bridges; 4 percent gravel; slightly acid; abrupt wavy boundary.

IIB22t—31 to 38 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; firm; few fine roots; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; few pebbles; neutral; gradual wavy boundary.

IIB3—38 to 49 inches; yellowish brown (10YR 5/4) loam; weak coarse subangular blocky structure; friable; thin discontinuous dark yellowish brown (10YR 4/4) clay films on vertical faces of peds; few pebbles; neutral; gradual wavy boundary.

IIC—49 to 60 inches; brown (10YR 5/3) loam; massive; firm; few pebbles; strong effervescence; moderately alkaline.

The solum is 36 to 60 inches thick. The loamy sand or sand upper horizons range in combined thickness from 20 to 40 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. In undisturbed areas, the A1 horizon is 1 to 3 inches thick and has hue of 10YR, value of 3, and chroma of 1 or 2. The A2 horizon, where present, has hue of 10YR, value of 5 or 6, and chroma of 2 or 3. The A horizon is loamy sand, loamy fine sand, or sand. It is slightly acid or medium acid.

The B2 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is sandy loam or sandy clay loam. The IIB2 horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. It is clay loam, loam, or sandy clay loam. The B horizon is mildly alkaline to medium acid.

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

Miami series

The Miami series consists of deep, well drained, moderately permeable and moderately slowly permeable soils on upland till plains and moraines. The soils formed in loam glacial till. Slopes range from 2 to 25 percent.

Miami soils are similar to Morley, Rawson, and Riddles soils. They are adjacent on the landscape to Crosby, Crosier, Fincastle, and Hennepin soils. Morley soils have more clay in the subsoil and the underlying material than Miami soils. Rawson soils have more clay in the lower part of the subsoil and in the underlying material. Riddles soils have a thicker solum. Crosby, Crosier, and Fincastle soils have mottling in the upper part of the subsoil and are on foot slopes and nearly level uplands. Hennepin soils have a thinner solum and less clay in the subsoil than Miami soils, and they are on steeper slopes.

Typical pedon of Miami loam, 2 to 6 percent slopes, eroded, in a cultivated field, 245 feet west and 1,290 feet north of the southeast corner of sec. 5, T. 29 N., R. 6 E.

Ap—0 to 8 inches; dark brown (10YR 4/3) loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; many fine roots; few pebbles; slightly acid; abrupt smooth boundary.

B21t—8 to 12 inches; yellowish brown (10YR 5/4) clay loam; moderate fine subangular blocky structure; firm; common fine roots; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; few pebbles; medium acid; gradual wavy boundary.

B22t—12 to 19 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; firm; common fine roots; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; few pebbles; medium acid; clear wavy boundary.

B23t—19 to 28 inches; dark yellowish brown (10YR 4/4) clay loam; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; thin continuous dark brown (10YR 4/3) clay films on faces of peds; few pebbles; slightly acid; clear irregular boundary.

B3—28 to 32 inches; yellowish brown (10YR 5/4) loam; weak coarse subangular blocky structure; very firm; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; few pebbles; slight effervescence; mildly alkaline; clear wavy boundary.

C—32 to 60 inches; yellowish brown (10YR 5/4) loam; massive; very firm; few pebbles; strong effervescence; moderately alkaline.

The solum is 24 to 40 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. In undisturbed areas the A1 horizon is very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2). The A2 horizon, where present, has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. The A horizon is loam, silt loam, clay loam, or sandy loam. It is neutral to medium acid.

The B2 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is dominantly clay loam, but the range includes loam, silty clay loam, and sandy clay loam. The B2 horizon is slightly acid to neutral. The B3 horizon is slightly acid to mildly alkaline.

The C horizon is brown (10YR 5/3) or yellowish brown (10YR 5/4) loam or sandy loam.

Milford series

The Milford series consists of deep, very poorly drained, moderately slowly permeable soils in deep depressions and small glacial lake beds on uplands, outwash plains, and terraces. The soils formed in lacustrine deposits. Slopes range from 0 to 2 percent.

Milford soils are similar to Millsdale, Pella, and Pewamo soils and commonly are adjacent on the landscape to Brookston, Houghton, Martisco, Palms, and Sebewa soils. Millsdale soils have limestone bedrock within 40 inches of the surface. Pella soils have less clay in the subsoil than Milford soils. Pewamo soils are underlain by glacial till and are not stratified in the lower part of the subsoil and in the underlying material. Brookston and Sebewa soils have less clay and more sand in the subsoil and are on slightly higher, convex parts of the landscape. Houghton, Martisco, and Palms soils have an organic surface layer.

Typical pedon of Milford silty clay loam, in a cultivated field, 720 feet north and 440 feet west of the southeast corner of sec. 12, T. 26 N., R. 6 E.

Ap—0 to 8 inches; very dark brown (10YR 2/2) silty clay loam, dark grayish brown (10YR 4/2) dry; moderate medium granular structure; firm; common fine roots; neutral; abrupt smooth boundary.

A12—8 to 15 inches; very dark brown (10YR 2/2) silty clay loam, dark grayish brown (10YR 4/2) dry; moderate medium subangular blocky structure; firm; few fine roots; neutral; clear wavy boundary.

B1g—15 to 19 inches; very dark brown (10YR 2/2) silty clay; strong medium and coarse angular blocky structure; firm; few fine roots; thin continuous black (N 2/0) organic coatings on faces of peds; neutral; clear wavy boundary.

B21g—19 to 26 inches; dark gray (10YR 4/1) silty clay; common medium distinct yellowish brown (10YR 5/6) mottles; strong coarse angular blocky structure; firm; few fine roots; thin continuous very dark gray (10YR 3/1) organic coatings on vertical faces of peds; neutral; clear wavy boundary.

B22g—26 to 37 inches; dark gray (5Y 4/1) silty clay loam; common medium distinct olive gray (5Y 5/2) mottles; strong coarse prismatic structure parting to strong coarse angular blocky; firm; few fine roots; thin continuous very dark gray (10YR 3/1) organic coatings on vertical faces of peds; neutral; clear wavy boundary.

C1g—37 to 48 inches; gray (10YR 6/1) silt loam; massive; friable; few snail shells; strong effervescence; moderately alkaline; clear smooth boundary.

C2g—48 to 60 inches; grayish brown (10YR 5/2) silt loam; thin strata of loam; massive; friable; few snail shells; strong effervescence; moderately alkaline.

The solum is 36 to 50 inches thick. It is neutral to slightly acid.

The A horizon has hue of 2.5Y and 10YR, value of 2 or 3, and chroma of 0 to 2. It is silty clay loam or silty clay.

The B horizon has hue of 2.5Y, 5Y, and 10YR, value of 4 or 5, and chroma of 0 to 2. It is silty clay loam, silty clay, and clay.

The C horizon is dominantly silt loam or silty clay loam, but in some pedons it includes thin strata of loam or sandy loam.

Millsdale series

The Millsdale series consists of moderately deep, very poorly drained, moderately slowly permeable soils in depressions on limestone terraces along the Wabash River. The soils formed in loamy glacial drift and the underlying limestone residuum. Slopes range from 0 to 2 percent.

Millsdale soils are similar to Milford and Pewamo soils and are adjacent on the landscape to Milton and Randolph soils. Unlike Millsdale soils, Milford and Pewamo soils are more than 60 inches deep to bedrock. Milton and Randolph soils do not have a thick dark surface layer, and they are on slightly higher, convex parts of the landscape.

Typical pedon of Millsdale silty clay loam, in a cultivated field, 120 feet west and 160 feet north of the southeast corner of sec. 35, T. 28 N., R. 7 E.

Ap—0 to 8 inches; black (10YR 2/1) silty clay loam, dark grayish brown (10YR 4/2) dry; moderate fine and medium granular structure; firm; few fine roots; few pebbles; slightly acid; abrupt smooth boundary.

A12—8 to 13 inches; black (10YR 2/1) silty clay, dark grayish brown (10YR 4/2) dry; moderate medium angular and subangular blocky structure; firm; few fine roots; few pebbles; neutral; clear wavy boundary.
B21tg—13 to 19 inches; very dark gray (5Y 3/1) clay, dark gray (10YR 4/1) dry; few fine distinct light olive brown (2.5Y 5/4 and 5/6) mottles; moderate fine and medium subangular blocky structure; firm; few fine roots; thin continuous black (5Y 2/1) clay films on faces of peds; few pebbles; neutral; clear wavy boundary.
B22tg—19 to 24 inches; dark gray (5Y 4/1) silty clay; many fine distinct olive (5Y 4/4) mottles; moderate fine subangular blocky structure; firm; few fine roots; thin discontinuous very dark gray (5Y 3/1) clay films on faces of peds; few pebbles; neutral; gradual wavy boundary.
B23tg—24 to 33 inches; gray (5Y 5/1) silty clay; common fine distinct olive brown (2.5Y 4/4) mottles; weak medium subangular blocky structure; firm; few fine roots; thin continuous black (5Y 2/1) clay and organic films on vertical faces of peds; neutral; clear wavy boundary.
IIB3—33 to 36 inches; gray (10YR 5/1) silty clay loam; common fine distinct yellowish brown (10YR 5/8) mottles; weak fine subangular blocky structure; friable; few fine roots; thin discontinuous dark gray (10YR 4/1) clay films on faces of peds; neutral; abrupt smooth boundary.
IIR—36 inches; limestone bedrock.

The depth to bedrock is 20 to 40 inches.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is silty clay loam or silt loam. It is neutral or slightly acid.

The B horizon has hue of 10YR, 2.5Y, and 5Y, value of 3 to 5, and chroma of 1 or 2. It is dominantly clay, silty clay, silty clay loam, or clay loam, but in places the B3 horizon just above the limestone bedrock is silt loam or loam. The B horizon is neutral or slightly acid. The R horizon ranges from rippable to hard.

Milton series

The Milton series consists of moderately deep, well drained, moderately slowly permeable soils on limestone terraces along the Wabash River. The soils formed in loamy glacial drift and the underlying limestone residuum. Slopes range from 0 to 12 percent.

Milton soils are similar to Morley soils and are adjacent on the landscape to Millsdale, Milton Variant, and Randolph soils. Unlike Milton soils, Morley soils do not have bedrock within a depth of 60 inches. Millsdale and Randolph soils are mottled in the upper part of the subsoil and are on flats and in depressions. Milton Variant soils have many coarse fragments throughout and are on steep breaks.

Typical pedon of Milton silt loam, 0 to 2 percent slopes, in a cultivated field, 760 feet north and 1,920 feet east of the southwest corner of sec. 35, T. 28 N., R. 7 E.

Ap—0 to 5 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate coarse granular structure; friable; few fine roots; neutral; abrupt smooth boundary.
A2—5 to 7 inches; brown (10YR 5/3) silt loam; moderate coarse granular structure; friable; few fine roots; slightly acid; clear wavy boundary.
B1t—7 to 12 inches; dark yellowish brown (10YR 4/4) clay loam; moderate medium subangular blocky structure; firm; few fine roots; thin discontinuous dark brown (10YR 3/3) clay films on faces of peds; strongly acid; clear wavy boundary.
B21t—12 to 23 inches; brown (10YR 4/3) clay; moderate medium subangular blocky structure; firm; few fine roots; thin continuous dark brown (10YR 3/3) clay films on faces of peds; medium acid; clear wavy boundary.
B22t—23 to 33 inches; dark brown (10YR 3/3) clay loam; weak coarse subangular blocky structure; firm; few fine roots; thin discontinuous dark brown (10YR 3/3) clay films on faces of peds; masses of dark yellowish brown (10YR 4/4) soil material; neutral; abrupt wavy boundary.
IIB3—33 to 38 inches; olive (5Y 5/3) silt loam; moderate thin platy structure; friable; few fine roots; thin discontinuous dark yellowish brown (10YR 3/4) clay films on faces of peds; neutral; abrupt wavy boundary.
IIR—38 inches; limestone bedrock.

The solum is 20 to 40 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. In undisturbed areas, the A1 horizon is very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2). The A2 horizon has hue of 10YR, value of 5 or 6, and chroma of 2 to 4. The A horizon is silt loam or loam. It is slightly acid or neutral.

The B2t and IIB2t horizons have hue of 7.5YR and 10YR, value of 3 to 5, and chroma of 3 to 6. They are dominantly clay loam or silty clay loam, but the range includes clay and silty clay. The B2t and IIB2t horizons range from strongly acid to moderately alkaline. The B3 horizon, just above the limestone bedrock, is silt loam or loam.

The R horizon ranges from rippable to hard.

Milton Variant

The Milton Variant consists of moderately deep, well drained, moderately permeable soils on very steep breaks along the Wabash River valley. The soils formed

in residuum of limestone rock. Slopes range from 30 to 70 percent.

Milton Variant soils are adjacent on the landscape to Milton soils. Unlike Milton Variant soils, Milton soils do not have a high percentage of coarse fragments in the subsoil, and they are less sloping.

Typical pedon of Milton Variant silt loam, 30 to 70 percent slopes, on a steep wooded break, 3,620 feet west and 4,000 feet north of the southeast corner of sec. 3, T. 28 N., R. 7 E.

A11—0 to 2 inches; very dark grayish brown (10YR 3/2) silt loam, dark brown (10YR 3/3) crushed, brown (10YR 5/3) dry; moderate medium granular structure; friable; common very fine to medium roots; 10 percent limestone rock fragments; neutral; clear wavy boundary.

A12—2 to 4 inches; dark brown (10YR 4/3) silt loam; moderate medium granular structure; friable; common very fine to medium roots; thin continuous dark brown (10YR 3/3) organic coatings; 12 percent limestone rock fragments; neutral; clear irregular boundary.

B2t—4 to 22 inches; dark yellowish brown (10YR 4/4) very flaggy silt loam; moderate fine subangular blocky structure; friable; few very fine roots; thin discontinuous very dark grayish brown (10YR 3/2) clay films on faces of peds; 85 percent limestone rock fragments; neutral; abrupt irregular boundary.

R—22 inches; limestone bedrock.

The solum is 20 to 40 inches thick. It is slightly acid to mildly alkaline.

The A11 horizon has hue of 10YR, value of 2 to 4, and chroma of 1 to 3. The A12 horizon has hue of 10YR, value of 3 to 5, and chroma of 3 or 4. The A horizon is silt loam or loam or the flaggy analogs and is 5 to 50 percent coarse fragments.

The B2t horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 or 4. It is very flaggy silt loam or very flaggy loam and is 50 to 90 percent coarse fragments.

The R horizon ranges from rippable to hard.

Morley series

The Morley series consists of deep, well drained, slowly permeable soils on upland moraines and till plains. The soils formed in clay loam glacial till. Slopes range from 7 to 25 percent.

Morley soils are similar to Glynwood, Miami, Milton, and Rawson soils. They are adjacent on the landscape to Blount and Hennepin soils. Unlike Morley soils, Glynwood soils have mottling in the upper part of the subsoil. Miami and Rawson soils have less clay and more sand in the upper part of the solum than Morley soils. Milton soils have limestone bedrock at a depth of 20 to 40 inches. Blount soils have mottling in the upper part of the subsoil and are on foot slopes and slight rises. Hennepin soils have a thinner solum than Morley soils and have less clay in the subsoil; they are on steep breaks.

Typical pedon of Morley silt loam, 7 to 12 percent slopes, eroded, in a cultivated field, 3,450 feet east and 3,625 feet north of the southwest corner of sec. 7, T. 27 N., R. 7 E.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

B1—6 to 9 inches; yellowish brown (10YR 5/4) silt loam; moderate medium subangular blocky structure; friable; many fine roots; slightly acid; clear wavy boundary.

B21t—9 to 14 inches; dark yellowish brown (10YR 4/4) clay loam; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; common fine roots; thin continuous dark yellowish brown (10YR 3/4) clay films on faces of peds; few pebbles; strongly acid; clear wavy boundary.

B22t—14 to 23 inches; dark yellowish brown (10YR 4/4) clay loam; strong medium prismatic structure parting to strong medium subangular blocky; firm; few fine roots; thin continuous dark yellowish brown (10YR 3/4) clay films on faces of peds; few pebbles; slightly acid; clear wavy boundary.

B23t—23 to 27 inches; dark yellowish brown (10YR 4/4) clay loam; weak coarse prismatic structure parting to weak coarse subangular blocky; firm; thin patchy dark yellowish brown (10YR 3/4) clay films on faces of peds; few pebbles; neutral; clear wavy boundary.

C—27 to 60 inches; yellowish brown (10YR 5/4) clay loam; massive; very firm; few pebbles; strong effervescence; moderately alkaline.

The solum is 20 to 36 inches thick.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. Undisturbed areas have an A1 horizon that is very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2). The A2 horizon, where present, is grayish brown (10YR 5/2) or brown (10YR 5/3). The A horizon commonly is silt loam or loam, but in severely eroded areas it is clay loam or silty clay loam. It is neutral or medium acid.

The B2 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. In some pedons there are mottles of low chroma in the lower part of the B horizon. The B2 horizon is clay loam, silty clay loam, or silty clay. It is medium acid to mildly alkaline.

The C horizon is brown (10YR 5/3) or yellowish brown (10YR 5/4) clay loam or silty clay loam.

Ockley series

The Ockley series consists of deep, well drained soils on river terraces and outwash plains. The soils are moderately permeable in the solum and rapidly permeable in the underlying material. They formed in loamy outwash and the underlying sand and gravel. Slopes range from 0 to 6 percent.

Ockley soils are similar to Fox and Kalamazoo soils and commonly are adjacent on the landscape to Westland soils. Fox soils have a thinner solum than Ockley soils. Kalamazoo soils have less clay in the lower part of the subsoil. Westland soils have mottling in the upper part of the subsoil and are in nearly level, low-lying areas and depressions.

Typical pedon of Ockley loam, 0 to 2 percent slopes (fig. 20), in a cultivated field, 1,240 feet east and 2,240 feet south of the northwest corner of sec. 31, T. 29 N., R. 6 E.

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; friable; few fine roots; slightly acid; abrupt smooth boundary.

A2—10 to 15 inches; dark brown (10YR 4/3) loam; moderate fine granular structure; friable; few fine roots; neutral; clear wavy boundary.

B1—15 to 22 inches; dark yellowish brown (10YR 4/4) loam; weak medium subangular blocky structure; friable; few fine roots; neutral; clear wavy boundary.

B21t—22 to 32 inches; dark brown (7.5YR 4/4) sandy clay loam; moderate medium subangular blocky structure; firm; few fine roots; thin patchy dark yellowish brown (10YR 3/4) clay films on vertical faces of peds; 4 percent gravel; neutral; gradual wavy boundary.

B22t—32 to 39 inches; dark brown (7.5YR 4/4) sandy clay loam; weak coarse subangular blocky structure; firm; few fine roots; thin patchy dark yellowish brown (10YR 3/4) clay films on vertical faces of peds; 7 percent gravel; slightly acid; clear wavy boundary.

IIB23t—39 to 50 inches; dark reddish brown (5YR 3/4) gravelly sandy loam; weak coarse subangular blocky structure; friable; few fine roots; 15 percent gravel; neutral; abrupt wavy boundary.

IIB3—50 to 56 inches; dark brown (7.5YR 3/2) gravelly sandy loam; weak coarse subangular blocky structure; friable; few fine roots; 20 percent gravel; neutral; abrupt wavy boundary.

IIC—56 to 60 inches; pale brown (10YR 6/3) sand and gravelly sand; single grain; loose; 35 percent gravel; strong effervescence; moderately alkaline.

The solum is 40 to 60 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. In undisturbed areas, the A1 horizon is very dark grayish brown (10YR 3/2) or dark brown (10YR 3/3). The A2 horizon, where present, has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. The A horizon commonly is loam or silt loam but ranges to sandy loam. It is neutral to medium acid.

Figure 20.—Profile of Ockley loam, 0 to 2 percent slopes.

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. The IIB2t horizon has hue of 7.5YR or 5YR, value of 3 or 4, and chroma of 3

or 4. It is clay loam, sandy clay loam, sandy loam, or the gravelly analogs. It is medium acid to neutral. The IIB3 horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 2 to 4. It is sandy clay loam, sandy loam, loamy sand, or the gravelly analogs. It is slightly acid to mildly alkaline.

The IIC horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. It is stratified loamy sand, sand, and gravelly sand.

Ormas series

The Ormas series consists of deep, well drained soils on river terraces and outwash plains. The soils are moderately rapidly permeable in the solum and very rapidly permeable in the underlying material. They formed in loamy and sandy outwash. Slopes range from 0 to 15 percent.

Ormas soils are similar to Chelsea soils and are adjacent on the landscape to Sebewa soils. Chelsea soils have more sand than Ormas soils and do not have a continuous subsoil. Sebewa soils have mottling in the upper part of the subsoil and are in depressions.

Typical pedon of Ormas loamy sand, 0 to 2 percent slopes, in a cultivated field, 2,750 feet east and 1,320 feet north of the southwest corner of sec. 26, T. 30 N., R. 7 E.

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) loamy sand, light brownish gray (10YR 6/2) dry; weak fine granular structure; very friable; many fine roots; neutral; abrupt smooth boundary.

A2—10 to 18 inches; yellowish brown (10YR 5/4) loamy sand; moderate fine granular structure; very friable; common fine roots; neutral; clear wavy boundary.

B21—18 to 23 inches; dark yellowish brown (10YR 4/4) loamy sand; weak medium subangular blocky structure; very friable; common fine roots; thin patchy dark brown (7.5YR 4/4) clay films on faces of peds and on surface of pebbles; neutral; clear wavy boundary.

B22t—23 to 32 inches; dark yellowish brown (10YR 4/4) loamy sand; moderate medium subangular blocky structure; friable; few fine roots; thin patchy yellowish brown (10YR 4/4) clay films on faces of peds and on surface of pebbles; slightly acid; clear wavy boundary.

IIB23t—32 to 44 inches; dark yellowish brown (10YR 4/4) gravelly sandy 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 and on surface of pebbles; 15 percent gravel; slightly acid; clear wavy boundary.

IIB3—44 to 50 inches; dark yellowish brown (10YR 4/4) gravelly loamy sand; moderate fine subangular blocky structure; very friable; few fine roots; thin patchy dark brown (7.5YR 4/4) clay bridges between sand grains; 15 percent gravel; slightly acid; abrupt irregular boundary.

IIC—50 to 60 inches; pale brown (10YR 6/3) gravelly sand; single grain; loose; 20 percent gravel; strong effervescence; moderately alkaline.

The solum is 50 to 72 inches thick.

The Ap horizon has hue of 10YR, value of 4, and chroma of 2 or 3. Undisturbed areas have an A1 horizon that is very dark grayish brown (10YR 3/2) or dark brown (10YR 3/3). The A2 horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. The A horizon is loamy sand or sand. It is neutral to medium acid.

The B2t and IIB2t horizons have hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. They are loamy sand, sandy loam, sandy clay loam, or the gravelly analogs. They are medium acid or slightly acid. The B3 horizon, where present, is gravelly loamy sand or gravelly sandy loam.

The IIC horizon is coarse sand, gravelly sand, or sand.

Palms series

The Palms series consists of deep, very poorly drained soils in deep depressions on uplands, outwash plains, and river terraces. The soils are moderately slowly permeable to moderately rapidly permeable in the muck and moderately slowly permeable in the underlying material. They formed in organic material over loamy glacial deposits. Slopes range from 0 to 2 percent.

Palms soils are similar to Houghton, Palms Variant, and Wallkill soils and are adjacent on the landscape to Milford and Pella soils. Houghton soils have a thicker organic layer than Palms soils. Palms Variant soils, unlike Palms soils, are underlain by sand. Wallkill soils have 16 to 40 inches of mineral material that was deposited over the organic material. Milford and Pella soils are mineral soils; they are at a slightly higher elevation in the depressions.

Typical pedon of Palms muck, undrained, in a marsh, 1,200 feet south and 2,000 feet west of the northeast corner of sec. 35, T. 30 N., R. 5 E.

Oa1—0 to 3 inches; very dark brown (10YR 2/2) broken face sapric material, very dark grayish brown (10YR 3/2) rubbed and pressed; about 5 percent fiber, a trace rubbed; weak very fine granular structure; very friable; many medium and fine roots; fibers are herbaceous; about 65 percent mineral material; neutral; clear smooth boundary.

Oa2—3 to 9 inches; dark reddish brown (5YR 2/2) broken face sapric material, dark reddish brown (5YR 3/2) rubbed and pressed; about 10 percent fiber, 2 percent rubbed; weak very fine granular structure; friable; many fine roots; fibers are herbaceous; about 20 percent mineral material; neutral; clear smooth boundary.

Oa3—9 to 19 inches; black (10YR 2/1) broken face, rubbed, and pressed sapric material; about 20 percent fiber, 2 percent rubbed; massive; friable; common fine roots; fibers are herbaceous; about 35 percent mineral material; neutral; clear smooth boundary.

Oa4—19 to 24 inches; dark reddish brown (5YR 2/2) broken face sapric material, black (10YR 2/1) rubbed and pressed; about 30 percent fiber, 5 percent rubbed; massive; friable; common fine roots; fibers are herbaceous; 20 percent mineral material; neutral; gradual smooth boundary.

Oa5—24 to 33 inches; black (10YR 2/1) broken face, rubbed, and pressed sapric material; about 8 percent fiber, 2 percent rubbed; massive; friable; few fine roots; fibers are herbaceous; 50 percent mineral material; neutral; abrupt smooth boundary.

IICg—33 to 60 inches; dark gray (10YR 4/1) silty clay loam; massive; friable; few fine roots; neutral.

The organic layer is 16 to 50 inches thick.

The Oa horizon has hue of 10YR, 7.5YR, or 5YR, value of 2 or 3, and chroma of 0 to 2. It is dominantly sapric material, but some pedons have a thin layer or layers of hemic material 2 to 6 inches thick that have a combined thickness of less than 10 inches. The Oa horizon is medium acid to mildly alkaline.

The IICg horizon has hue of 10YR or 2.5YR, value of 4 to 6, and chroma of 1 or 2. It is silty clay loam, loam, silt loam, or fine sandy loam. It is neutral to moderately alkaline.

Palms Variant

The Palms Variant consists of deep, very poorly drained soils in deep depressions on outwash plains and river terraces. The soils are moderately slowly permeable in the muck and in the upper part of the underlying material and moderately rapidly permeable in the lower part of the underlying material. They formed in organic material over loamy and sandy glacial deposits. Slopes range from 0 to 2 percent.

Palms Variant soils are similar to Martisco and Palms soils and are adjacent on the landscape to Rensselaer and Sebewa soils. Houghton soils have a thicker organic layer than Palms Variant soils. Martisco soils have a thinner organic layer and have a layer of marl over the sand. Palms soils do not have a sandy substratum. Rensselaer and Sebewa soils are mineral soils; they are in slightly higher positions in the depressions than Palms Variant soils.

Typical pedon of Palms Variant muck, drained, in a cultivated field, 860 feet east and 1,680 feet north of the southwest corner of sec. 31, T. 30 N., R. 7 E.

Oap—0 to 9 inches; black (5YR 2/1) broken face sapric material, black (5YR 2/1) rubbed and pressed; about 2 percent fiber, 1 percent rubbed; moderate fine granular structure; very friable; many medium and fine roots; fibers are herbaceous; 25 percent mineral material; medium acid; abrupt smooth boundary.

Oa2—9 to 18 inches; black (5YR 2/1) broken face sapric material, black (5YR 2/1) rubbed and pressed; about 3 percent fiber, 2 percent rubbed; moderate medium granular structure; friable; common fine roots; fibers are herbaceous; 15 percent mineral material; medium acid; abrupt wavy boundary.

Oa3—18 to 22 inches; black (10YR 2/1) broken face sapric material, dark reddish brown (5YR 2.5/2) rubbed and pressed; about 18 percent fiber, 5 percent rubbed; weak medium subangular blocky structure; friable; few fine roots; fibers are herbaceous; 50 percent mineral material; strongly acid; clear wavy boundary.

Oa4—22 to 26 inches; black (10YR 2/1) broken face sapric material, very dark grayish brown (10YR 3/2) rubbed and pressed; about 6 percent fiber, 2 percent rubbed; moderate medium platy structure; friable; few fine roots; fibers are herbaceous; 60 percent mineral material; strongly acid; abrupt smooth boundary.

IIC1g—26 to 35 inches; dark grayish brown (10YR 4/2) silt loam; few fine faint dark brown (7.5YR 4/4) mottles; massive; friable; medium acid; clear wavy boundary.

IIIC2g—35 to 60 inches; dark gray (10YR 4/1) stratified loamy sand and fine sand; single grain; loose; slight effervescence; mildly alkaline.

The organic layer is 16 to 50 inches thick.

The Oa horizon has hue of 10YR, 7.5YR, or 5YR, value of 2 or 3, and chroma of 0 to 2. It is dominantly sapric material, but some pedons have a thin layer of hemic material 2 to 6 inches thick. It is strongly acid to moderately alkaline.

The IICg horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2. It is loam, silt loam, or sandy loam. It is slightly acid to moderately alkaline.

The IIICg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. It is loamy sand or sand. It is slightly acid to moderately alkaline.

Pella series

The Pella series consists of deep, very poorly drained, moderately permeable soils in deep depressions and small glacial lakebeds on uplands, outwash plains, and terraces. The soils formed in silty material over stratified silty and loamy sediments. Slopes range from 0 to 2 percent.

Pella soils are similar to Cyclone, Milford, and Rensselaer soils and commonly are adjacent on the landscape to Brookston, Houghton, and Palms soils. Cyclone soils are not stratified in the lower part of the subsoil and the underlying material. Milford soils have more clay in the subsoil than Pella soils. Rensselaer soils have more sand in the subsoil. Brookston soils have more sand in the subsoil, are not stratified in the underlying material, and are on slightly higher, convex parts of the landscape. Houghton and Palms soils have an organic surface layer and are in deeper depressions.

Typical pedon of Pella silty clay loam, in a cultivated field, 2,600 feet east and 40 feet north of the southwest corner of sec. 8, T. 26 N., R. 6 E.

Ap—0 to 8 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; weak fine subangular blocky structure; firm; few fine roots; neutral; abrupt smooth boundary.

A12—8 to 15 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; few fine distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; few fine roots; neutral; clear wavy boundary.

B2g—15 to 20 inches; gray (10YR 5/1) silty clay loam; many medium distinct yellowish brown (10YR 5/8) mottles; moderate fine subangular blocky structure; firm; few fine roots; thin continuous dark gray (10YR 4/1) coatings on vertical faces of peds; neutral; clear wavy boundary.

B3g—20 to 31 inches; grayish brown (10YR 5/2) silty clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; friable; thin continuous gray (10YR 5/1) coatings on vertical faces of peds; neutral; clear wavy boundary.

Cg—31 to 60 inches; gray (N6/0) silt loam; thin strata of fine sandy loam; many medium distinct yellowish brown (10YR 5/6) mottles; massive; friable; strong effervescence; moderately alkaline.

The solum is 28 to 42 inches thick.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is silt loam or silty clay loam. It is neutral or slightly acid.

The B horizon has hue of 2.5Y and 10YR, value of 4 or 5, and chroma of 0 to 2, and it is mottled. It is dominantly silty clay loam, but in places it has subhorizons of silt loam. It is slightly acid to mildly alkaline.

The C horizon is stratified silt loam or silty clay loam. In some pedons it has strata of fine sandy loam, loamy fine sand, or fine sand. The C horizon is neutral to moderately alkaline.

Pewamo series

The Pewamo series consists of deep, very poorly drained, moderately slowly permeable soils in depressions and drainageways on upland till plains and moraines. The soils formed in clay loam glacial till. Slopes range from 0 to 2 percent.

Pewamo soils are similar to Milford and Millsdale soils and commonly are adjacent on the landscape to Blount, Glynwood, and Haskins soils. Unlike Pewamo soils, Milford soils are stratified in the lower part of the subsoil and in the underlying material. Millsdale soils have limestone bedrock within a depth of 40 inches. Blount, Glynwood, and Haskins soils do not have a thick, dark surface layer and are on slightly higher, convex parts of the landscape.

Typical pedon of Pewamo silty clay loam, in a cultivated field, 400 feet east and 200 feet south of the center of sec. 31, T. 29 N., R. 8 E.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; weak fine granular structure; firm; few fine roots; slightly acid; abrupt smooth boundary.

B21tg—9 to 14 inches; very dark gray (10YR 3/1) silty clay, gray (10YR 5/1) dry; common medium distinct dark yellowish brown (10YR 4/4) mottles; moderate medium subangular blocky structure; firm; few fine roots; thin continuous black (10YR 2/1) clay films on faces of peds; few pebbles; slightly acid; clear wavy boundary.

B22tg—14 to 20 inches; dark gray (10YR 4/1) silty clay; common medium distinct dark yellowish brown (10YR 4/4) mottles; moderate medium subangular blocky structure; firm; few fine roots; thin continuous very dark gray (10YR 3/1) clay films on faces of peds; few pebbles; neutral; clear wavy boundary.

B23tg—20 to 37 inches; dark gray (10YR 4/1) silty clay loam; many coarse distinct yellowish brown (10YR 5/6) mottles; moderate medium angular blocky structure; firm; few fine roots; thin continuous very dark gray (10YR 3/1) clay films on faces of peds; few pebbles; neutral; clear wavy boundary.

B3—37 to 43 inches; gray (10YR 5/1) clay loam; many coarse distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; few pebbles; neutral; gradual wavy boundary.

C—43 to 60 inches; yellowish brown (10YR 5/4) clay loam; common coarse distinct grayish brown (10YR 5/2) mottles; massive; very firm; few pebbles; strong effervescence; moderately alkaline.

The solum is dominantly 30 to 40 inches thick, but it ranges from 28 to 60 inches in thickness.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is silty clay loam or silt loam. It is slightly acid or neutral.

The B horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2, and it is mottled. It is clay loam, silty clay loam, or silty clay. It is slightly acid to mildly alkaline.

The C horizon has hue of 10YR, value of 4 to 6, and chroma of 1 to 4. It is silty clay loam or clay loam.

Randolph series

The Randolph series consists of moderately deep, somewhat poorly drained, moderately slowly permeable soils on limestone terraces along the Wabash River. The soils formed in loamy and silty glacial drift and the underlying limestone residuum. Slopes range from 0 to 2 percent.

Randolph soils are adjacent on the landscape to Milton and Millsdale soils. Unlike Randolph soils, Milton soils do not have mottles in the upper part of the solum, and they are in higher positions on the landscape. Millsdale soils have a thicker and darker surface layer, are dominantly gray in the subsoil, and are in depressions.

Typical pedon of Randolph silt loam, 0 to 2 percent slopes, in a cultivated field, 100 feet west and 740 feet north of the southeast corner of sec. 35, T. 28 N., R. 7 E.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate fine granular structure; friable; few fine roots; neutral; clear wavy boundary.

B1t—7 to 10 inches; gray (10YR 6/1) silt loam; many medium prominent yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; friable; few fine roots; neutral; clear wavy boundary.

B21t—10 to 14 inches; yellowish brown (10YR 5/6) silty clay loam; many medium distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; friable; few fine roots; thin continuous gray (10YR 6/1) silt coatings on faces on peds; neutral; clear smooth boundary.

B22t—14 to 21 inches; olive (5Y 5/6) silty clay; many medium distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; few fine roots; thin continuous gray (10YR 5/1) clay films on faces of peds; slightly acid; clear wavy boundary.

IIB3—21 to 25 inches; olive (5Y 4/4) silty clay; many medium distinct light brownish gray (10YR 6/2) mottles; weak thick platy structure; friable; few fine roots; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; neutral; clear wavy boundary.

IIC—25 to 28 inches; pale yellow (2.5Y 7/4) silt loam; common medium distinct light gray (5Y 7/1) mottles; massive; friable; thin patchy dark grayish brown (10YR 4/2) clay films on faces of peds; neutral; abrupt smooth boundary.

IIR—28 inches; limestone bedrock.

The depth to bedrock is 20 to 40 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. Undisturbed areas have an A1 horizon that is very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2). The A2 horizon, where present, has hue of 10YR, value of 5 or 6, and chroma of 1 or 2. The A horizon is silt loam or loam. It is slightly acid or neutral.

The B2 horizon has hue of 10YR, 2.5Y, and 5Y, value of 4 or 5, and chroma of 2 to 6, and it is mottled. It is dominantly silty clay, silty clay loam, or clay loam. It is slightly acid or medium acid.

The IIC horizon, where present, has hue of 2.5Y or 5Y, value of 6 or 7, and chroma of 4 or 6, and it is mottled. It is silty clay to silt loam.

The IIR horizon is rippable to hard.

Rawson series

The Rawson series consists of deep, moderately well drained soils on till plains and moraines. The soils are moderately permeable in the upper part of the solum and slowly permeable in the lower part of the solum and in the underlying material. They formed in loamy glacial outwash and the underlying clay loam glacial till. Slopes range from 0 to 12 percent.

Rawson soils are similar to Glynwood, Miami, and Morley soils and are adjacent on the landscape to Blount, Haskins, and Metea soils. Glynwood soils have more clay and less sand in the upper part of the solum than Rawson soils. Miami soils have less clay in the lower part of the subsoil and in the underlying material. Morley soils have less sand and more clay in the upper part of the subsoil. Blount and Haskins soils have mottling in the upper part of the subsoil and are less sloping; they generally are on lower levels and in depressions in the landscape. Metea soils have more sand and less clay in the upper part of the solum and are on the crest of hills and ridges.

Typical pedon of Rawson sandy loam, 2 to 6 percent slopes, eroded, in a cultivated field, 380 feet north and 1,380 feet west of the center of sec. 26, T. 29 N., R. 7 E.

Ap—0 to 9 inches; dark brown (10YR 4/3) sandy loam, pale brown (10YR 6/3) dry; weak medium granular structure; friable; few fine roots; neutral; abrupt smooth boundary.

B1t—9 to 16 inches; yellowish brown (10YR 5/4) sandy loam; weak fine subangular blocky structure; friable; few fine roots; thin discontinuous brown (10YR 5/3) coatings on faces of peds; neutral; gradual wavy boundary.

B21t—16 to 27 inches; brown (7.5YR 4/4) sandy clay loam; weak coarse subangular blocky structure; firm; few fine roots; thin patchy dark brown (10YR 3/3) clay films on vertical faces of peds; 8 percent gravel; slightly acid; abrupt wavy boundary.

IIB22t—27 to 34 inches; yellowish brown (10YR 5/4) clay loam; common fine faint grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; few fine roots; thin continuous dark brown (10YR 3/3) clay films on faces of peds; few pebbles; neutral; clear wavy boundary.

IIB3—34 to 41 inches; yellowish brown (10YR 5/4) clay loam; many fine faint grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; thin discontinuous dark yellowish brown (10YR 3/4) clay films on vertical faces of peds; few pebbles; slight effervescence; mildly alkaline; gradual wavy boundary.

IIC—41 to 60 inches; brown (10YR 5/3) clay loam; few fine faint gray (10YR 5/1) mottles; massive; very firm; few pebbles; strong effervescence; moderately alkaline.

The solum is 26 to 48 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The A2 horizon, where present, has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. The A horizon is sandy loam or loam. It is slightly acid or neutral.

The B horizon has hue of 7.5YR and 10YR, value of 4 or 5, and chroma of 3 to 6. Some pedons have mottles of low chroma in the lower subhorizons. The B horizon is dominantly sandy clay loam or clay loam or the gravelly analogs, but in places it also has thin layers of sandy loam or loam or the gravelly analogs. It is slightly acid to strongly acid.

The IIB horizon is clay loam, silty clay, or silty clay loam. It ranges from slightly acid to mildly alkaline.

The IIC horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is clay loam or silty clay loam.

Rensselaer series

The Rensselaer series consists of deep, very poorly drained, moderately permeable soils in depressions on river terraces and outwash plains. The soils formed in stratified sandy, loamy, and silty glacial sediments. Slopes range from 0 to 2 percent.

Rensselaer soils are similar to Brookston, Pella, and Westland soils and commonly are adjacent on the landscape to Martinsville, Martisco, Palms Variant, and Whitaker soils. Brookston soils are not stratified in the lower part of the subsoil and in the underlying material. Pella soils have less sand in the upper part of the subsoil than Rensselaer soils. Westland soils have more gravel in the subsoil and in the underlying material. Unlike Rensselaer soils, Martinsville and Whitaker soils do not have a thick, dark surface layer, and they are on higher, convex parts of the landscape. Martisco and Palms Variant soils have an organic surface layer and are in deep depressions.

Typical pedon of Rensselaer loam, in a cultivated field, 275 feet south and 1,290 feet east of the northwest corner of sec. 23, T. 30 N., R. 5 E.

Ap—0 to 8 inches; black (10YR 2/1) loam, dark gray (10YR 4/1) dry; moderate medium granular structure; friable; few fine roots; slightly acid; abrupt smooth boundary.

A12—8 to 17 inches; black (10YR 2/1) sandy clay loam, dark gray (10YR 4/1) dry; few medium faint very dark gray (10YR 3/1) and dark brown (7.5YR 4/4) mottles; moderate fine subangular blocky structure; friable; few fine roots; neutral; clear wavy boundary.

B1tg—17 to 21 inches; dark gray (10YR 4/1) sandy clay loam; common medium distinct olive brown (2.5Y 4/4) mottles; weak fine subangular blocky structure; friable; few fine roots; neutral; clear wavy boundary.

B21tg—21 to 30 inches; gray (10YR 5/1) clay loam; many medium distinct yellowish brown (10YR 5/6 and 10YR 5/8) mottles; moderate medium prismatic structure parting to moderate coarse subangular blocky; firm; few fine roots; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; few dark yellowish brown (10YR 3/4) iron and manganese accumulations and concretions; neutral; abrupt wavy boundary.

B22tg—30 to 34 inches; gray (10YR 5/1) clay loam; many medium distinct yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure; firm; few fine roots; thin continuous dark gray (10YR 4/1) clay films on vertical faces of peds; few dark yellowish brown (10YR 3/4) iron and manganese accumulations and concretions; neutral; clear wavy boundary.

IIB3g—34 to 42 inches; gray (10YR 5/1) stratified sandy loam, silt loam, and silty clay loam; common medium distinct yellowish brown (10YR 5/8) mottles; weak coarse prismatic structure; friable; few fine roots; thin continuous dark gray (10YR 4/1) clay films on vertical faces of peds; few dark yellowish brown (10YR 3/4) iron and manganese accumulations and concretions; neutral; clear wavy boundary.

IICg—42 to 60 inches; gray (10YR 5/1) stratified loamy fine sand, sandy loam, silt loam, and silty clay loam; few fine distinct yellowish brown (10YR 5/4) mottles; massive; loose to firm; neutral.

The solum is 40 to 60 inches thick. The mollic epipedon is 10 to 18 inches thick.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is silt loam, loam, sandy clay loam, clay loam, or silty clay loam. It is neutral or slightly acid.

The B2tg horizon has hue of 2.5Y and 10YR, value of 4 or 5 and chroma of 1 or 2. It has few to many mottles. It is dominantly clay loam or sandy clay loam, but individual subhorizons range from silty clay loam to loamy fine sand. It is slightly acid to mildly alkaline.

The C horizon is stratified. It ranges from sand to silty clay loam. It is dominantly moderately alkaline and has free carbonates, but in some places it ranges to neutral.

Riddles series

The Riddles series consists of deep, well drained, moderately permeable soils on upland till plains and moraines. The soils formed in loam glacial till. Slopes range from 0 to 12 percent.

Riddles soils are similar to Martinsville and Miami soils and are adjacent on the landscape to Crosier, Fincastle, and Metea soils. Martinsville soils have more sand than Riddles soils and are stratified in the lower part of the solum and in the underlying material. Miami soils have a thinner solum than Riddles soils. Crosier and Fincastle soils have mottling in the upper part of the subsoil and are in nearly level areas. Metea soils have more sand in the upper part of the solum and are on the crest of hills and ridges.

Typical pedon of Riddles loam, 2 to 6 percent slopes, eroded, in a cultivated field, 140 feet north and 750 feet west of the southeast corner of sec. 30, T. 30 N., R. 6 E.

Ap—0 to 8 inches; dark brown (10YR 4/3) loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; few fine roots; few pebbles; slightly acid; abrupt smooth boundary.

B21t—8 to 22 inches; brown (7.5YR 4/4) clay loam; moderate medium subangular blocky structure; firm; few fine roots; thin continuous dark brown (10YR 4/3) clay films on faces of peds; few pebbles; medium acid; clear wavy boundary.

B22t—22 to 35 inches; dark yellowish brown (10YR 4/4) sandy clay loam; moderate coarse subangular blocky structure; firm; few fine roots; thin continuous dark brown (10YR 4/3) clay films on faces of peds; few pebbles; medium acid; clear wavy boundary.

B23t—35 to 43 inches; dark brown (10YR 4/3) loam; moderate coarse subangular blocky structure; firm; few fine roots; thin discontinuous dark brown (10YR 4/3) clay films on faces of peds; few pebbles; medium acid; clear wavy boundary.

B3—43 to 49 inches; yellowish brown (10YR 5/4) loam; weak coarse subangular blocky structure; friable; thin patchy dark yellowish brown (10YR 4/4) clay films on vertical faces of peds; few pebbles; slight effervescence; mildly alkaline; gradual wavy boundary.

C—49 to 60 inches; brown (10YR 5/3) loam; massive; firm; few pebbles; strong effervescence; moderately alkaline.

The solum is 40 to 72 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The A2 horizon, where present, has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. The A horizon is loam, silt loam, or sandy loam. It is neutral to medium acid.

The B2 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is clay loam, loam, sandy clay loam, or silty clay loam. It is commonly medium acid to strongly acid, but individual subhorizons range to neutral. The B3 horizon is slightly acid to mildly alkaline.

The C horizon is loam or sandy loam.

Rodman series

The Rodman series consists of deep, excessively drained soils on breaks between terraces and bottom lands and on side slopes of deeply cut drainageways. The soils are shallow over sand or gravelly sand. They are moderately rapidly permeable in the solum and very rapidly permeable in the underlying material. They formed in sandy and gravelly glacial outwash. Slopes range from 25 to 50 percent.

The Rodman soil in this survey area has a thinner dark surface layer than is definitive for the Rodman series, but this difference does not alter its use or behavior.

Rodman soils are adjacent on the landscape to Fox and Kosciusko soils. Fox and Kosciusko soils have a thicker solum, have more clay in the subsoil, and are on less sloping parts of the landscape than Rodman soils.

Typical pedon of Rodman gravelly loam, 25 to 50 percent slopes, on a wooded slope, 1,350 feet east and 1,480 feet south of the northwest corner of sec. 30, T. 26 N., R. 7 E.

A1—0 to 5 inches; very dark brown (10YR 2/2) gravelly loam, dark grayish brown (10YR 4/2) dry; moderate medium granular structure; very friable; common medium and fine roots; neutral; abrupt wavy boundary.

B1—5 to 10 inches; dark yellowish brown (10YR 3/4) gravelly loam; moderate fine subangular blocky structure; friable; common medium and fine roots; neutral; clear wavy boundary.

B3—10 to 15 inches; dark yellowish brown (10YR 4/4) gravelly sandy loam; weak coarse subangular blocky structure; very friable; common medium and fine roots; slight effervescence; mildly alkaline; clear irregular boundary.
C—15 to 60 inches; brown (10YR 5/3) gravelly loamy sand; single grain; loose; few fine roots; strong effervescence; moderately alkaline.

The solum is 8 to 15 inches thick.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is gravelly loam or gravelly sandy loam. It is neutral to mildly alkaline.

The B horizon has hue of 10YR, value of 3 or 4, and chroma of 3 or 4. It is gravelly loam or gravelly sandy loam. It is neutral to mildly alkaline.

The C horizon is gravelly sand, gravelly loamy sand, or sand.

Sebewa series

The Sebewa series consists of very poorly drained soils in depressions on river terraces and outwash plains. The soils are moderately deep over sand and gravel. They are moderately permeable in the solum and rapidly permeable in the underlying material. They formed in loamy outwash and the underlying sand and gravel. Slopes range from 0 to 2 percent.

Sebewa soils are similar to Westland soils and are adjacent on the landscape to Fox, Homer, Kosciusko, and Milford soils. Westland soils have a thicker solum than Sebewa soils. Fox, Homer, and Kosciusko soils do not have a thick, dark surface layer and are on higher, convex parts of the landscape. Milford soils have more clay and less sand and gravel in the solum and are in deep depressions.

Typical pedon of Sebewa loam, in a cultivated field, 360 feet south and 580 feet east of the northwest corner of sec. 8, T. 29 N., R. 7 E.

Ap—0 to 11 inches; very dark grayish brown (10YR 3/2) loam, dark grayish brown (10YR 4/2) dry; weak fine granular structure; friable; few fine roots; few pebbles; neutral; abrupt smooth boundary.
A12—11 to 14 inches; very dark gray (10YR 3/1) loam, dark grayish brown (10YR 4/2) dry; moderate medium granular structure; friable; few fine roots; few pebbles; neutral; clear wavy boundary.
B2tg—14 to 22 inches; gray (10YR 5/1) gravelly clay loam; many coarse distinct yellowish brown (10YR 5/4) mottles; weak coarse subangular blocky structure; friable; few fine roots; thin patchy dark gray (10YR 4/1) clay films on faces of peds and on the surface of pebbles; 15 percent gravel; neutral; clear wavy boundary.
IIB3g—22 to 29 inches; gray (10YR 5/1) gravelly sandy loam; weak fine subangular blocky structure; very friable; few fine roots; thin patchy very dark grayish brown (10YR 3/2) clay films on surface of pebbles; slight effervescence; 20 percent gravel; mildly alkaline, abrupt wavy boundary.
IICg—29 to 60 inches; gray (10YR 5/1) sand and gravelly sand; single grain; loose; strong effervescence; moderately alkaline.

The solum is 20 to 40 inches thick.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is sandy loam, silt loam, and loam, and it is neutral to slightly acid.

The B horizon has hue of 10YR or 2.5Y, value of 2 to 5, and chroma of 1 or 2. The B2 horizon is clay loam, sandy clay loam, sandy loam, or the gravelly analogs. It is neutral or slightly acid. The IIB3 horizon is neutral to moderately alkaline.

The IIC horizon has hue of 10YR, value of 5 or 6, and chroma of 1 or 2. It is stratified sand, gravelly sand, and gravelly loamy sand.

Shoals series

The Shoals series consists of deep, somewhat poorly drained, moderately permeable soils on bottom lands. The soils formed in loamy alluvium. Slopes range from 0 to 2 percent.

Shoals soils are similar to Whitaker soils and are adjacent on the landscape to Genesee and Sloan soils. Whitaker soils have an increase of clay in the subsoil. Genesee soils do not have mottling in the upper part of the solum and are on slightly higher levels than Shoals soils. Sloan soils have a thicker and darker surface layer and are in lower lying, slack-water areas.

Typical pedon of Shoals silt loam, occasionally flooded, in a cultivated field, 255 feet west and 100 feet south of the northeast corner of sec. 36, T. 28 N., R. 7 E.

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; few fine roots; neutral; abrupt smooth boundary.
A12—10 to 16 inches; dark brown (10YR 4/3) silt loam; weak fine subangular blocky structure; friable; few fine roots; thin continuous very dark gray (10YR 3/1) organic coatings on faces of peds; neutral; gradual wavy boundary.
B1—16 to 25 inches; dark grayish brown (10YR 4/2) silt loam; common fine distinct dark yellowish brown (10YR 4/6) mottles; moderate fine subangular blocky structure; friable; few fine roots; thin continuous dark gray (10YR 4/1) organic coatings on faces of peds; neutral; gradual wavy boundary.

B21—25 to 43 inches; grayish brown (10YR 5/2) loam; common fine and medium distinct dark yellowish brown (10YR 3/4 and 4/6) mottles; weak fine subangular blocky structure; friable; neutral; clear wavy boundary.

B22—43 to 48 inches; grayish brown (10YR 5/2) stratified loam and sandy loam; common medium and coarse distinct dark yellowish brown (10YR 3/4 and 4/6) and yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; friable; neutral; clear wavy boundary.

C—48 to 60 inches; gray (10YR 5/1) stratified sandy loam and loamy sand; few medium distinct dark yellowish brown (10YR 4/6) mottles; massive; very friable and loose; slight effervescence; mildly alkaline.

The depth to free carbonates ranges from 24 to 60 inches.

The A horizon is dark grayish brown (10YR 4/2) or dark brown (10YR 4/3). It is silt loam or loam. It is neutral or slightly acid.

The B horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It is mottled. It is silty clay loam, silt loam, loam, or sandy loam. It is neutral or slightly acid.

The C horizon has hue of 10YR, value of 5 or 6, and chroma of 1 to 3. It is stratified and ranges from silt loam to gravelly sand. It is neutral to moderately alkaline.

Sloan series

The Sloan series consists of deep, very poorly drained, moderately slowly permeable soils on bottom lands. The soils formed in loamy alluvium. Slopes range from 0 to 2 percent.

Sloan soils are adjacent on the landscape to Genesee and Shoals soils. Genesee and Shoals soils do not have a thick, dark surface layer and are slightly higher on the landscape than Sloan soils.

Typical pedon of Sloan silty clay loam, frequently flooded, in a cultivated field, 1,980 feet east and 940 feet north of the southwest corner of sec. 28, T. 30 N., R. 7 E.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; few fine roots; neutral; abrupt smooth boundary.

A12—8 to 12 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; weak medium granular structure; friable; few fine roots; neutral; clear wavy boundary.

A13—12 to 16 inches; very dark grayish brown (10YR 3/2) silty clay loam, dark gray (10YR 4/1) dry; moderate fine subangular blocky structure; firm; few fine roots; neutral; clear wavy boundary.

B1g—16 to 21 inches; dark grayish brown (2.5Y 4/2) silty clay loam; many fine distinct dark yellowish brown (10YR 4/4) and dark gray (2.5Y 4/1) mottles; weak medium subangular blocky structure; firm; few fine roots; neutral; clear wavy boundary.

B2g—21 to 32 inches; dark gray (10YR 4/1) loam; few medium distinct yellowish brown (10YR 5/6) mottles; massive; firm; few fine roots; neutral; clear wavy boundary.

C1g—32 to 42 inches; very dark gray (10YR 3/1) loam; few fine distinct dark yellowish brown (10YR 4/4) mottles; massive; firm; neutral; abrupt wavy boundary.

C2g—42 to 60 inches; very dark gray (2.5Y 3/1) stratified sand, loam, and loamy sand; massive and single grain; firm to loose; neutral.

The mollic epipedon is 10 to 18 inches thick. The depth to free carbonates ranges from 24 to 72 inches.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is silty clay loam, clay loam, silt loam, or loam. It is neutral or slightly acid.

The B horizon has hue of 10YR and 2.5Y, value of 4 or 5, and chroma of 1 or 2, and it is mottled. It is silty clay loam, clay loam, loam, or silt loam. It is neutral or slightly acid.

The C horizon is stratified and ranges from silt loam to gravelly sand. It is neutral to moderately alkaline.

Wallkill series

The Wallkill series consists of deep, very poorly drained, moderately permeable soils in deep depressions on uplands, outwash plains, and river terraces. The soils formed in recent deposits of alluvial mineral material and the underlying organic material. Slopes range from 0 to 2 percent.

Wallkill soils are similar to Palms and Washtenaw soils and commonly are adjacent on the landscape to Fox, Kosciusko, Miami, and Morley soils. Unlike Wallkill soils, Palms soils have less than 16 inches of alluvial mineral deposits over the organic material. Washtenaw soils have mineral material underlying the alluvial deposits. Fox, Kosciusko, Miami, and Morley soils do not have mottling in the upper part of the solum, and they are in higher positions around the depressions.

Typical pedon of Wallkill silt loam, in a cultivated field, 700 feet north and 250 feet west of the southeast corner of sec. 30, T. 30 N., R. 6 E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; few fine roots; thin continuous very dark gray (10YR 3/1) organic films on faces of peds; neutral; abrupt smooth boundary.

C1—9 to 25 inches; dark grayish brown (10YR 4/2) silt loam; weak fine subangular blocky structure; friable; few fine roots; thin discontinuous very dark grayish brown (10YR 3/2) organic films on vertical faces of peds; neutral; abrupt smooth boundary.

IIOa1—25 to 33 inches; black (10YR 2/1) broken face and rubbed sapric material; about 2 percent fiber, trace rubbed; moderate medium subangular blocky structure; friable; few fine roots; thin continuous dark grayish brown (10YR 4/2) silt coatings on vertical faces of peds; fibers are herbaceous; about 40 percent mineral material; neutral; clear wavy boundary.

IIOa2—33 to 44 inches; black (10YR 2/1) broken face and rubbed sapric material; about 8 percent fiber, 1 percent rubbed; massive; few fine roots; fibers are herbaceous; about 10 percent mineral material; neutral; clear smooth boundary.

IIOa3—44 to 60 inches; very dark brown (10YR 2/2) broken face and rubbed sapric material; about 10 percent fiber, 3 percent rubbed; massive; fibers are herbaceous; about 25 percent mineral material; neutral.

The mineral material is 20 to 40 inches thick and overlies organic material that is over 16 inches thick.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 1 or 2. It is silt loam or loam. It is slightly acid or neutral.

The C horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It is silt loam or loam. It is neutral or slightly acid.

The IIOa horizon has hue of 10YR or 2.5Y, value of 2 or 3, and chroma of 0 to 2. It is sapric material. It is slightly acid or neutral.

The IIIC horizon, where present, is glacial till or glacial outwash. In most places it is at a depth of more than 60 inches.

Washtenaw series

The Washtenaw series consists of deep, very poorly drained, slowly permeable soils in deep depressions and old glacial lakebeds on uplands, outwash plains, and river terraces. The soils formed in recent deposits of alluvium and the underlying glacial material. Slopes range from 0 to 2 percent.

Washtenaw soils are similar to Milford and Wallkill soils and commonly are adjacent on the landscape to Fox, Kosciusko, Miami, and Morley soils. Unlike Washtenaw soils, Milford soils do not have 20 inches or more of lighter colored alluvial deposits at the surface, and Wallkill soils have organic material underlying the alluvial deposits. Fox, Kosciusko, Miami, and Morley soils do not have alluvial deposits and do not have mottling in the upper part of the subsoil. They are more sloping than Washtenaw soils and are in higher positions around the depressions.

Typical pedon of Washtenaw silt loam, in a cultivated field, 320 feet south and 1,500 feet west of the northeast corner of sec. 34, T. 30 N., R. 6 E.

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; few fine roots; neutral; abrupt smooth boundary.

C1—10 to 18 inches; dark grayish brown (10YR 4/2) silt loam; few fine distinct yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure; firm; few fine roots; neutral; gradual smooth boundary.

C2—18 to 25 inches; grayish brown (10YR 5/2) silt loam; common fine distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; few fine roots; neutral; abrupt smooth boundary.

IIA1b—25 to 38 inches; black (10YR 2/1) silty clay loam; weak coarse subangular blocky structure; firm; few fine roots; thin patchy dark grayish brown (10YR 4/2) silt coatings on vertical faces of peds; neutral; clear wavy boundary.

IIB21bg—38 to 48 inches; very dark grayish brown (10YR 3/2) clay loam; common fine distinct dark yellowish brown (10YR 4/4) mottles; weak coarse subangular blocky structure; firm; thin discontinuous very dark grayish brown (10YR 3/2) coatings on faces of peds; neutral; gradual wavy boundary.

IIB22bg—48 to 60 inches; dark gray (10YR 4/1) clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; thin patchy very dark grayish brown (10YR 3/2) coatings on faces of peds; few pebbles; neutral.

The alluvial deposits are 20 to 40 inches thick over the buried soil.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is silt loam or loam. It is slightly acid or neutral.

The C horizon has hue of 10YR, value of 4 or 5, and chroma of 1 or 2. It is silt loam or loam. It is neutral or slightly acid.

The IIAb horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is silt loam, loam, or silty clay loam. It is slightly acid or neutral.

The IIBb horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 or less, and it is mottled. It is clay loam, silty clay loam, or silt loam.

The IIC horizon, where present, is glacial till, glacial outwash, or lacustrine deposits. It is moderately alkaline. In most places it is at a depth of more than 60 inches.

Westland series

The Westland series consists of deep, very poorly drained soils in depressions on river terraces and outwash plains. The soils are moderately slowly permeable in the solum and rapidly permeable in the underlying material. They formed in loamy outwash and the underlying sand and gravel glacial outwash. Slopes range from 0 to 2 percent.

Westland soils are similar to Rensselaer and Sebewa soils and are adjacent on the landscape to Fox and Ockley soils. Rensselaer soils have less gravel in the lower part of the subsoil and in the underlying material than Westland soils. Sebewa soils have a thinner solum. Fox and Ockley soils do not have a thick, dark surface layer and are on higher, convex parts of the landscape.

Typical pedon of Westland loam, in a cultivated field, 1,880 feet north and 260 feet east of the southwest corner of sec. 25, T. 29 N., R. 5 E.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; common fine roots; slightly acid; abrupt smooth boundary.

A12—10 to 15 inches; very dark gray (10YR 3/1) loam, gray (10YR 5/1) dry; weak medium granular structure; friable; few fine roots; slightly acid; clear wavy boundary.

B1tg—15 to 21 inches; dark gray (10YR 4/1) clay loam; few fine distinct yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; firm; few fine roots; thin continuous very dark gray (10YR 3/1) organic coatings on faces of peds; neutral; clear wavy boundary.

B21tg—21 to 31 inches; dark gray (10YR 4/1) clay loam; many fine 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; thin discontinuous very dark gray (10YR 3/1) organic coatings on faces of peds; slightly acid; clear wavy boundary.

IIB22tg—31 to 39 inches; grayish brown (10YR 5/2) gravelly sandy clay loam; many fine distinct yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure; friable; few fine roots; thin discontinuous dark gray (10YR 4/1) clay films on faces of peds; 18 percent gravel; neutral; clear wavy boundary.

IIB3g—39 to 46 inches; grayish brown (10YR 5/2) gravelly sandy loam; many fine distinct yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure; friable; 15 percent gravel; neutral; gradual wavy boundary.

IIC—46 to 60 inches; grayish brown (10YR 5/2) gravelly loamy sand; single grain; loose; strong effervescence; 40 percent gravel; moderately alkaline.

The solum is 40 to 60 inches thick.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is loam, silt loam, or clay loam. It is neutral to slightly acid.

The B1 horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 or less, and it is mottled. The B2 horizon is clay loam or sandy clay loam, and the IIB2 horizon is gravelly clay loam, gravelly sandy clay loam, or gravelly sandy loam. The B horizon is neutral to slightly acid.

The IIC horizon is grayish brown (10YR 5/2) or gray (10YR 5/1) stratified sand, gravelly loamy sand, or gravelly sand.

Whitaker series

The Whitaker series consists of deep, somewhat poorly drained, moderately permeable soils on river terraces and outwash plains. The soils formed in stratified sandy, loamy, and silty glacial sediments. Slopes range from 0 to 2 percent.

Whitaker soils are similar to Crosier soils and commonly are adjacent on the landscape to Martinsville and Rensselaer soils. Unlike Whitaker soils, Crosier soils are not stratified in the lower part of the solum and are underlain by glacial till. Martinsville soils are not mottled in the upper part of the subsoil, and they are on rises and more sloping parts of the landscape. Rensselaer soils have a thicker and darker surface layer and are in depressions.

Typical pedon of Whitaker loam, in a cultivated field, 165 feet north and 545 feet east of the southwest corner of sec. 7, T. 28 N., R. 7 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; common medium and fine roots; neutral; abrupt smooth boundary.

B1—8 to 12 inches; brown (10YR 5/3) loam; few fine faint dark yellowish brown (10YR 3/4) mottles; weak fine subangular blocky structure; friable; common fine roots; thin discontinuous brown (10YR 4/3) clay films on faces of peds; neutral; clear wavy boundary.

B21t—12 to 19 inches; dark yellowish brown (10YR 4/4) loam; common medium distinct grayish brown (10YR 5/2) and dark yellowish brown (10YR 4/6) mottles; weak fine subangular blocky structure; firm; common fine roots; thin discontinuous brown (10YR 4/3) clay films on faces of peds; medium acid; clear wavy boundary.

B22t—19 to 31 inches; dark yellowish brown (10YR 4/6) loam; common medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; weak fine prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; thin discontinuous brown (10YR 4/3) clay films on faces of peds; thin continuous light brownish gray (10YR 6/2) silt coatings on faces of peds; few very dark brown (10YR 2/2) manganese accumulations; slightly acid; clear irregular boundary.

B23t—31 to 41 inches; dark yellowish brown (10YR 4/6) sandy clay loam; many coarse distinct yellowish brown (10YR 5/6) and common fine distinct grayish brown (10YR 5/2) mottles; weak fine subangular blocky structure; firm; few fine roots; thin continuous light brownish gray (10YR 6/2) silt coatings on faces of peds; few pebbles; slightly acid; clear irregular boundary.

IIB3—41 to 49 inches; grayish brown (10YR 5/2) loamy sand; few fine and medium distinct dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6) mottles; massive; friable; thin continuous light brownish gray (10YR 6/2) silt coatings on faces of peds; neutral; clear wavy boundary.

IIC1—49 to 60 inches; brown (10YR 5/3) fine sand; few medium faint brown (10YR 4/3) mottles; single grain; very friable; neutral.

The solum is 40 to 60 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. In undisturbed areas, the A1 horizon is very dark gray (10YR 3/1) or very dark grayish brown (10YR 3/2). The A2 horizon, where present, has hue of 10YR, value of 5 or 6, and chroma of 2 or 3. The A horizon is loam, silt loam, or sandy loam. It is neutral to medium acid.

The B2 horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 6. It is dominantly loam, clay loam, or sandy clay loam, but in some places it includes subhorizons that are silty clay loam or sandy loam. It is strongly acid to neutral.

The IIC horizon is stratified and ranges from silty clay loam to sand. It is neutral to moderately alkaline.

formation of the soils

In this section the major factors of soil formation and their degree of importance in the formation of the soils in Wabash County are discussed.

factors of soil formation

Soil is a natural, three-dimensional body on the earth's surface that is capable of supporting the growth of plants. The characteristics of the soil at any given point are determined by the physical and mineralogical composition of the parent material, the climate under which the soil material has accumulated and weathered, the plant and animal life on and in the soil, the relief, or lay of the land, and the length of time the forces of soil formation have acted on the soil material.

Climate and plant and animal life, chiefly plants, are the active factors of soil formation. They act on the parent material that has accumulated 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 is formed. Finally, time is needed for changing the parent material into soil. It may be much or little, but some time is always required for the differentiation of soil horizons. Generally, a long time is required for distinct horizons to develop.

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. Many of the processes of soil development are unknown.

parent material

Parent material is the unconsolidated mass from which a soil is formed. It determines the limits of the chemical and mineralogical composition of the soil. The parent materials of the soils in Wabash County were deposited by glaciers or by melt water from the glaciers. The glaciers covered the county for thousands of years and finally retreated from it about 15,000 years ago. Some of the parent materials were subsequently reworked and redeposited by water and wind. Although the parent materials are mainly of common glacial origin, their properties vary greatly, sometimes within a small area, depending on how the materials were deposited. The dominant parent materials in Wabash County were deposited as glacial till, outwash deposits, loess, lacustrine deposits, alluvium, and organic material.

Glacial till is material that was laid down directly by glacial ice with little or no sorting or displacement by water. It consists of mixed particles of different sizes. Sharp corners and edges on many of the small pebbles in glacial till indicate that they have not been worn by water washing. The glacial till in Wabash County is calcareous and firm. It is sandy loam, loam, or clay loam. Soils that formed in glacial till, for example, Miami soils, typically are loamy and have well developed structure.

Outwash material was deposited by water flowing from melting glaciers. The size of the particles in outwash material varies according to the velocity of the water that carried them. When swiftly flowing water slowed down, the coarser particles were deposited first. Finer particles, such as very fine sand, silt, and clay, remained in suspension in the more slowly moving water. Outwash deposits generally consist of layers of particles of similar size. Loam, sandy loam, sand, gravel, and other coarse particles are dominant. Ockley soils, for example, formed in deposits of outwash material.

Loess consists of particles that were deposited by wind. The particles are dominantly silt-sized. The loess was deposited after the glaciers receded. The thickest deposits of loess are on the uplands in the southwestern quarter of the county. Cyclone and Fincastle soils formed partly in loess.

Lacustrine material was deposited from still, or ponded, glacial melt water. Because the coarser fragments dropped out of moving water as outwash, only the finer particles, such as very fine sand, silt, and clay, remained to settle out in still water. Lacustrine deposits are silty or clayey. In Wabash County, soils that formed in lacustrine deposits typically are silty clay loam. Milford soils, for example, formed in lacustrine material.

Alluvial material was deposited by floodwaters of existing streams in geologically recent time. This material varies in texture depending on the velocity of the water from which it was deposited. The alluvial material deposited along a swift stream like Treaty Creek is coarser than that deposited along a slow, sluggish stream like Paw Paw Creek. Genesee and Sloan soils are examples of alluvial soils.

Organic material is made up of plant remains. After the glaciers receded, lakes formed as water was left standing in depressions in outwash and till plains.

Grasses and sedges grew at the water's edge, and when they died, their remains sank to the bottom. Because of wetness, the plant remains decomposed far more slowly than they accumulated around the lakes. Later, water-tolerant trees grew in these accumulations. As the trees died, their residue became part of the organic accumulation. The lakes gradually filled with organic material, which subsequently partly decomposed and became muck and peat. Houghton soils, for example, formed in organic material.

plant and animal life

Plants, of all living organisms, have had the greatest influence on the soils in Wabash County; however, bacteria, fungi, and earthworms have also been important. In recent time, the activities of man have been increasingly influential. 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 kind of plant cover. The remains of plants decay and eventually become organic matter in the soil. Plant roots provide channels for the downward movement of water through the soil and also add organic matter to the soil as they decay. Bacteria in the soil help to break down the organic matter so that it can be used by growing plants.

The native vegetation in Wabash County was mainly deciduous forest. Differences in natural drainage and minor variations in parent material influenced the composition of the forest.

In general, the well drained upland soils, such as Miami, Rawson, and Riddles soils, were mainly covered with sugar maple, beech, black walnut, tulip poplar, and red oak. The wet soils supported primarily silver maple, swamp white oak, and sycamore. A few wet soils also had a ground cover of sphagnum and other mosses, which contributed substantially to the accumulation of organic matter. Milford and Pella soils developed under wet conditions and have a considerable content of organic matter. The soils in Wabash County that developed under forest generally have less organic matter than soils in other parts of the state that developed under grasses.

climate

Climate determines the kind of plant and animal life on and in the soil. It determines the amount of water available for weathering of minerals, for removal of the products of weathering, and for translocation of soil material. Through its influence on soil temperature, climate determines the rate of chemical reaction in the soil. These influences are important, but they affect the soils in large areas rather than in a relatively small area such as a county.

The climate of Wabash County is cool and humid and presumably is similar to that which existed when the soils formed. The climate is fairly uniform throughout the county. Therefore, the differences in the soils are only to a minor extent the result of differences in climate.

relief

Relief has a marked influence on the soils through its influence on the depth of the water table, erosion, plant cover, and soil temperature. In Wabash County slopes range from nearly level to very steep. The depth of the water table largely determines the natural soil drainage, which ranges from well drained on ridgetops to very poorly drained in depressions.

Relief influences the formation of soils by affecting runoff and drainage. Drainage, through its effect on aeration of the soil, determines the color of the soil. Runoff is most rapid on steep slopes; in low areas, water may be temporarily ponded. Water and air move freely through soils that are well drained but slowly through soils that are very poorly drained. In soils that are well aerated, the iron compounds that give most soils their color are oxidized and brightly colored; in poorly aerated soils the color is dull gray and mottled. Ockley soils, for example, are well drained and well aerated, and Milford soils are very poorly drained and poorly aerated. Soils that are poorly drained, somewhat poorly drained, and moderately well drained tend to be intermediate in color and in amount of mottling between very poorly drained soils and well drained soils.

time

Generally, a long time is required for the agents of soil formation to change the parent material into soil that has distinct horizons. The degree of development of a soil profile commonly corresponds to the length of time that the parent material has been in place. Nevertheless, some soils develop rapidly and others slowly.

The soils in Wabash 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 to allow distinct horizons to develop. However, some soils that formed in recent alluvial sediment have not been in place long enough for distinct horizons to develop. Genesee soils, for example, are young soils that formed in alluvial material.

processes of soil formation

Several processes have been involved in the formation of the soils in Wabash County. These processes are the accumulation of organic matter; the solution, transfer, and removal of calcium carbonates and bases; and the liberation and translocation of silicate clay minerals. In most soils, more than one of these processes have been active in horizon differentiation. Leaching of bases and translocation of silicate clays are among the more important processes in horizon differentiation in the soils of Wabash County.

Some organic matter has accumulated in the surface layer of all the soils in the county. The content of organic matter of some soils is low, but that of others is high. Generally, the soils that have the highest content of organic matter, such as Brookston or Rensselaer soils, have a thick, dark surface horizon.

Carbonates and bases have been leached from the upper horizons of nearly all the soils in Wabash County. Leaching generally is held to precede the translocation of silicate clay minerals. Most of the carbonates and some of the bases have been leached from the A and B horizons in 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 the water table is high or because water moves slowly through such soils.

Clay accumulates in pores and other voids and forms a film on surfaces along which water moves. Miami soils are examples of soils in which translocated silicate clays have accumulated in the B2t horizon in the form of clay films.

The reduction and transfer of iron, or gleying, has taken place in all of the very poorly drained and somewhat poorly drained soils. In these naturally wet soils, this process has been significant in horizon differentiation and is indicatd by the gray color of the subsoil. Reduction commonly is accompanied by some downward transfer of iron, either to lower horizons or completely out of the profile. Mottles indicate redistribution and segregation of iron.

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glossary

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium or on steep rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Basal till. Compact glacial till deposited beneath the ice.

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a fragment.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard compacted layers to a depth below normal plow depth.

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 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation tillage. A tillage system that does not invert the soil and that leaves all or part of the crop residue on the surface throughout the year.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Coprogenous earth (sedimentary peat). Fecal material deposited in water by aquatic organisms. The Lco horizon is a limnic layer that contains many fecal pellets.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazingland for a prescribed period.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious

layer within the profile, seepage, nearly continuous rainfall, or a combination of these.
Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, subsurface. Removal of excess ground water through buried drains. 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.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.
Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.
Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Excess lime (in tables). Excess carbonates in the soil that restrict the growth of some plants.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, and clay.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 37.5 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

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.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

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.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) 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 Arabic numeral 2 precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

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.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Large stones (in tables). Rock fragments 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

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.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Muck. Dark colored, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash, glacial. Stratified sand and gravel produced by glaciers and carried, sorted, and deposited by glacial melt water.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor filter (in tables). Because of rapid permeability the soil may not adequately filter effluent from a waste disposal system.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

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.

Sedimentary peat. See Coprogenous earth.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to insure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A1, A2, 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.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Till plain. An extensive flat to undulating area underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Underlying material. The part of the soil below the solum. Technically, the substratum.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size and diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1951-74 at Wabash, Indiana]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[1]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January	33.2	15.3	24.3	60	-15	13	2.20	.96	3.20	7	6.1
February	36.4	17.4	26.9	61	-10	12	1.83	.87	2.61	5	7.4
March	45.7	25.5	35.6	77	2	75	2.76	1.74	3.68	8	5.2
April	60.2	36.9	48.6	84	18	268	4.00	2.15	5.51	9	.8
May	71.4	46.8	59.1	91	28	592	3.74	2.74	4.67	8	.0
June	81.0	56.6	68.8	96	38	864	4.08	2.57	5.44	8	.0
July	84.4	60.1	72.3	96	44	1,001	3.92	2.19	5.32	7	.0
August	82.7	57.4	70.1	94	41	933	3.77	2.16	5.07	6	.0
September	77.2	50.0	63.6	94	31	708	3.10	1.36	4.50	6	.0
October	66.3	39.1	52.7	87	21	402	2.53	.87	3.85	5	.0
November	49.8	30.0	39.9	74	10	89	2.71	1.75	3.58	7	1.9
December	37.1	20.2	28.7	65	-9	33	2.56	.95	3.85	6	7.8
Year	60.5	37.9	49.2	98	-18	4,990	37.20	32.46	41.76	82	29.2

[1] 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 (40° F) below which growth is minimal for the principal crops in the area.

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1951-74 at Wabash, Indiana]

Probability	Minimum 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 22	May 11	May 27
2 years in 10 later than--	April 17	May 4	May 21
5 years in 10 later than--	April 7	April 22	May 8
First freezing temperature in fall:			
1 year in 10 earlier than--	October 18	October 1	September 20
2 years in 10 earlier than--	October 22	October 7	September 25
5 years in 10 earlier than--	October 29	October 19	October 5

TABLE 3.--GROWING SEASON

[Recorded in the period 1951-74 at Wabash, Indiana]

Probability	Length of growing season if daily minimum temperature is--		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	183	154	127
8 years in 10	190	163	134
5 years in 10	205	179	149
2 years in 10	219	195	163
1 year in 10	226	204	171

TABLE 4.--POTENTIALS AND LIMITATIONS OF MAP UNITS ON THE GENERAL SOIL MAP

Map unit	Percentage of survey area	Cultivated farm crops	Woodland	Urban uses	Intensive recreation areas
	Pct				
1. Blount-Pewamo-Glynwood	29	Good	Fair: wetness.	Poor: wetness, percs slowly.	Fair: wetness, percs slowly.
2. Fincastle-Cyclone	13	Good	Fair: wetness.	Poor: wetness, percs slowly.	Fair: wetness, percs slowly.
3. Crosby-Brookston-Crosier	8	Good	Fair: wetness.	Poor: wetness, percs slowly.	Fair: wetness, percs slowly.
4. Rensselaer-Whitaker	3	Good	Fair: wetness.	Poor: wetness.	Poor: wetness.
5. Glynwood-Morley	16	Fair: erosion hazard.	Good	Fair: slope, percs slowly.	Fair: slope, percs slowly.
6. Miami-Riddles	9	Fair: erosion hazard.	Good	Fair: slope.	Fair: slope.
7. Miami-Crosby	8	Fair: erosion hazard.	Good	Fair: slope, wetness, percs slowly.	Fair: slope, percs slowly.
8. Fox-Ockley-Kosciusko	10	Fair: drought-iness.	Good	Fair: poor filter.	Good.
9. Genesee-Milton-Shoals:	4				
Bottom lands		Fair: flooding.	Good	Poor: flooding.	Poor: flooding.
Terraces		Fair: erosion hazard, drought-iness.	Good	Poor: depth to bedrock.	Poor: depth to bedrock.

TABLE 5.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
BaA	Blount silt loam, 0 to 2 percent slopes	3,600	1.3
BaB2	Blount silt loam, 1 to 4 percent slopes, eroded	29,900	11.1
Br	Brookston loam	7,900	2.9
ChC	Chelsea fine sand, 4 to 15 percent slopes	430	0.2
CrA	Crosby silt loam, 0 to 3 percent slopes	9,200	3.4
CsA	Crosier loam, 0 to 3 percent slopes	4,450	1.6
Cy	Cyclone silt loam	16,050	5.9
FnA	Fincastle silt loam, 0 to 2 percent slopes	16,100	6.0
FsA	Fox loam, 0 to 2 percent slopes	1,800	0.7
FsB2	Fox loam, 2 to 6 percent slopes, eroded	1,550	0.6
FsC2	Fox loam, 6 to 12 percent slopes, eroded	840	0.3
FsD2	Fox loam, 12 to 20 percent slopes, eroded	420	0.2
FtC3	Fox clay loam, 6 to 12 percent slopes, severely eroded	750	0.3
FtD3	Fox clay loam, 12 to 18 percent slopes, severely eroded	520	0.2
Ge	Genesee loam, occasionally flooded	6,300	2.3
GnB2	Glynwood silt loam, 4 to 7 percent slopes, eroded	21,650	8.0
GoC3	Glynwood clay loam, 5 to 12 percent slopes, severely eroded	12,200	4.5
HaA	Haskins loam, 0 to 3 percent slopes	5,200	1.9
HeG	Hennepin loam, 25 to 50 percent slopes	3,500	1.3
Ho	Homer loam	1,230	0.5
Ht	Houghton muck, undrained	970	0.4
Hx	Houghton muck, drained	850	0.3
KaA	Kalamazoo sandy loam, 0 to 2 percent slopes	2,100	0.8
KaB	Kalamazoo sandy loam, 2 to 6 percent slopes	1,250	0.5
KsA	Kosciusko sandy loam, 0 to 2 percent slopes	990	0.4
KsB	Kosciusko sandy loam, 2 to 6 percent slopes	1,650	0.6
KsC	Kosciusko sandy loam, 6 to 12 percent slopes	460	0.2
MbA	Martinsville loam, 0 to 2 percent slopes	1,700	0.6
MbB	Martinsville loam, 2 to 6 percent slopes	1,950	0.7
MbC2	Martinsville loam, 6 to 12 percent slopes, eroded	750	0.3
Md	Martisco muck, sandy substratum	200	0.1
MeB	Metea loamy sand, 2 to 6 percent slopes	450	0.2
MeC	Metea loamy sand, 6 to 12 percent slopes	170	0.1
MfB2	Miami loam, 2 to 6 percent slopes, eroded	3,650	1.3
MfC2	Miami loam, 6 to 12 percent slopes, eroded	1,550	0.6
MfD2	Miami loam, 12 to 18 percent slopes, eroded	1,950	0.7
MfE2	Miami loam, 18 to 25 percent slopes, eroded	610	0.2
MhB2	Miami silt loam, 2 to 6 percent slopes, eroded	8,100	3.0
MhC2	Miami silt loam, 6 to 12 percent slopes, eroded	2,600	1.0
MkC3	Miami clay loam, 6 to 12 percent slopes, severely eroded	2,800	1.0
MkD3	Miami clay loam, 12 to 25 percent slopes, severely eroded	1,100	0.4
MlC3	Miami clay loam, moderately permeable substratum, 6 to 12 percent slopes, severely eroded	1,750	0.6
Mm	Milford silty clay loam	1,700	0.6
Mp	Millsdale silty clay loam	240	0.1
MsA	Milton silt loam, 0 to 2 percent slopes	1,800	0.7
MsB2	Milton silt loam, 2 to 6 percent slopes, eroded	1,300	0.5
MsC2	Milton silt loam, 6 to 12 percent slopes, eroded	550	0.2
MtG	Milton Variant silt loam, 30 to 70 percent slopes	900	0.3
MvC2	Morley silt loam, 7 to 12 percent slopes, eroded	3,000	1.1
MvD2	Morley silt loam, 12 to 18 percent slopes, eroded	850	0.3
MvE2	Morley silt loam, 18 to 25 percent slopes, eroded	270	0.1
MxD3	Morley clay loam, 12 to 25 percent slopes, severely eroded	2,150	0.8
OcA	Ockley loam, 0 to 2 percent slopes	4,150	1.5
OcB2	Ockley loam, 2 to 6 percent slopes, eroded	1,250	0.5
OmA	Ormas loamy sand, 0 to 2 percent slopes	620	0.2
OmB	Ormas loamy sand, 2 to 6 percent slopes	960	0.4
OmC	Ormas loamy sand, 6 to 15 percent slopes	330	0.1
Or	Orthents, loamy	800	0.3
Pa	Palms muck, undrained	410	0.2
Pm	Palms muck, drained	550	0.2
Pp	Palms Variant muck, drained	150	0.1
Pt	Pella silty clay loam	1,050	0.4
Pw	Pewamo silty clay loam	14,100	5.2
Px	Pits, gravel	210	0.1
Py	Pits, quarry	50	*
RaA	Randolph silt loam, 0 to 2 percent slopes	740	0.3
RcA	Rawson sandy loam, 0 to 2 percent slopes	630	0.2
RcB2	Rawson sandy loam, 2 to 6 percent slopes, eroded	3,640	1.3
RcC2	Rawson sandy loam, 6 to 12 percent slopes, eroded	430	0.2

See footnote at end of table.

TABLE 5.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
Re	Rensselaer loam	7,700	2.9
RhA	Riddles loam, 0 to 2 percent slopes	1,500	0.6
RhB2	Riddles loam, 2 to 6 percent slopes, eroded	4,150	1.5
RhC2	Riddles loam, 6 to 12 percent slopes, eroded	560	0.2
RmG	Rodman gravelly loam, 25 to 50 percent slopes	790	0.3
Se	Sebewa loam	1,250	0.5
Sf	Sebewa-Milford complex	1,470	0.5
Sh	Shoals silt loam, occasionally flooded	9,600	3.6
So	Sloan silty clay loam, frequently flooded	5,700	2.1
Wc	Wallkill silt loam	810	0.3
Wh	Washtenaw silt loam	1,450	0.5
Ws	Westland loam	790	0.3
Wt	Whitaker loam	4,350	1.6
	Water	5,300	2.0
	Total	269,440	100.0

* Less than 0.1 percent.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Corn	Soybeans	Winter wheat	Grass-legume hay	Tall fescue
	Bu	Bu	Bu	Ton	AUM*
BaA---- Blount	105	35	48	4.3	7.2
BaB2---- Blount	95	32	42	4.1	7.1
Br---- Brookston	145	51	55	4.8	9.6
ChC---- Chelsea	45	18	25	1.5	3.0
CrA---- Crosby	110	37	49	4.4	8.8
CsA---- Crosier	120	40	50	4.4	8.8
Cy---- Cyclone	155	54	55	5.1	10.2
FnA---- Fincastle	125	44	50	4.6	9.2
FsA---- Fox	95	32	45	4.5	9.0
FsB2---- Fox	90	30	42	4.3	8.6
FsC2---- Fox	85	28	38	4.0	8.0
FsD2---- Fox	65	---	32	3.6	7.2
FtC3---- Fox	60	20	30	3.4	6.8
FtD3---- Fox	---	---	---	3.0	6.0
Ge---- Genesee	120	40	45	3.5	8.0
GnB2---- Glynwood	90	30	40	4.2	8.4
GoC3---- Glynwood	70	22	30	3.5	7.0
HaA---- Haskins	110	40	46	4.4	8.8
HeG---- Hennepin	---	---	---	1.2	2.4
Ho---- Homer	100	35	48	3.3	6.6
Ht---- Houghton	---	---	---	---	---

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*
Hx---------- Houghton	115	34	---	---	---
KaA---------- Kalamazoo	90	30	42	3.8	7.6
KaB---------- Kalamazoo	85	30	40	3.6	7.2
KsA---------- Kosciusko	80	28	38	2.6	5.2
KsB---------- Kosciusko	75	26	38	2.5	5.0
KsC---------- Kosciusko	65	24	32	2.4	4.8
MbA---------- Martinsville	120	42	48	4.0	8.0
MbB---------- Martinsville	115	42	48	4.0	8.0
MbC2---------- Martinsville	105	37	42	3.4	6.8
Md---------- Martisco	85	---	---	---	---
MeB---------- Metea	85	28	38	2.8	5.6
MeC---------- Metea	75	24	34	2.5	5.0
MfB2---------- Miami	105	37	47	3.4	6.8
MfC2---------- Miami	95	32	40	3.0	6.0
MfD2---------- Miami	80	28	36	2.6	5.2
MfE2---------- Miami	---	---	---	---	4.6
MhB2---------- Miami	105	37	47	3.4	6.8
MhC2---------- Miami	95	33	43	3.1	6.2
MkC3---------- Miami	80	30	40	3.0	6.0
MkD3---------- Miami	---	---	---	2.5	5.0
MlC3---------- Miami	80	28	36	2.6	5.2
Mm---------- Milford	130	45	48	4.8	9.6
Mp---------- Millsdale	110	42	46	4.6	9.2

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*
MsA---------- Milton	90	30	40	4.0	8.0
MsB2---------- Milton	80	28	38	3.5	7.0
MsC2---------- Milton	60	22	33	3.0	6.0
MtG---------- Milton Variant	---	---	---	---	---
MvC2---------- Morley	85	28	36	4.0	8.0
MvD2---------- Morley	70	24	30	3.7	7.4
MvE2---------- Morley	---	---	---	3.1	6.2
MxD3---------- Morley	---	---	---	3.3	6.6
OcA---------- Ockley	110	38	44	3.6	7.2
OcB2---------- Ockley	105	37	42	3.4	6.8
OmA---------- Ormas	70	25	32	2.3	4.6
OmB---------- Ormas	60	21	30	2.0	4.0
OmC---------- Ormas	50	19	28	1.8	3.6
Or. Orthents					
Pa---------- Palms	---	---	---	---	---
Pm---------- Palms	105	42	---	---	---
Pp---------- Palms Variant	95	30	---	---	---
Pt---------- Pella	135	45	50	4.8	9.6
Pw---------- Pewamo	125	42	50	4.6	9.2
Px, Py. Pits					
RaA---------- Randolph	100	36	42	4.1	8.2
RcA---------- Rawson	105	38	46	4.2	8.4
RcB2---------- Rawson	100	32	42	4.0	8.0

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*
RcC2--Rawson	90	28	38	3.8	7.6
Re--Rensselaer	150	53	55	5.0	10.0
RhA--Riddles	120	42	48	4.0	8.0
RhB2--Riddles	115	40	46	3.8	7.6
RhC2--Riddles	105	40	42	3.4	6.8
RmG--Rodman	---	---	---	---	0.2
Se--Sebewa	120	40	48	4.6	9.2
Sf--Sebewa-Milford	115	35	45	4.0	8.0
Sh--Shoals	125	42	48	4.3	8.6
So--Sloan	110	35	---	4.0	8.0
Wc--Wallkill	100	28	---	3.5	7.0
Wh--Washtenaw	120	40	46	4.3	8.6
Ws--Westland	140	49	52	4.6	9.2
Wt--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	7,980	---	---	---
II	197,730	78,390	113,640	5,700
III	24,800	13,010	8,890	2,900
IV	21,350	20,720	200	430
V	1,380	---	1,380	---
VI	4,650	4,650	---	---
VII	5,190	4,400	---	790
VIII	---	---	---	---

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
BaA, BaB2---- Blount	3c	Slight	Slight	Moderate	Moderate	White oak----	65	Eastern white pine, yellow-poplar.
						Northern red oak----	65	
						Green ash----	---	
						Bur oak----	---	
						Pin oak----	---	
Br---- Brookston	2w	Slight	Severe	Severe	Moderate	Pin oak----	86	Eastern white pine, red maple, white ash, pin oak, white oak.
						White oak----	75	
						Northern red oak----	78	
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	
CrA---- Crosby	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	
CsA---- 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	
Cy---- Cyclone	2w	Slight	Severe	Severe	Severe	Pin oak----	90	Eastern white pine, red maple, white ash.
						White oak----	75	
FnA---- Fincastle	3o	Slight	Slight	Slight	Slight	Northern red oak----	75	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.
						White oak----	75	
						Pin oak----	85	
						Yellow-poplar----	85	
FsA, FsB2, FsC2---- Fox	2o	Slight	Slight	Slight	Slight	Northern red oak----	80	Yellow-poplar, white ash, eastern white pine, red pine, black locust.
						White oak----	---	
						Sugar maple----	---	
FsD2---- Fox	2r	Moderate	Moderate	Slight	Slight	Northern red oak----	80	Yellow-poplar, white ash, eastern white pine, red pine, black locust.
						White oak----	---	
						Sugar maple----	---	
FtC3---- Fox	2o	Slight	Slight	Slight	Slight	Northern red oak----	80	Yellow-poplar, white ash, eastern white pine, red pine, black locust.
						White oak----	---	
						Sugar maple----	---	
FtD3---- Fox	2r	Moderate	Moderate	Slight	Slight	Northern red oak----	80	Yellow-poplar, white ash, eastern white pine, red pine, black locust.
						White oak----	---	
						Sugar maple----	---	
Ge---- Genesee	1o	Slight	Slight	Slight	Slight	Yellow-poplar----	100	Eastern white pine, black walnut, yellow-poplar, black locust.

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	
GnB2, GoC3--------- Glynwood	2c	Slight	Slight	Moderate	Moderate	Northern red oak---- Black oak---------- White oak---------- Black walnut--------	80 80 80 ---	Eastern white pine, yellow-poplar, white ash.
HaA---------- Haskins	2o	Slight	Slight	Slight	Slight	White oak---------- Northern red oak---- Pin oak---------- Black walnut-------- Black cherry-------- Sugar maple--------- White ash---------- Yellow-poplar-------	75 80 90 --- --- --- --- ---	Red maple, white ash, eastern white pine, yellow-poplar, northern red oak, white oak.
HeG---------- Hennepin	1r	Severe	Severe	Slight	Slight	Northern red oak---- White oak----------	85 ---	Northern red oak, white oak, green ash, black walnut, eastern white pine, red pine.
Ho---------- Homer	3o	Slight	Slight	Slight	Slight	White oak---------- Pin oak---------- Yellow-poplar-------	70 85 85	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.
Ht, Hx---------- Houghton	4w	Slight	Severe	Severe	Severe	White ash---------- Red maple---------- Quaking aspen------- Black willow-------- Silver maple--------	51 51 56 --- 76	
KaA, KaB---------- Kalamazoo	2o	Slight	Slight	Slight	Slight	Northern red oak---- White ash---------- Black walnut-------- Yellow-poplar------- White oak---------- Black cherry-------- American basswood--- Sugar maple---------	65 65 65 65 --- --- 65 61	Black walnut, yellow-poplar, eastern white pine, white spruce, red pine.
KsA, KsB, KsC------ Kosciusko	2s	Slight	Slight	Slight	Slight	Northern red oak---- White oak---------- Eastern white pine-- Black oak---------- Jack pine----------	78 76 70 --- ---	Eastern white pine, red pine, jack pine.
MbA, MbB, MbC2----- Martinsville	1o	Slight	Slight	Slight	Slight	White oak---------- Yellow-poplar-------	90 98	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
Md---------- Martisco	5w	Slight	Severe	Severe	Severe	Red maple----------	55	
MeB, MeC---------- 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.
MfB2, MfC2--------- Miami	1o	Slight	Slight	Slight	Slight	White oak---------- Yellow-poplar------- Northern red oak----	90 98 90	Black walnut, yellow-poplar, white ash, eastern white pine, red pine.
MfD2---------- Miami	1o	Slight	Slight	Slight	Slight	White oak---------- Yellow-poplar-------	90 98	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.

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	
MfE2---------- Miami	1r	Moderate	Moderate	Slight	Slight	White oak----------	90	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
						Yellow-poplar-------	98	
MhB2, MhC2, MkC3, MkD3---------- Miami	1o	Slight	Slight	Slight	Slight	White oak----------	90	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
						Yellow-poplar-------	98	
MlC3---------- Miami	1o	Slight	Slight	Slight	Slight	White oak----------	90	Black walnut, yellow-poplar, white ash, eastern white pine, red pine.
						Yellow-poplar-------	98	
						Northern red oak----	90	
Mm---------- Milford	---	---	---	---	---	---	---	Pin oak, green ash, eastern hemlock, red maple.
Mp---------- Millsdale	2w	Slight	Severe	Severe	Severe	Pin oak----------	86	Red maple, American sycamore, eastern cottonwood, pin oak, green ash, swamp white oak.
						Red maple----------	---	
						Eastern cottonwood--	---	
						Black cherry--------	---	
						Green ash----------	---	
						Swamp white oak-----	---	
MsA, MsB2, MsC2---- Milton	2o	Slight	Slight	Slight	Slight	Northern red oak----	80	Eastern white pine, yellow-poplar, white ash, red pine, northern red oak, white oak.
						Yellow-poplar-------	95	
						Black walnut--------	---	
						Black cherry--------	---	
						White oak----------	---	
						White ash----------	---	
						Sugar maple---------	---	
MtG---------- Milton Variant	3r	Moderate	Severe	Severe	Slight	Northern red oak----	65	Eastern white pine, red pine, yellow-poplar, black cherry.
						Yellow-poplar-------	85	
MvC2---------- Morley	2o	Slight	Slight	Slight	Slight	White oak----------	80	White oak, black walnut, green ash, eastern white pine, red pine, white spruce.
						Northern red oak----	80	
						Yellow-poplar-------	90	
						Black walnut--------	---	
						Bur oak-------------	---	
						Northern red oak----	---	
						Shagbark hickory----	---	
						Bur oak-------------	---	
MvD2, MvE2, MxD3--- Morley	2r	Moderate	Moderate	Slight	Slight	White oak----------	80	White oak, green ash, eastern white pine, red pine, white spruce.
						Northern red oak----	80	
						Yellow-poplar-------	90	
						Black walnut--------	---	
						Bur oak-------------	---	
						Northern red oak----	---	
						Shagbark hickory----	---	
						Bur oak-------------	---	
OcA, OcB2---------- Ockley	1o	Slight	Slight	Slight	Slight	White oak----------	90	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
						Northern red oak----	90	
						Yellow-poplar-------	98	
OmA, OmB, OmC------ Ormas	3s	Slight	Slight	Moderate	Slight	White oak----------	70	Eastern white pine, red pine, yellow-poplar.
						Yellow-poplar-------	---	
						Eastern white pine--	---	
						Red pine-----------	78	

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	
Pa, Pm---------- Palms	4w	Slight	Severe	Severe	Severe	White ash---------- Red maple---------- Quaking aspen------- Black willow-------- Silver maple--------	51 51 56 --- 76	
Pp---------- Palms Variant	4w	Slight	Severe	Severe	Severe	Red maple---------- Silver maple-------- White ash----------	51 76 51	Red maple, silver maple, white ash.
Pt---------- Pella	---	---	---	---	---	----------	---	Black spruce, pin oak, green ash.
Pw---------- 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, eastern white pine, red maple, green ash.
RaA---------- Randolph	3o	Slight	Slight	Slight	Slight	Northern red oak---- Sugar maple--------- Yellow-poplar-------	75 90 85	Eastern white pine, yellow-poplar.
RcA, RcB2, RcC2---- Rawson	2o	Slight	Slight	Slight	Slight	White oak---------- Northern red oak---- Black walnut-------- Black cherry-------- Sugar maple--------- White ash---------- Yellow-poplar-------	75 80 --- --- --- --- ---	Eastern white pine, yellow-poplar, white ash, red pine, white oak.
Re---------- Rensselaer	2w	Slight	Severe	Severe	Severe	Pin oak---------- White oak---------- Northern red oak----	86 75 76	Eastern white pine, red maple, white ash.
RhA, RhB2, RhC2---- Riddles	1o	Slight	Slight	Slight	Slight	White oak---------- Yellow-poplar------- Sweetgum---------- Northern red oak----	90 98 76 90	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
RmG---------- Rodman	3s	Severe	Severe	Severe	Slight	Northern red oak---- White oak---------- Red pine---------- Eastern white pine--	70 70 75 85	Eastern white pine, red pine, jack pine.
Se---------- Sebewa	2w	Slight	Severe	Severe	Severe	Pin oak---------- White ash---------- White oak---------- Red maple---------- American basswood---	88 75 72 --- ---	Eastern white pine, white ash, green ash.
Sf: Sebewa----------	2w	Slight	Severe	Severe	Severe	Pin oak---------- White ash---------- White oak---------- Red maple---------- American basswood---	88 75 72 --- ---	Eastern white pine, white ash, green ash.
Milford----------	---	---	---	---	---	----------	---	Pin oak, green ash, eastern hemlock, red maple.

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	
Sh---------- Shoals	2o	Slight	Slight	Slight	Slight	Pin oak----------	90	Red maple, swamp chestnut oak, pin oak, yellow-poplar.
						Yellow-poplar-------	90	
						Virginia pine-------	90	
						Eastern cottonwood--	---	
						White ash----------	---	
So---------- Sloan	2w	Slight	Severe	Severe	Severe	Pin oak----------	86	Red maple, white ash, eastern cottonwood, pin oak, swamp white oak.
						Swamp white oak-----	---	
						Red maple----------	---	
						Green ash----------	---	
						Eastern cottonwood--	---	
We---------- Wallkill	4w	Slight	Severe	Severe	Severe	Pin oak----------	65	Red maple, green ash, eastern cottonwood, pin oak, swamp white oak.
						Red maple----------	51	
						White ash----------	52	
						Quaking aspen-------	56	
						Silver maple--------	---	
Wh---------- Washtenaw	2w	Slight	Severe	Severe	Moderate	Pin oak----------	86	Eastern white pine, red maple, white ash, white spruce, black spruce.
						Northern red oak----	75	
						Red maple----------	70	
						Silver maple--------	---	
						White ash----------	---	
						American basswood---	---	
						White oak----------	---	
Ws---------- Westland	2w	Slight	Severe	Severe	Severe	Pin oak----------	85	Eastern white pine, red maple, white ash.
						White oak----------	75	
Wt---------- Whitaker	3o	Slight	Slight	Slight	Slight	White oak----------	70	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.
						Pin oak----------	85	
						Yellow-poplar-------	85	
						Northern red oak----	75	

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

[The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil]

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
BaA, BaB2--------- Blount	---	American cranberrybush, Tatarian honeysuckle, Amur honeysuckle, arrowwood, Amur privet, Washington hawthorn, eastern redcedar.	Osageorange, green ash, Austrian pine.	Eastern white pine	---
Br---------- Brookston	---	Amur honeysuckle, silky dogwood, Amur privet, American cranberrybush.	Northern white-cedar, Norway spruce, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
ChC---------- Chelsea	Siberian peashrub	Eastern redcedar, radiant crabapple, Washington hawthorn, autumn-olive, Amur honeysuckle, lilac, Tatarian honeysuckle.	Austrian pine, jack pine, red pine.	Eastern white pine	---
CrA---------- Crosby	---	Arrowwood, eastern redcedar, Washington hawthorn, Amur honeysuckle, American cranberrybush, Amur privet, Tatarian honeysuckle.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
CsA---------- Crosier	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Austrian pine, blue spruce, northern white-cedar, Washington hawthorn, white fir	Norway spruce-----	Eastern white pine, pin oak.
Cy---------- Cyclone	---	Amur honeysuckle, silky dogwood, Amur privet, American cranberrybush.	Northern white-cedar, Norway spruce, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
FnA---------- Fincastle	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
FsA, FsB2, FsC2, FsD2, FtC3, FtD3-Fox	Siberian peashrub	Autumn-olive, Amur honeysuckle, eastern redcedar, radiant crabapple, Washington hawthorn, lilac, Tatarian honeysuckle.	Eastern white pine, Austrian pine, red pine, jack pine.	---	---
Ge-Genesee	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
GnB2, GoC3-Glynwood	---	Amur honeysuckle, Washington hawthorn, Amur privet, arrowwood, eastern redcedar, Tatarian honeysuckle, American cranberrybush.	Austrian pine, green ash, osageorange.	Pin oak, eastern white pine.	---
HaA-Haskins	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
HeG-Hennepin	---	Amur honeysuckle, silky dogwood, Amur privet, American cranberrybush.	Blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Pin oak, eastern white pine.
Ho-Homer	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
Ht, Hx-Houghton	Common ninebark, whitebelle honeysuckle.	Amur honeysuckle, Amur privet, silky dogwood, nannyberry viburnum, Tatarian honeysuckle.	Tall purple willow	Golden willow, black willow.	Imperial Carolina poplar.
KaA, KaB-Kalamazoo	---	Lilac, Amur privet, Tatarian honeysuckle, silky dogwood, nannyberry viburnum, autumn-olive.	White spruce	Red pine, eastern white pine, Norway spruce, Austrian pine.	Carolina poplar.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
KsA, KsB, KsC----- Kosciusko	Siberian peashrub	Eastern redcedar, lilac, radiant crabapple, autumn-olive, Amur honeysuckle, Tatarian honeysuckle, Washington hawthorn.	Eastern white pine, red pine, Austrian pine, jack pine.	---	---
MbA, MbB, MbC2---- Martinsville	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
Md---------- Martisco	Common ninebark, whitebelle honeysuckle.	Amur honeysuckle, Amur privet, silky dogwood, nannyberry viburnum, Tatarian honeysuckle.	Tall purple willow	Golden willow, black willow.	Imperial Carolina poplar.
MeB, MeC---------- Metea	Siberian peashrub	Eastern redcedar, radiant crabapple, lilac, Washington hawthorn, Amur honeysuckle, autumn-olive, Tatarian honeysuckle.	Red pine, jack pine, Austrian pine.	Eastern white pine	---
MfB2, MfC2-------- Miami	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
MfD2---------- Miami	---	Amur honeysuckle, Amur privet, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
MfE2. Miami					
MhB2, MhC2, MkC3, MkD3---------- Miami	---	Amur honeysuckle, Amur privet, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
MlC3---------- Miami	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
Mm---------- Milford	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, white fir, blue spruce, northern white-cedar, Austrian pine, Norway spruce.	Eastern white pine	Pin oak.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Mp---------- Millsdale	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Northern white-cedar, Norway spruce, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
MsA, MsB2, MsC2--- Milton	Siberian peashrub	Eastern redcedar, radiant crabapple, Washington hawthorn, autumn-olive, Amur honeysuckle, lilac, Tatarian honeysuckle.	Eastern white pine, Austrian pine, red pine, jack pine.	---	---
MtG. Milton Variant					
MvC2, MvD2-------- Morley	---	Amur honeysuckle, Washington hawthorn, osageorange, Amur privet, arrowwood, American cranberrybush, Tatarian honeysuckle.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
MvE2. Morley					
MxD3---------- Morley	---	Amur honeysuckle, Washington hawthorn, osageorange, Amur privet, arrowwood, American cranberrybush, Tatarian honeysuckle.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
OcA, OcB2--------- Ockley	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
OmA, OmB, OmC----- Ormas	Siberian peashrub	Eastern redcedar, lilac, radiant crabapple, autumn-olive, Washington hawthorn, Amur honeysuckle, Tatarian honeysuckle.	Red pine, Austrian pine, jack pine.	Eastern white pine	---
Or*. Orthents					

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Pa, Pm---------- Palms	Common ninebark, whitebelle honeysuckle.	Amur honeysuckle, Amur privet, silky dogwood, nannyberry viburnum, Tatarian honeysuckle.	Tall purple willow	Golden willow, black willow.	Imperial Carolina poplar.
Pp---------- Palms Variant	Common ninebark, whitebelle, honeysuckle.	Amur honeysuckle, Amur privet, silky dogwood, nannyberry viburnum, Tatarian honeysuckle.	Tall purple willow	Golden willow, black willow.	Imperial Carolina poplar.
Pt---------- Pella	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, white fir, blue spruce, northern white-cedar, Austrian pine, Norway spruce.	Eastern white pine	Pin oak.
Pw---------- Pewamo	---	Amur honeysuckle, silky dogwood, Amur privet, American cranberrybush.	Northern white-cedar, Norway spruce, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
Px*, Py*. Pits					
RaA---------- Randolph	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, northern white-cedar, blue spruce, white fir, Austrian pine.	Norway spruce-----	Pin oak, eastern white pine.
RcA, RcB2, RcC2--- Rawson	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Northern white-cedar, Austrian pine, white fir, blue spruce, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
Re---------- Rensselaer	---	Amur honeysuckle, silky dogwood, Amur privet, American cranberrybush.	Northern white-cedar, Norway spruce, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
RhA, RhB2, RhC2--- Riddles	---	Amur privet, Amur honeysuckle, American cranberrybush, Washington hawthorn, Tatarian honeysuckle.	Eastern redcedar, Austrian pine, northern white-cedar, osageorange.	Eastern white pine, Norway spruce, red pine.	---
RmG. Rodman					

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Se---------- Sebewa	---	Amur honeysuckle, silky dogwood, Amur privet, American cranberrybush.	Northern white-cedar, Norway spruce, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
Sf*: Sebewa----------	---	Amur honeysuckle, silky dogwood, Amur privet, American cranberrybush.	Northern white-cedar, Norway spruce, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
Milford----------	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, white fir, blue spruce, northern white-cedar, Austrian pine, Norway spruce.	Eastern white pine	Pin oak.
Sh---------- Shoals	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Northern white-cedar, Austrian pine, white fir, blue spruce, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
So---------- Sloan	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Northern white-cedar, Norway spruce, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
Wc---------- Wallkill	Common ninebark, whitebelle honeysuckle.	Amur honeysuckle, Amur privet, silky dogwood, nannyberry viburnum, Tatarian honeysuckle.	Tall purple willow	Golden willow, black willow.	Imperial Carolina poplar.
Wh---------- Washtenaw	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Northern white-cedar, Norway spruce, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
Ws---------- Westland	---	Amur honeysuckle, silky dogwood, Amur privet, American cranberrybush.	Northern white-cedar, Norway spruce, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
Wt---------- Whitaker	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, Austrian pine, blue spruce, Washington hawthorn, northern white-cedar.	Norway spruce-----	Eastern white pine, pin oak.

* 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
BaA, BaB2 Blount	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Br Brookston	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
ChC Chelsea	Severe: too sandy.	Severe: too sandy.	Severe: too sandy, slope.	Severe: too sandy.	Moderate: slope, droughty.
CrA Crosby	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
CsA Crosier	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Cy Cyclone	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
FnA Fincastle	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
FsA Fox	Slight	Slight	Moderate: small stones.	Slight	Slight.
FsB2 Fox	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
FsC2 Fox	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
FsD2 Fox	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
FtC3 Fox	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
FtD3 Fox	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Ge Genesee	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
GnB2 Glynwood	Moderate: percs slowly, wetness.	Moderate: wetness, percs slowly.	Moderate: wetness, slope, percs slowly.	Moderate: wetness.	Slight.
GoC3 Glynwood	Moderate: slope, percs slowly, wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
HaA Haskins	Severe: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
HeG Hennepin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Ho Homer	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Ht, Hx Houghton	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.
KaA Kalamazoo	Slight	Slight	Moderate: small stones.	Slight	Moderate: droughty.
KaB Kalamazoo	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.
KsA Kosciusko	Slight	Slight	Moderate: small stones.	Slight	Moderate: droughty.
KsB Kosciusko	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.
KsC Kosciusko	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
MbA Martinsville	Slight	Slight	Slight	Slight	Slight.
MbB Martinsville	Slight	Slight	Moderate: slope.	Slight	Slight.
MbC2 Martinsville	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Md Martisco	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
MeB Metea	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
MeC Metea	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
MfB2 Miami	Slight	Slight	Moderate: slope.	Slight	Slight.
MfC2 Miami	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
MfD2, MfE2 Miami	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
MhB2 Miami	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
MhC2, MkC3 Miami	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
MkD3 Miami	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
MlC3 Miami	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Mm Milford	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Mp Millsdale	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
MsA Milton	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Slight	Moderate: thin layer.
MsB2 Milton	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, depth to rock, percs slowly.	Slight	Moderate: thin layer.
MsC2 Milton	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope, thin layer.
MtG Milton Variant	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: large stones, slope.
MvC2 Morley	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily	Moderate: slope.
MvD2, MvE2, MxD3 Morley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
OcA Ockley	Slight	Slight	Slight	Slight	Slight.
OcB2 Ockley	Slight	Slight	Moderate: slope.	Slight	Slight.
OmA Ormas	Slight	Slight	Slight	Slight	Moderate: droughty.
OmB Ormas	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
OmC Ormas	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
Or*. Orthents					
Pa, Pm Palms	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
Pp Palms Variant	Severe: ponding, excess humus.	Severe: ponding, excess humus.	Severe: excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, excess humus.
Pt Pella	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Pw Pewamo	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Px*, Py*. Pits					
RaA Randolph	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, thin layer.
RcA, RcB2 Rawson	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	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
RcC2 Rawson	Moderate: percs slowly, slope.	Moderate: percs slowly, slope.	Severe: slope.	Slight	Moderate: slope.
Re Rensselaer	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
RhA Riddles	Slight	Slight	Slight	Slight	Slight.
RhB2 Riddles	Slight	Slight	Moderate: slope.	Slight	Slight.
RhC2 Riddles	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
RmG Rodman	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: droughty, slope.
Se Sebewa	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Sf*:					
Sebewa	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Milford	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Sh Shoals	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.
So Sloan	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
Wc Wallkill	Severe: flooding, wetness, excess humus.	Severe: wetness, excess humus.	Severe: wetness, flooding, excess humus.	Severe: wetness, excess humus.	Severe: wetness, flooding.
Wh Washtenaw	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: flooding, wetness.
Ws Westland	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Wt Whitaker	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--WILDLIFE HABITAT

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
BaA---------- Blount	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
BaB2---------- Blount	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Br---------- Brookston	Good	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
ChC---------- Chelsea	Very poor.	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
CrA---------- Crosby	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
CsA---------- Crosier	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Cy---------- Cyclone	Good	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
FnA---------- Fincastle	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
FsA, FsB2, FsC2---- Fox	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
FsD2---------- Fox	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
FtC3---------- Fox	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
FtD3---------- Fox	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Ge---------- Genesee	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
GnB2---------- Glynwood	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
GoC3---------- Glynwood	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
HaA---------- Haskins	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
HeG---------- Hennepin	Very poor.	Poor	Good	Good	Fair	Very poor.	Very poor.	Poor	Good	Very poor.
Ho---------- Homer	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Ht, Hx---------- Houghton	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
KaA, KaB---------- Kalamazoo	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
KsA, KsB---------- Kosciusko	Fair	Good	Good	Fair	Fair	Poor	Very poor.	Good	Fair	Very poor.

TABLE 11.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
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.
MbC2---- Martinsville	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Md---- Martisco	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Good	Good	Very poor.	Very poor.	Good.
MeB---- Metea	Poor	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
MeC---- Metea	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
MfB2, MfC2---- Miami	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
MfD2, MfE2---- Miami	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
MhB2---- Miami	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
MhC2, 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.
MlC3---- Miami	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Mm---- Milford	Good	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Mp---- Millsdale	Fair	Fair	Fair	Fair	Poor	Good	Fair	Fair	Fair	Fair.
MsA, MsB2---- Milton	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
MsC2---- Milton	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
MtG---- Milton Variant	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
MvC2---- Morley	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
MvD2, MvE2, MxD3--- Morley	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
OcA, OcB2---- Ockley	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
OmA, OmB---- Ormas	Poor	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
OmC---- Ormas	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							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
Or*. Orthents										
Pa, Pm----- Palms	Fair	Poor	Poor	Poor	Poor	Good	Good	Fair	Poor	Good.
Pp----- Palms Variant	Fair	Poor	Poor	Poor	Poor	Good	Good	Fair	Poor	Good.
Pt----- Pella	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
Pw----- Pewamo	Good	Fair	Fair	Fair	Fair	---	Good	Fair	Fair	Good.
Px*, Py*. Pits										
RaA----- Randolph	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
RcA----- Rawson	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
RcB2----- Rawson	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
RcC2----- Rawson	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Re----- Rensselaer	Good	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
RhA, RhB2----- Riddles	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
RhC2----- Riddles	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
RmG----- Rodman	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Se----- Sebewa	Good	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Sf*:										
Sebewa-----	Good	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Milford-----	Good	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Sh----- Shoals	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
So----- Sloan	Fair	Fair	Good	Poor	Poor	Good	Good	Fair	Poor	Good.
Wc----- Wallkill	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Wh----- Washtenaw	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Ws----- Westland	Good	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Wt----- 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
BaA, BaB2--------- Blount	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Br---------- Brookston	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
ChC---------- Chelsea	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope, droughty.
CrA---------- Crosby	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
CsA---------- Crosier	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, low strength.	Moderate: wetness.
Cy---------- Cyclone	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
FnA---------- Fincastle	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
FsA---------- Fox	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight---------	Moderate: shrink-swell.	Moderate: frost action, shrink-swell.	Slight.
FsB2--------- Fox	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight---------	Moderate: shrink-swell, slope.	Moderate: frost action, shrink-swell.	Slight.
FsC2--------- Fox	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action, shrink-swell.	Moderate: slope.
FsD2--------- Fox	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
FtC3--------- Fox	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action, shrink-swell.	Moderate: slope.
FtD3--------- Fox	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Ge---------- Genesee	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
GnB2--------- Glynwood	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: slope, shrink-swell, wetness.	Severe: frost action, low strength.	Slight.
GoC3--------- Glynwood	Severe: wetness.	Moderate: slope, shrink-swell, wetness.	Severe: wetness.	Severe: slope.	Severe: frost action, low strength.	Moderate: slope.

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
HaA---------- Haskins	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
HeG---------- Hennepin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Ho---------- Homer	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Ht, Hx---------- 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.
KaA---------- Kalamazoo	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, frost action.	Moderate: droughty.
KaB---------- Kalamazoo	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: low strength, frost action.	Moderate: droughty.
KsA---------- Kosciusko	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight---------	Moderate: shrink-swell.	Moderate: frost action, shrink-swell.	Moderate: droughty.
KsB---------- 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.
MbC2---------- Martinsville	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: slope.
Md---------- Martisco	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding, excess humus.
MeB---------- Metea	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Moderate: frost action.	Moderate: droughty.
MeC---------- Metea	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: droughty, slope.
MfB2---------- Miami	Slight---------	Moderate: shrink-swell.	Slight---------	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
MfC2---------- Miami	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
MfD2, MfE2--------- Miami	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

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
MhB2---------- Miami	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Moderate: frost action, low strength.	Slight.
MhC2, 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.
MlC3---------- Miami	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
Mm---------- Milford	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Mp---------- Millsdale	Severe: depth to rock, ponding.	Severe: ponding, shrink-swell.	Severe: ponding, depth to rock, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, frost action.	Severe: ponding.
MsA---------- Milton	Severe: depth to rock.	Moderate: shrink-swell, depth to rock.	Severe: depth to rock.	Moderate: shrink-swell, depth to rock.	Severe: low strength.	Moderate: thin layer.
MsB2---------- Milton	Severe: depth to rock.	Moderate: shrink-swell, depth to rock.	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: low strength.	Moderate: thin layer.
MsC2---------- Milton	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: delth to rock.	Severe: slope.	Severe: low strength.	Moderate: slope, thin layer.
MtG---------- Milton Variant	Severe: large stones, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: large stones, slope.
MvC2---------- Morley	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
MvD2, MvE2, MxD3-- Morley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
OcA---------- Ockley	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
OcB2---------- Ockley	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Slight.
OmA---------- Ormas	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Moderate: droughty.
OmB---------- Ormas	Severe: cutbanks cave.	Slight---------	Slight---------	Moderate: slope.	Moderate: frost action.	Moderate: droughty.
OmC---------- Ormas	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
Or*. Orthents						
Pa, Pm---------- 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.
Pp---------- Palms Variant	Severe: cutbanks cave, excess humus, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action, low strength.	Severe: ponding, excess humus.
Pt---------- Pella	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Pw---------- Pewamo	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Px*, Py*. Pits						
RaA---------- Randolph	Severe: depth to rock, wetness.	Severe: wetness, shrink-swell.	Severe: depth to rock, wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, frost action, shrink-swell.	Moderate: wetness, thin layer.
RcA---------- Rawson	Moderate: too clayey, dense layer, wetness.	Slight---------	Moderate: wetness, shrink-swell.	Slight---------	Moderate: frost action, low strength.	Slight.
RcB2---------- Rawson	Moderate: too clayey, dense layer, wetness.	Slight---------	Moderate: wetness, shrink-swell.	Moderate: slope.	Moderate: frost action, low strength.	Slight.
RcC2---------- Rawson	Moderate: too clayey, dense layer, wetness.	Moderate: slope.	Moderate: wetness, slope, shrink-swell.	Severe: slope.	Moderate: slope, frost action, low strength.	Moderate: slope.
Re---------- Rensselaer	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
RhA---------- Riddles	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, frost action.	Slight.
RhB2---------- Riddles	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Moderate: low strength, frost action.	Slight.
RhC2---------- Riddles	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: slope.
RmG---------- Rodman	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
Se---------- Sebewa	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: frost action, ponding.	Severe: ponding.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Sf*:						
Sebewa	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: frost action, ponding.	Severe: ponding.
Milford	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Sh Shoals	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Moderate: wetness, flooding.
So Sloan	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding.
Wc Wallkill	Severe: ponding, excess humus.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, low strength.	Severe: ponding, frost action, low strength.	Severe: ponding.
Wh Washtenaw	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: frost action, low strength, ponding.	Severe: ponding.
Ws Westland	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Wt 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
BaA, BaB2 Blount	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Br Brookston	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding, hard to pack.
ChC Chelsea	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy, seepage.
CrA Crosby	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Severe: wetness.	Poor: wetness.
CsA Crosier	Severe: percs slowly, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Cy Cyclone	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
FnA Fincastle	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: hard to pack, wetness.
FsA, FsB2 Fox	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
FsC2 Fox	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
FsD2 Fox	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
FtC3 Fox	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
FtD3 Fox	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
Ge Genesee	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Good.
GnB2 Glynwood	Severe: percs slowly, wetness.	Moderate: slope.	Moderate: wetness, too clayey.	Moderate: wetness.	Fair: too clayey, wetness.
GoC3 Glynwood	Severe: percs slowly, wetness.	Severe: slope.	Moderate: wetness, too clayey, slope.	Moderate: slope, wetness.	Fair: slope, too clayey, wetness.

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
HaA---------- Haskins	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
HeG---------- Hennepin	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Ho---------- Homer	Severe: wetness, poor filter.	Severe: seepage, wetness.	Severe: seepage, wetness, too sandy.	Severe: seepage, wetness.	Poor: seepage, too sandy, small stones.
Ht, Hx---------- Houghton	Severe: ponding, percs slowly.	Severe: seepage, ponding, excess humus.	Severe: ponding, excess humus.	Severe: ponding, seepage.	Poor: ponding, excess humus.
KaA, KaB---------- Kalamazoo	Severe: poor filter.	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
KsA, KsB---------- 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.	Slight----------	Slight----------	Fair: too clayey, thin layer.
MbB---------- Martinsville	Slight----------	Moderate: seepage, slope.	Slight----------	Slight----------	Fair: too clayey, thin layer.
MbC2---------- Martinsville	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: too clayey, slope, thin layer.
Md---------- Martisco	Severe: ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, excess humus.	Severe: ponding.	Severe: ponding, excess humus.
MeB---------- Metea	Moderate: percs slowly.	Severe: seepage.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy.
MeC---------- Metea	Moderate: slope, percs slowly.	Severe: seepage, slope.	Severe: too sandy.	Severe: seepage.	Poor: seepage, too sandy.
MfB2---------- Miami	Moderate: percs slowly.	Moderate: seepage, slope.	Slight----------	Slight----------	Good.
MfC2---------- Miami	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
MfD2, MfE2---------- Miami	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.

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
MhB2---------- Miami	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight----------	Fair: too clayey.
MhC2, 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.
MlC3---------- Miami	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
Mm---------- Milford	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
Mp---------- Millsdale	Severe: depth to rock, ponding, percs slowly.	Severe: depth to rock, ponding.	Severe: depth to rock, ponding, too clayey.	Severe: depth to rock, ponding.	Poor: too clayey, area reclaim, hard to pack.
MsA, MsB2---------- Milton	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey.
MsC2---------- Milton	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey.
MtG---------- Milton Variant	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: area reclaim, large stones, slope.
MvC2---------- Morley	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
MvD2, MvE2, MxD3---- Morley	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
OcA, OcB2---------- Ockley	Slight----------	Severe: seepage.	Severe: seepage.	Slight----------	Poor: small stones.
OmA, OmB---------- Ormas	Slight----------	Severe: seepage.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
OmC---------- Ormas	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: thin layer.
Or*. Orthents					
Pa, Pm---------- Palms	Severe: ponding.	Severe: seepage, excess humus, ponding.	Severe: ponding, excess humus.	Severe: ponding, seepage.	Poor: ponding, excess humus.

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
Pp Palms Variant	Severe: ponding, percs slowly.	Severe: seepage, excess humus, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: seepage, too sandy, ponding.
Pt Pella	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Pw Pewamo	Severe: percs slowly, ponding.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, ponding, hard to pack.
Px*, Py*. Pits					
RaA Randolph	Severe: depth to rock, wetness, percs slowly.	Severe: depth to rock, wetness.	Severe: depth to rock, wetness, too clayey.	Severe: wetness, depth to rock.	Poor: too clayey, area reclaim, hard to pack.
RcA Rawson	Severe: wetness, percs slowly.	Moderate: seepage.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
RcB2 Rawson	Severe: wetness, percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
RcC2 Rawson	Severe: wetness, percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: wetness, slope.	Poor: too clayey, hard to pack.
Re Rensselaer	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too sandy.	Severe: ponding.	Poor: too sandy, ponding.
RhA Riddles	Moderate: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
RhB2 Riddles	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
RhC2 Riddles	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: slope, too clayey.
RmG Rodman	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, small stones.
Se Sebewa	Severe: poor filter, ponding.	Severe: seepage, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: small stones, seepage, too sandy.
Sf*: Sebewa	Severe: poor filter, ponding.	Severe: seepage, ponding.	Severe: seepage, ponding, too sandy.	Severe: seepage, ponding.	Poor: small stones, seepage, too sandy.
Milford	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Sh---------- Shoals	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
So---------- Sloan	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
Wc---------- Wallkill	Severe: ponding, poor filter.	Severe: ponding, seepage, excess humus.	Severe: ponding, seepage.	Severe: ponding, seepage.	Poor: ponding, excess humus.
Wh---------- Washtenaw	Severe: percs slowly, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Ws---------- Westland	Severe: ponding.	Severe: seepage, ponding.	Severe: seepage, ponding.	Severe: ponding.	Poor: ponding.
Wt---------- 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
BaA, BaB2 Blount	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Br Brookston	Poor: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
ChC Chelsea	Good	Probable	Improbable: too sandy.	Poor: too sandy.
CrA Crosby	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones.
CsA Crosier	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Cy Cyclone	Poor: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
FnA Fincastle	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
FsA, FsB2, FsC2 Fox	Good	Probable	Probable	Poor: small stones, area reclaim.
FsD2 Fox	Fair: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
FtC3 Fox	Good	Probable	Probable	Poor: small stones, area reclaim.
FtD3 Fox	Fair: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
Ge Genesee	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
GnB2, GoC3 Glynwood	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
HaA Haskins	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, thin layer.
HeG Hennepin	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Ho Homer	Fair: wetness.	Probable	Probable	Poor: small stones, area reclaim.
Ht, Hx Houghton	Poor: wetness, low strength.	Improbable: excess humus.	Improbable: excess humus.	Poor: wetness, excess humus.
KaA, KaB Kalamazoo	Good	Probable	Probable	Poor: area reclaim, small stones.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
KsA, KsB, KsC--------- Kosciusko	Good----------	Probable----------	Probable----------	Poor: small stones, area reclaim.
MbA, MbB--------- Martinsville	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
MbC2--------- Martinsville	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
Md--------- Martisco	Poor: wetness, low strength.	Probable----------	Improbable: excess fines.	Poor: excess humus, wetness.
MeB--------- Metea	Poor: thin layer.	Improbable: thin layer.	Improbable: too sandy.	Fair: too sandy.
MeC--------- Metea	Poor: thin layer.	Improbable: thin layer.	Improbable: too sandy.	Fair: too sandy, slope.
MfB2--------- Miami	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
MfC2--------- Miami	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
MfD2, MfE2--------- Miami	Fair: slope, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
MhB2--------- Miami	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim.
MhC2, 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.
MlC3--------- Miami	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
Mm--------- Milford	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Mp--------- Millsdale	Poor: low strength, area reclaim, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, thin layer.
MsA, MsB2, MsC2------- Milton	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
MtG--------- Milton Variant	Poor: area reclaim, large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, slope.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
MvC2---------- Morley	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
MvD2, MvE2, MxD3------ Morley	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
OcA, OcB2---------- Ockley	Good----------	Probable----------	Probable----------	Poor: small stones, area reclaim.
OmA, OmB---------- Ormas	Good----------	Probable----------	Probable----------	Fair: too sandy, small stones.
OmC---------- Ormas	Good----------	Probable----------	Probable----------	Fair: too sandy, small stones, slope.
Or*. Orthents				
Pa, Pm---------- Palms	Poor: wetness.	Improbable: excess humus, excess fines.	Improbable: excess humus, excess fines.	Poor: wetness, excess humus.
Pp---------- Palms Variant	Poor: wetness.	Probable----------	Improbable: too sandy.	Poor: excess humus, wetness.
Pt---------- Pella	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Pw---------- Pewamo	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Px*, Py*. Pits				
RaA---------- Randolph	Poor: low strength, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
RcA, RcB2---------- Rawson	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, thin layer.
RcC2---------- Rawson	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, thin layer, slope.
Re---------- Rensselaer	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
RhA, RhB2---------- Riddles	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
RhC2---------- Riddles	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: slope, small stones.
RmG---------- Rodman	Poor: slope.	Probable----------	Probable----------	Poor: small stones, area reclaim, slope.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Se---------- Sebewa	Poor: wetness.	Probable----------	Probable----------	Poor: wetness, small stones, area reclaim.
Sf*: Sebewa----------	Poor: wetness.	Probable----------	Probable----------	Poor: wetness, small stones, area reclaim.
Milford----------	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Sh---------- Shoals	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
So---------- Sloan	Poor: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Wc---------- 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.
Ws---------- Westland	Poor: wetness.	Probable----------	Probable----------	Poor: wetness, small stones, area reclaim.
Wt---------- 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
BaA---- Blount	Slight	Moderate: piping, wetness.	Severe: no water.	Percs slowly, frost action.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily.
BaB2---- Blount	Moderate: slope.	Moderate: piping, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily.
Br---- Brookston	Moderate: seepage.	Severe: ponding.	Severe: slow refill.	Ponding, frost action.	Ponding	Wetness.
ChC---- Chelsea	Severe: slope, seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Slope, too sandy, soil blowing.	Slope, droughty.
CrA---- Crosby	Slight	Severe: piping, wetness.	Severe: slow refill.	Percs slowly, frost action.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, rooting depth.
CsA---- Crosier	Slight	Severe: piping, wetness.	Severe: slow refill.	Frost action	Wetness	Wetness.
Cy---- Cyclone	Moderate: seepage.	Severe: ponding.	Severe: slow refill.	Ponding, frost action.	Ponding, erodes easily.	Wetness, erodes easily.
FnA---- Fincastle	Moderate: seepage.	Severe: wetness.	Severe: slow refill.	Frost action	Erodes easily, wetness.	Wetness, erodes easily.
FsA, FsB2---- Fox	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy	Rooting depth.
FsC2, FsD2, FtC3, FtD3---- Fox	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, too sandy.	Slope, rooting depth.
Ge---- Genesee	Moderate: seepage.	Moderate: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
GnB2---- Glynwood	Moderate: slope.	Moderate: wetness, piping.	Severe: no water.	Slope, percs slowly, frost action.	Erodes easily, wetness.	Erodes easily.
GoC3---- Glynwood	Severe: slope.	Moderate: wetness, piping.	Severe: no water.	Slope, percs slowly, frost action.	Slope, erodes easily, wetness.	Slope, erodes easily.
HaA---- Haskins	Moderate: seepage.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, frost action.	Erodes easily, wetness.	Wetness, erodes easily, rooting depth.
HeG---- Hennepin	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, percs slowly.	Slope, droughty, percs slowly.
Ho---- Homer	Severe: seepage.	Severe: seepage, wetness.	Severe: cutbanks cave.	Frost action, cutbanks cave.	Erodes easily, wetness, too sandy.	Wetness, erodes easily.
Ht, Hx---- Houghton	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Frost action, subsides, ponding.	Ponding, soil blowing.	Wetness.
KaA, KaB---- Kalamazoo	Severe: seepage.	Severe: thin layer.	Severe: no water.	Deep to water	Soil blowing	Droughty.

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
KsA, KsB---------- 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.
MbC2---------- Martinsville	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
Md---------- Martisco	Severe: seepage.	Severe: ponding.	Severe: cutbanks cave.	Ponding, percs slowly, subsides.	Ponding, soil blowing, percs slowly.	Wetness, percs slowly.
MeB---------- Metea	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Droughty.
MeC---------- Metea	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, too sandy, soil blowing.	Slope, droughty.
MfB2---------- Miami	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
MfC2, MfD2, MfE2-- Miami	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
MhB2---------- Miami	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
MhC2, MkC3, MkD3, MlC3---------- Miami	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
Mm---------- Milford	Slight---------	Severe: ponding.	Severe: slow refill.	Ponding, frost action.	Erodes easily, ponding.	Wetness, erodes easily.
Mp---------- Millsdale	Moderate: depth to rock.	Severe: ponding.	Severe: no water.	Depth to rock, frost action, ponding.	Depth to rock, ponding.	Wetness, depth to rock.
MsA---------- Milton	Moderate: seepage, depth to rock.	Severe: thin layer.	Severe: no water.	Deep to water	Depth to rock, erodes easily.	Erodes easily, depth to rock.
MsB2---------- Milton	Moderate: seepage, depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Depth to rock, erodes easily.	Erodes easily, depth to rock.
MsC2---------- Milton	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
MtG---------- Milton Variant	Severe: slope.	Severe: piping, large stones.	Severe: no water.	Deep to water	Slope, large stones, depth to rock.	Large stones, slope, droughty.
MvC2, MvD2, MvE2, MxD3---------- Morley	Severe: slope.	Slight---------	Severe: no water.	Deep to water	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.

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
OcA---------- Ockley	Moderate: seepage.	Moderate: thin layer.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
OcB2---------- Ockley	Moderate: seepage, slope.	Moderate: thin layer.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
OmA, OmB---------- Ormas	Severe: seepage.	Severe: thin layer.	Severe: no water.	Deep to water	Soil blowing---	Droughty.
OmC---------- Ormas	Severe: seepage, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, soil blowing.	Slope, droughty.
Or*. Orthents						
Pa, Pm---------- Palms	Severe: seepage.	Severe: excess humus, ponding.	Severe: slow refill.	Ponding, subsides, frost action.	Ponding, soil blowing.	Wetness.
Pp---------- Palms Variant	Severe: seepage.	Severe: seepage, piping, ponding.	Severe: slow refill, cutbanks cave.	Ponding, subsides, frost action.	Ponding, too sandy, soil blowing.	Wetness, rooting depth.
Pt---------- Pella	Moderate: seepage.	Severe: piping, ponding.	Moderate: slow refill.	Ponding, frost action.	Ponding--------	Wetness.
Pw---------- Pewamo	Slight---------	Severe: ponding.	Severe: slow refill.	Ponding, frost action.	Ponding--------	Wetness.
Px* , Py*. Pits						
RaA---------- Randolph	Moderate: depth to rock.	Severe: hard to pack.	Severe: no water.	Depth to rock, frost action.	Depth to rock, wetness, erodes easily.	Wetness, depth to rock, erodes easily.
RcA---------- Rawson	Moderate: seepage.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly---	Wetness, soil blowing.	Percs slowly.
RcB2---------- Rawson	Moderate: seepage, slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, slope.	Wetness, soil blowing.	Percs slowly.
RcC2---------- Rawson	Severe: slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, slope.	Slope, wetness, soil blowing.	Slope, percs slowly.
Re---------- Rensselaer	Moderate: seepage.	Severe: piping, ponding.	Severe: slow refill, cutbanks cave.	Ponding, percs slowly, frost action.	Ponding, too sandy.	Wetness, percs slowly.
RhA---------- Riddles	Moderate: seepage.	Slight---------	Severe: no water.	Deep to water	Favorable------	Favorable.
RhB2---------- Riddles	Moderate: seepage, slope.	Slight---------	Severe: no water.	Deep to water	Favorable------	Favorable.
RhC2---------- Riddles	Severe: slope.	Slight---------	Severe: no water.	Deep to water	Slope----------	Slope.
RmG---------- Rodman	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, too sandy.	Slope, droughty.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
Se---------- Sebewa	Severe: seepage.	Severe: seepage, ponding.	Severe: cutbanks cave.	Frost action, cutbanks cave, ponding.	Too sandy, ponding.	Wetness.
Sf*: Sebewa----------	Severe: seepage.	Severe: seepage, ponding.	Severe: cutbanks cave.	Frost action, cutbanks cave, ponding.	Too sandy, soil blowing, ponding.	Wetness.
Milford----------	Slight---------	Severe: ponding.	Severe: slow refill.	Ponding, frost action.	Erodes easily, ponding.	Wetness, erodes easily.
Sh---------- Shoals	Moderate: seepage.	Severe: wetness, piping.	Moderate: slow refill.	Flooding, frost action.	Erodes easily, wetness.	Wetness, erodes easily.
So---------- Sloan	Moderate: seepage.	Severe: piping, wetness.	Severe: slow refill.	Flooding, frost action.	Erodes easily, wetness.	Wetness, erodes easily.
Wc---------- 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.
Ws---------- Westland	Moderate: seepage.	Severe: ponding.	Severe: slow refill, cutbanks cave.	Ponding, frost action.	Ponding--------	Wetness.
Wt---------- 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	
BaA, BaB2-------- Blount	0-9	Silt loam---------	CL	A-6, A-4	0-5	95-100	95-100	90-100	80-95	25-40	8-20
	9-23	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
	23-60	Silty clay loam, clay loam.	CL	A-6, A-7	0-10	90-100	90-100	80-100	70-90	30-45	10-25
Br--------------- Brookston	0-16	Loam--------------	CL	A-4, A-6	0	98-100	98-100	85-100	60-90	22-40	8-18
	16-49	Clay loam, silty clay loam.	CL, CH	A-6, A-7	0	98-100	85-100	75-95	60-85	36-52	18-30
	49-60	Loam, sandy loam, clay loam.	CL	A-4, A-6	0-3	90-100	85-95	78-90	55-70	22-30	7-15
ChC-------------- Chelsea	0-4	Fine sand---------	SM, SP-SM	A-2-4	0	100	100	65-80	10-35	---	NP
	4-60	Fine sand, sand, loamy sand.	SP, SM, SP-SM	A-3, A-2-4	0	100	100	65-80	3-20	---	NP
CrA-------------- Crosby	0-13	Silt loam---------	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	50-90	22-34	6-15
	13-25	Clay loam, silty clay loam.	CL, CH	A-6, A-7	0-3	92-99	89-97	78-93	64-76	37-55	17-31
	25-60	Loam, clay loam, sandy loam.	CL, ML, CL-ML	A-4, A-6	0-3	88-94	83-89	74-87	50-64	17-30	2-14
CsA-------------- Crosier	0-11	Loam--------------	CL	A-4, A-6	0	100	95-100	85-95	60-80	22-33	8-15
	11-26	Clay loam, loam, sandy clay loam.	CL	A-6, A-7	0	90-95	85-95	75-90	60-70	33-47	15-26
	26-60	Loam, sandy loam	CL, ML	A-4, A-6	0-3	85-90	80-90	70-85	50-60	25-35	2-12
Cy--------------- Cyclone	0-10	Silt loam---------	CL, CL-ML	A-4, A-6	0	100	100	95-100	80-95	25-40	5-15
	10-52	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	30-50	15-30
	52-68	Loam, clay loam---	CL, CL-ML	A-4, A-6	0	95-100	85-100	80-95	50-80	25-40	4-15
	68-75	Loam--------------	CL-ML, CL	A-4, A-6	0	90-100	85-100	75-95	50-75	20-30	6-15
FnA-------------- Fincastle	0-13	Silt loam---------	CL, ML	A-4, A-6	0	100	95-100	90-100	75-93	27-36	4-12
	13-31	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	95-100	85-95	38-54	20-32
	31-42	Clay loam, loam	CH, CL	A-7	0	95-100	90-98	85-95	75-85	45-58	30-38
	42-60	Loam, clay loam	CL, ML, CL-ML	A-4, A-6	0-3	88-96	82-90	70-86	50-66	20-35	3-12
FsA, FsB2, FsC2, FsD2---------- Fox	0-12	Loam--------------	ML, CL, CL-ML	A-4	0	95-100	85-100	75-95	55-90	20-30	3-10
	12-27	Gravelly clay loam, loam, sandy clay loam.	CL, SC	A-2, A-6, A-7	0-5	75-100	60-95	50-95	20-65	25-45	10-25
	27-60	Stratified sand to gravel.	SP, SM, GP, GM	A-1, A-2, A-3	0-10	40-100	35-100	15-95	2-20	---	NP
FtC3, FtD3------- Fox	0-8	Clay loam---------	CL	A-6	0	90-100	75-100	75-95	60-80	20-40	10-20
	8-26	Clay loam, gravelly loam, sandy clay loam.	CL, SC	A-2, A-6, A-7	0-5	75-100	60-95	50-95	20-65	25-45	10-25
	26-60	Stratified sand to gravel.	SP, SM, GP, GM	A-1, A-2, A-3	0-10	40-100	35-100	15-95	2-20	---	NP
Ge--------------- Genesee	0-10	Loam--------------	ML, CL	A-4, A-6	0	100	100	90-100	75-90	26-40	3-15
	10-35	Silt loam, loam	ML, CL	A-4, A-6	0	100	100	90-100	75-90	26-40	3-15
	35-60	Stratified sandy loam to silt loam.	ML, CL, CL-ML	A-4, A-6	0	90-100	85-100	60-90	50-90	20-35	3-15

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	
GnB2----------	0-8	Silt loam--------	CL-ML, CL	A-4, A-6	0	95-100	90-100	80-100	55-90	23-40	4-15
Glynwood	8-26	Clay loam, silty clay loam, clay.	CL, CH	A-7, A-6	0-5	95-100	85-100	75-100	65-95	35-55	15-30
	26-60	Clay loam, silty clay loam.	CL	A-6, A-4	0-5	95-100	80-100	75-95	65-90	25-40	7-18
GoC3----------	0-7	Clay loam--------	CL	A-6, A-7	0-2	95-100	85-100	75-100	60-95	25-45	10-22
Glynwood	7-23	Clay, clay loam, silty clay loam.	CL, CH	A-7, A-6	0-5	95-100	85-100	75-100	65-95	35-55	15-30
	23-60	Clay loam, silty clay loam.	CL	A-6, A-4	0-5	95-100	80-100	75-95	65-90	25-40	7-18
HaA----------	0-12	Loam----------	CL-ML, CL	A-4, A-6	0	95-100	85-100	70-100	55-90	25-40	5-20
Haskins	12-25	Clay loam, loam, gravelly sandy clay loam.	SC, CL	A-6, A-4, A-2	0	85-100	70-100	55-85	30-65	20-40	7-20
	25-60	Clay, silty clay, clay loam.	CH, CL	A-7, A-6	0	100	85-100	80-100	70-95	35-65	15-40
HeG----------	0-3	Loam----------	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	70-100	60-95	25-40	5-20
Hennepin	3-13	Loam, sandy loam, clay loam.	SC, SM-SC, CL, CL-ML	A-4, A-6, A-7	0-5	85-100	80-100	65-100	35-95	20-50	5-25
	13-60	Loam, sandy loam, clay loam.	SC, SM-SC, CL, CL-ML	A-4, A-6, A-7	0-5	85-100	80-100	65-100	35-95	20-50	5-25
Ho----------	0-11	Loam----------	CL, CL-ML	A-4, A-6	0	95-100	90-100	85-100	70-95	25-35	5-15
Homer	11-15	Silty clay loam, clay loam, loam.	CL	A-6, A-7	0	90-100	90-100	90-100	70-95	30-50	15-30
	15-35	Gravelly sandy clay loam, sandy clay loam, sandy loam.	SC	A-2-6, A-6	0-3	90-100	85-100	75-90	30-50	25-35	10-15
	35-60	Stratified loamy sand to very gravelly sand.	SP, GP, SP-SM, GP-GM	A-1	1-5	30-70	22-55	7-20	2-10	---	NP
Ht, Hx----------	0-60	Sapric material	Pt	A-8	0	---	---	---	---	---	---
Houghton											
KaA, KaB----------	0-12	Sandy loam--------	SM, SM-SC	A-2-4	0-5	95-100	80-100	60-70	15-35	<20	NP-7
Kalamazoo	12-30	Clay loam, sandy clay loam, gravelly sandy loam.	SC, CL	A-4, A-6	0-5	95-100	70-95	65-95	35-80	20-38	9-20
	30-49	Loamy coarse sand, loamy sand, gravelly sandy loam.	SM, SP-SM	A-2-4, A-1-b	0-5	95-100	60-95	40-60	10-25	---	NP
	49-60	Sand, gravelly sand.	SP, SP-SM	A-1, A-3, A-2	0-5	60-80	25-75	10-55	0-10	---	NP
KsA, KsB, KsC----	0-9	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
Kosciusko	9-19	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
	19-38	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
	38-60	Gravelly coarse sand.	SP, SP-SM, GP, GP-GM	A-1	1-8	30-60	30-55	15-40	2-10	<20	NP

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	
MbA, MbB, MbC2---	0-12	Loam----------	CL, CL-ML	A-4, A-6	0	100	90-100	80-100	60-90	22-33	4-12
Martinsville	12-29	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
	29-53	Sandy loam, sandy clay loam, loam.	SM, ML	A-2-4, A-4	0	100	90-100	50-80	15-60	30-40	2-8
	53-60	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
Md----------	0-13	Sapric material	Pt	A-8	0	---	---	---	---	---	---
Martisco	13-56	Marl----------	---	---	0	---	---	---	---	---	---
	56-60	Loamy sand, fine sand, sand.	SM, SP-SM	A-2-4, A-3	0	95-100	80-100	50-90	3-20	---	NP
MeB, MeC----------	0-10	Loamy sand-------	SM	A-2-4	0	100	100	50-80	15-35	---	NP
Metea	10-25	Loamy sand, loamy fine sand, sand.	SP-SM, SM	A-2-4	0	100	100	50-80	10-35	---	NP
	25-49	Clay loam, sandy clay loam, sandy loam.	CL, SC	A-6, A-7	0	90-100	90-95	55-95	35-75	25-50	12-30
	49-60	Loam, silty clay loam, clay loam.	CL, CL-ML	A-4, A-6	0-3	85-95	80-90	75-90	50-75	25-40	5-18
MfB2, MfC2-------	0-8	Loam----------	CL	A-4, A-6	0-2	95-100	90-100	76-95	55-75	25-35	8-15
Miami	8-32	Clay loam, loam	CL	A-6, A-7	0-2	90-100	90-95	80-95	60-76	30-45	10-20
	32-60	Loam, sandy loam	CL, CL-ML, SM, SM-SC	A-4, A-6	0-2	90-100	85-95	70-90	45-70	20-30	5-15
MfD2, MfE2-------	0-8	Loam----------	CL, CL-ML, ML	A-4	0	100	95-100	80-100	50-90	15-30	3-10
Miami	8-32	Clay loam, silty clay loam, sandy clay loam.	CL, SC	A-6	0	90-100	85-100	70-95	40-95	30-40	15-25
	32-60	Loam, clay loam, sandy loam.	CL, CL-ML	A-4, A-6	0-3	95-100	90-100	80-90	55-75	20-40	5-20
MhB2, MhC2-------	0-6	Silt loam--------	CL, CL-ML, ML	A-4	0	100	95-100	80-100	50-90	15-30	3-10
Miami	6-33	Clay loam, silty clay loam, loam.	CL, SC	A-6	0	90-100	85-100	70-95	40-95	30-40	15-25
	33-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0-3	95-100	90-100	80-90	55-75	20-40	5-20
MkC3, MkD3-------	0-9	Clay loam--------	CL	A-6	0	100	90-100	75-95	65-95	30-40	15-20
Miami	9-25	Clay loam, silty clay loam, loam.	CL, SC	A-6	0	90-100	85-100	70-95	40-95	30-40	15-25
	25-60	Loam, clay loam	CL, CL-ML	A-4, A-6	0-3	95-100	90-100	80-90	55-75	20-40	5-20
MlC3----------	0-9	Clay loam--------	CL	A-6	0-2	95-100	90-100	80-100	60-80	30-40	10-20
Miami	9-26	Clay loam, loam--	CL	A-6, A-7	0-2	90-100	90-95	80-95	60-76	30-45	10-20
	26-60	Loam, sandy loam-	CL, CL-ML	A-4, A-6	0-2	95-100	85-95	70-90	40-70	20-30	5-15
Mm----------	0-15	Silty clay loam	CL, CH	A-7	0	100	95-100	90-100	80-95	40-60	20-35
Milford	15-37	Silty clay, silty clay loam, clay loam.	CH, CL	A-7	0	100	95-100	90-100	75-100	40-60	20-40
	37-60	Stratified clay to sandy loam.	CL	A-6, A-7	0	97-100	95-100	90-100	70-100	30-50	15-30
Mp----------	0-13	Silty clay loam	CL	A-6, A-7	0	90-100	80-100	75-100	60-95	32-50	12-25
Millsdale	13-36	Clay, silty clay loam, silty clay	CH, CL	A-7	0-5	85-100	80-100	75-100	60-95	40-60	20-35
	36	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

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	
MsA, MsB2, MsC2-- Milton	0-7	Silt loam--------	ML, CL	A-4, A-6	0	95-100	90-100	85-100	70-95	26-36	4-12
	7-33	Silty clay loam, clay loam, clay.	CL	A-2 , A-7	0	95-100	80-100	75-100	70-95	32-48	12-28
	33-38	Clay, sandy clay loam, silt loam.	CH, CL	A-7, A-6	0-5	95-100	80-100	70-95	50-90	32-55	14-33
	38	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
MtG---------- Milton Variant	0-4	Silt loam--------	CL, CL-ML	A-4, A-6	5-50	90-100	80-95	75-95	60-85	20-35	5-15
	4-22	Very flaggy silt loam, very flaggy loam.	SC, SM-SC, GC, GM-GC	A-2, A-4, A-6	50-80	50-75	40-70	35-70	30-50	20-40	5-15
	22	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
MvC2, MvD2, MvE2- Morley	0-9	Silt loam--------	CL, CL-ML	A-6, A-4	0-5	95-100	95-100	90-100	75-95	25-40	5-15
	9-27	Silty clay, clay loam, clay.	CL, CH	A-7	0-10	95-100	90-100	85-95	80-90	40-60	15-35
	27-60	Silty clay loam, clay loam.	CL, CH	A-6, A-7	0-10	95-100	90-100	85-95	80-90	30-60	15-30
MxD3---------- Morley	0-6	Clay loam--------	CL	A-6, A-7	0-5	95-100	90-100	85-95	80-90	30-45	15-25
	6-22	Silty clay, clay loam, clay.	CL, CH	A-7	0-10	95-100	90-100	85-95	80-90	40-60	15-35
	22-60	Silty clay loam, clay loam.	CL, CH	A-6, A-7	0-10	95-100	90-100	85-95	80-90	30-60	15-30
OcA, OcB2-------- Ockley	0-15	Loam----------	CL, ML, CL-ML	A-4, A-6	0	100	95-100	80-100	60-90	22-33	3-12
	15-39	Clay loam, sandy clay loam, loam.	CL	A-6, A-7	0	100	75-100	65-100	50-80	30-45	15-25
	39-56	Gravelly clay loam, gravelly sandy loam.	CL, SC, GC	A-6, A-7	0-2	70-85	45-75	40-70	35-55	30-50	15-30
	56-60	Stratified sand to gravelly sand.	SP, SP-SM, GP, GP-GM	A-1	1-5	30-70	20-55	5-20	2-10	---	NP
OmA, OmB, OmC---- Ormas	0-32	Loamy sand-------	SM	A-2-4	0	98-100	95-100	50-75	15-30	---	NP
	32-50	Gravelly sandy clay loam, gravelly sandy 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
	50-60	Gravelly sand----	SP, SP-SM	A-3, A-1-b, A-2-4	0	60-80	55-80	30-55	3-12	---	NP
Or*. Orthents											
Pa, Pm---------- Palms	0-33	Sapric material	Pt	---	---	---	---	---	---	---	---
	33-60	Clay loam, silty clay loam, fine sandy loam.	CL-ML, CL	A-4, A-6	0	85-100	80-100	70-95	50-90	25-40	5-20
Pp---------- Palms Variant	0-26	Sapric material	Pt	---	0	---	---	---	---	---	---
	26-35	Silt loam, loam	ML, CL-ML, CL	A-4	0	100	100	90-100	60-90	15-30	2-10
	35-60	Loamy sand, loamy fine sand, fine sand.	SM, SP-SM, SP	A-2-4, A-3	0	95-100	80-100	50-90	3-20	---	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	
Pt Pella	0-15	Silty clay loam	CL	A-6, A-7	0	100	95-100	85-100	75-95	30-50	15-30
	15-31	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	95-100	85-100	75-95	30-50	15-30
	31-60	Stratified sandy loam to silty clay loam.	SM-SC, SC, CL, CL-ML	A-2, A-4, A-6	0-5	90-100	80-100	50-100	30-85	20-35	7-20
Pw Pewamo	0-9	Silty clay loam	CL	A-6, A-7	0-5	90-100	80-100	80-100	70-90	35-50	15-25
	9-43	Clay loam, clay, silty clay.	CL, CH	A-7, A-6	0-5	95-100	90-100	90-100	75-95	35-55	15-30
	43-60	Clay loam, silty clay loam.	CL	A-7	0-5	95-100	90-100	90-100	70-90	40-50	15-25
Px*, Py*. Pits											
RaA Randolph	0-10	Silt loam	CL-ML, CL	A-4, A-6	0	95-100	95-100	90-100	75-85	20-38	4-15
	10-28	Clay, silty clay, clay loam.	CL, CH	A-7, A-6	0-5	75-95	75-95	75-85	70-80	38-74	14-42
	28	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
RcA, RcB2, RcC2 Rawson	0-16	Sandy loam	SM, ML	A-2-4, A-4	0	90-100	80-100	50-85	25-55	<30	NP-5
	16-27	Clay loam, sandy clay loam, gravelly sandy clay loam.	SC, CL	A-4, A-6	0	65-100	55-95	45-90	25-75	20-40	7-20
	27-60	Clay loam, silty clay, silty clay loam.	CH, CL	A-7, A-6	0	90-100	85-100	85-100	75-95	35-65	15-40
Re Rensselaer	0-8	Loam	CL, ML	A-4, A-6	0	100	100	85-95	60-75	27-36	4-12
	8-34	Clay loam, silty clay loam, sandy clay loam.	CL	A-6, A-7	0	95-100	90-100	80-100	60-80	33-47	15-26
	34-60	Stratified fine sand to silty clay loam.	CL, SC, CL-ML, SM-SC	A-4, A-2	0	95-100	90-100	60-95	20-70	<30	4-9
RhA, RhB2, RhC2 Riddles	0-8	Loam	CL	A-4, A-6	0	95-100	85-95	80-90	60-75	20-35	8-15
	8-49	Sandy clay loam, clay loam, loam.	CL, SC	A-6	0	90-100	80-95	75-90	35-75	25-40	10-20
	49-60	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
RmG Rodman	0-5	Gravelly loam	ML, CL, SM, SC	A-4	0-2	70-85	65-85	60-80	36-65	<30	3-9
	5-15	Gravelly loam, gravelly sandy loam.	ML, CL-ML, SM-SC, SM	A-4, A-2, A-1	0-2	70-85	60-85	40-75	20-55	<25	NP-5
	15-60	Stratified gravelly loamy sand to gravelly sand.	SP, SP-SM, GP, GP-GM	A-1	1-5	30-70	22-55	7-20	2-10	---	NP
Se Sebewa	0-14	Loam	CL, CL-ML	A-4, A-6	0	95-100	80-100	75-95	50-90	22-35	6-12
	14-29	Sandy clay loam, gravelly clay loam, gravelly sandy loam.	SC, CL	A-4, A-6	0	95-100	65-95	55-85	40-75	25-40	8-20
	29-60	Gravelly sand	SP, SP-SM, GP, GP-GM	A-1	0-5	40-75	35-70	20-40	0-10	---	NP
Sf*: Sebewa	0-9	Sandy loam	SM, SM-SC	A-2-4, A-4	0	95-100	80-100	55-70	25-40	<25	NP-6
	9-32	Sandy clay loam, gravelly sandy loam, gravelly clay loam.	SC, CL	A-4, A-6	0	95-100	65-95	55-85	40-75	25-40	8-20
	32-60	Gravelly sand	SP, SP-SM, GP, GP-GM	A-1	0-5	40-75	35-70	20-40	0-10	---	NP

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	> 3 inches	4	10	40	200		
	In				Pct					Pct	
Sf*:											
Milford	0-11	Silty clay loam	CL, CH	A-7	0	100	95-100	90-100	80-95	40-60	20-35
	11-37	Silty clay, silty clay loam, clay loam.	CH, CL	A-7	0	100	95-100	90-100	75-100	40-60	20-40
	37-60	Stratified clay to sandy loam.	CL	A-6, A-7	0	97-100	95-100	90-100	70-100	30-50	15-30
Sh	0-16	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	90-100	65-90	20-35	6-15
Shoals	16-43	Silt loam, loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	75-85	25-40	5-15
	43-60	Stratified silt loam to loamy sand.	ML, CL, CL-ML	A-4	0-3	90-100	85-100	50-80	40-70	<30	4-10
So	0-16	Silty clay loam	CL	A-6, A-7	0	100	95-100	85-100	70-95	35-45	12-20
Sloan	16-42	Silty clay loam, clay loam, loam.	CL, ML	A-6, A-7, A-4	0	100	90-100	85-100	75-95	30-45	8-18
	42-60	Stratified gravelly sand to silty clay loam.	ML, CL	A-4, A-6	0	95-100	70-100	60-95	50-90	25-40	3-15
Wc	0-25	Silt loam	ML, SM, OL	A-5, A-7	0	95-100	90-100	70-100	40-90	40-50	5-15
Wallkill	25-60	Sapric material	Pt	A-8	0	---	---	---	---	---	---
Wh	0-10	Silt loam	ML, CL	A-4, A-6	0	100	100	90-100	70-90	27-36	4-12
Washtenaw	10-25	Silt loam, loam	CL, ML	A-6, A-4	0	100	100	90-100	70-90	27-36	4-12
	25-60	Silty clay loam, clay loam.	CL	A-6, A-7	0	95-100	95-100	90-100	75-95	36-50	15-28
Ws	0-15	Loam	CL	A-6	0	95-100	90-100	85-95	65-75	27-38	11-20
Westland	15-31	Clay loam	CL	A-6, A-7	0	95-100	90-100	80-90	65-75	35-50	15-30
	31-46	Gravelly clay loam, gravelly sandy loam.	CL	A-6, A-7	0-5	65-75	60-70	55-70	50-70	30-50	15-30
	46-60	Stratified loamy sand to gravelly sand.	SP, GP, SP-SM, GP-GM	A-1	1-5	30-70	22-55	7-20	2-10	---	NP
Wt	0-8	Loam	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	60-90	22-33	4-12
Whitaker	8-41	Clay loam, loam, silty clay loam.	CL	A-6, A-7	0	100	95-100	90-100	70-80	30-47	12-26
	41-60	Stratified coarse sand to silty clay loam.	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
BaA, BaB2--------	0-9	22-27	1.35-1.55	0.6-2.0	0.20-0.24	5.6-7.3	Low----------	0.43	3	6	1-3
Blount	9-23	35-50	1.40-1.70	0.06-0.6	0.12-0.19	5.6-7.8	Moderate-----	0.43			
	23-60	27-38	1.60-1.85	0.06-0.6	0.07-0.10	7.4-8.4	Moderate-----	0.43			
Br---------------	0-16	18-27	1.35-1.50	0.6-2.0	0.21-0.24	6.1-7.3	Moderate-----	0.28	5	6	3-5
Brookston	16-49	27-35	1.40-1.60	0.6-2.0	0.15-0.19	6.1-8.4	Moderate-----	0.28			
	49-60	15-32	1.45-1.70	0.6-2.0	0.05-0.19	7.4-8.4	Moderate-----	0.28			
ChC---------------	0-4	8-15	1.50-1.55	6.0-20	0.10-0.15	5.6-7.3	Low----------	0.17	5	2	.5-2
Chelsea	4-60	5-10	1.55-1.70	6.0-20	0.06-0.08	5.1-6.0	Low----------	0.17			
CrA---------------	0-13	11-22	1.40-1.55	0.6-2.0	0.20-0.24	5.1-6.5	Low----------	0.43	3	5	1-3
Crosby	13-25	35-45	1.50-1.70	0.06-0.2	0.15-0.20	5.1-7.8	Moderate-----	0.43			
	25-60	15-32	1.70-2.00	0.06-0.6	0.05-0.19	7.9-8.4	Low----------	0.43			
CsA---------------	0-11	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	11-26	20-33	1.40-1.60	0.2-0.6	0.15-0.19	5.1-7.3	Moderate-----	0.32			
	26-60	10-20	1.40-1.60	0.2-0.6	0.10-0.19	6.1-8.4	Low----------	0.32			
Cy---------------	0-10	18-27	1.30-1.50	0.6-2.0	0.23-0.25	6.1-7.3	Low----------	0.28	5	6	4-6
Cyclone	10-52	27-35	1.40-1.60	0.6-2.0	0.18-0.20	6.1-7.3	Moderate-----	0.43			
	52-68	15-25	1.40-1.60	0.6-2.0	0.15-0.19	6.6-7.8	Low----------	0.43			
	68-75	15-25	1.50-1.80	0.2-0.6	0.05-0.19	7.4-8.4	Low----------	0.43			
FnA---------------	0-13	11-22	1.40-1.55	0.6-2.0	0.22-0.24	5.1-6.5	Low----------	0.37	5	5	1-3
Fincastle	13-31	20-35	1.45-1.65	0.6-2.0	0.18-0.20	5.6-7.3	Moderate-----	0.37			
	31-42	20-35	1.45-1.65	0.6-2.0	0.15-0.19	5.6-7.3	Moderate-----	0.37			
	42-60	20-30	1.55-1.90	0.2-0.6	0.05-0.19	7.4-8.4	Low----------	0.37			
FsA, FsB2, FsC2, FsD2----------	0-12	10-17	1.35-1.55	0.6-2.0	0.20-0.24	5.1-7.3	Low----------	0.32	4	5	1-3
Fox	12-27	25-35	1.55-1.65	0.6-2.0	0.15-0.19	5.6-8.4	Moderate-----	0.32			
	27-60	0-2	1.30-2.20	>6.0	0.02-0.04	7.4-8.4	Low----------	0.10			
FtC3, FtD3-------	0-8	27-35	1.55-1.65	0.6-2.0	0.17-0.19	5.1-7.3	Moderate-----	0.32	3	6	5-2
Fox	8-26	25-35	1.55-1.65	0.6-2.0	0.15-0.19	5.6-8.4	Moderate-----	0.32			
	26-60	0-2	1.30-2.20	>6.0	0.02-0.04	7.4-8.4	Low----------	0.10			
Ge---------------	0-10	18-27	1.30-1.50	0.6-2.0	0.20-0.24	6.1-7.8	Low----------	0.37	5	5	1-3
Genesee	10-35	18-27	1.30-1.50	0.6-2.0	0.17-0.22	6.1-8.4	Low----------	0.37			
	35-60	10-20	1.30-1.50	0.6-2.0	0.19-0.21	7.4-8.4	Low----------	0.37			
GnB2--------------	0-8	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	8-26	35-55	1.45-1.75	0.06-0.2	0.11-0.18	4.5-8.4	Moderate-----	0.32			
	26-60	27-36	1.65-1.85	0.06-0.2	0.06-0.10	7.4-8.4	Moderate-----	0.32			
GoC3--------------	0-7	27-38	1.35-1.55	0.2-0.6	0.17-0.23	5.6-7.3	Low----------	0.43	2	6	.5-2
Glynwood	7-23	35-55	1.45-1.75	0.06-0.2	0.11-0.18	4.5-8.4	Moderate-----	0.32			
	23-60	27-36	1.65-1.85	0.06-0.2	0.06-0.10	7.4-8.4	Moderate-----	0.32			
HaA---------------	0-12	12-20	1.30-1.45	0.6-2.0	0.18-0.22	5.1-7.3	Low----------	0.37	4	5	1-3
Haskins	12-25	18-35	1.45-1.70	0.6-2.0	0.12-0.16	5.1-7.3	Low----------	0.37			
	25-60	35-55	1.60-1.80	<0.2	0.08-0.12	6.1-8.4	Moderate-----	0.37			
HeG---------------	0-3	20-30	1.20-1.40	0.6-2.0	0.18-0.24	6.1-7.8	Low----------	0.32	4	5	1-3
Hennepin	3-13	18-30	1.30-1.60	0.2-2.0	0.14-0.22	6.1-7.8	Low----------	0.32			
	13-60	18-30	1.45-1.70	0.2-0.6	0.07-0.11	6.1-8.4	Low----------	0.32			

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
Ho	0-11	10-17	1.35-1.55	0.6-2.0	0.20-0.24	5.1-7.3	Low	0.37	4	5	1-3
Homer	11-15	20-35	1.45-1.65	0.6-2.0	0.17-0.19	5.1-6.0	Moderate	0.37			
	15-35	17-27	1.45-1.65	0.6-2.0	0.15-0.17	5.1-6.0	Low	0.37			
	35-60	2-8	1.50-1.70	6.0-20	0.02-0.04	7.9-8.4	Low	0.10			
Ht, Hx	0-60	---	0.15-0.45	0.2-6.0	0.35-0.45	5.6-7.8	---	---	---	3	>70
Houghton											
KaA, KaB	0-12	8-20	1.10-1.65	2.0-6.0	0.10-0.15	5.1-7.3	Low	0.24	4	3	1-3
Kalamazoo	12-30	18-35	1.25-1.70	0.6-2.0	0.10-0.18	5.1-7.3	Moderate	0.32			
	30-49	2-15	1.50-1.65	6.0-20	0.02-0.08	5.1-7.8	Low	0.10			
	49-60	0-10	1.50-1.65	6.0-20	0.01-0.03	7.4-8.4	Low	0.10			
KsA, KsB, KsC	0-9	7-17	1.30-1.45	0.6-2.0	0.13-0.20	5.1-7.3	Low	0.28	4	3	.5-2
Kosciusko	9-19	18-27	1.40-1.60	0.6-2.0	0.07-0.14	5.1-7.3	Moderate	0.28			
	19-38	4-12	1.50-1.70	0.6-2.0	0.05-0.11	5.6-7.8	Low	0.28			
	38-60	1-5	1.70-1.90	>20	0.02-0.04	7.4-8.4	Low	0.10			
MbA, MbB, MbC2	0-12	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
Martinsville	12-29	18-30	1.40-1.60	0.6-2.0	0.17-0.20	5.1-6.5	Moderate	0.37			
	29-53	10-25	1.40-1.60	0.6-2.0	0.12-0.14	5.6-7.3	Low	0.24			
	53-60	3-23	1.50-1.70	0.6-2.0	0.19-0.21	7.4-8.4	Low	0.24			
Md	0-13	---	0.30-0.55	0.6-6.0	0.35-0.45	6.1-8.4	---	---	---	3	30-75
Martisco	13-56	---	---	0.06-0.2	---	7.4-8.4	Low	---			
	56-60	2-8	1.60-1.80	2.0-6.0	0.05-0.10	7.4-8.4	Low	---			
MeB, MeC	0-10	3-8	1.45-1.60	6.0-20	0.10-0.12	5.6-7.3	Low	0.17	5	2	.5-2
Metea	10-25	2-10	1.50-1.70	6.0-20	0.06-0.11	5.1-7.3	Low	0.17			
	25-49	25-35	1.50-1.70	0.6-2.0	0.15-0.19	5.6-7.8	Moderate	0.32			
	49-60	20-30	1.40-1.65	0.6-2.0	0.05-0.19	7.4-8.4	Low	0.32			
MfB2, MfC2	0-8	20-27	1.30-1.45	0.6-2.0	0.19-0.21	5.6-7.3	Moderate	0.37	5	5	1-3
Miami	8-32	27-35	1.45-1.60	0.6-2.0	0.15-0.19	5.6-7.8	Moderate	0.37			
	32-60	15-26	1.45-1.60	0.6-2.0	0.17-0.19	7.4-8.4	Low	0.37			
MfD2, MfE2	0-8	11-22	1.30-1.45	0.6-2.0	0.20-0.24	5.6-7.3	Low	0.37	5	5	1-3
Miami	8-32	25-35	1.45-1.65	0.6-2.0	0.15-0.20	5.6-6.0	Moderate	0.37			
	32-60	15-30	1.55-1.90	0.2-0.6	0.05-0.19	6.6-8.4	Moderate	0.37			
MhB2, MhC2	0-6	11-22	1.30-1.45	0.6-2.0	0.20-0.24	5.6-7.3	Low	0.37	5	5	1-3
Miami	6-33	25-35	1.45-1.65	0.6-2.0	0.15-0.20	5.6-6.0	Moderate	0.37			
	33-60	15-30	1.55-1.90	0.2-0.6	0.05-0.19	6.6-8.4	Moderate	0.37			
MkC3, MkD3	0-9	27-35	1.35-1.60	0.6-2.0	0.18-0.20	5.6-7.3	Moderate	0.37	4	6	.5-2
Miami	9-25	25-35	1.45-1.65	0.6-2.0	0.15-0.20	5.6-6.0	Moderate	0.37			
	25-60	15-30	1.55-1.90	0.2-0.6	0.05-0.19	6.6-8.4	Moderate	0.37			
MlC3	0-9	27-35	1.35-1.50	0.6-2.0	0.17-0.19	5.6-7.3	Moderate	0.37	5	6	.5-2
Miami	9-26	27-35	1.45-1.60	0.6-2.0	0.15-0.19	5.6-7.8	Moderate	0.37			
	26-60	15-26	1.45-1.60	0.6-2.0	0.17-0.19	7.4-8.4	Low	0.37			
Mm	0-15	35-42	1.30-1.50	0.6-2.0	0.12-0.23	5.6-7.3	High	0.28	5	4	5-6
Milford	15-37	35-42	1.40-1.60	0.2-0.6	0.18-0.20	5.6-7.8	Moderate	0.43			
	37-60	20-30	1.50-1.70	0.2-0.6	0.20-0.22	6.6-8.4	Moderate	0.43			
Mp	0-13	27-32	1.30-1.50	0.6-2.0	0.19-0.22	6.1-7.3	Moderate	0.32	4	6	4-7
Millsdale	13-36	35-45	1.40-1.70	0.2-0.6	0.12-0.16	6.1-8.4	High	0.32			
	36	---	---	---	---	---	---	---			
MsA, MsB2, MsC2	0-7	14-27	1.30-1.50	0.6-2.0	0.18-0.23	5.1-7.3	Low	0.37	4	6	1-3
Milton	7-33	35-50	1.45-1.70	0.2-0.6	0.12-0.18	4.5-7.8	Moderate	0.37			
	33-38	25-45	1.40-1.70	0.2-2.0	0.12-0.16	6.1-7.8	Moderate	0.37			
	38	---	---	---	---	---	---	---			

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
MtG----------	0-4	15-25	1.20-1.40	0.6-2.0	0.16-0.20	6.1-7.8	Low----------	0.32	4	5	2-4
Milton Variant	4-22	15-27	1.30-1.50	0.6-2.0	0.07-0.09	6.1-7.8	Low----------	0.24			
	22	---	---	---	---	---	----------	----			
MvC2, MvD2, MvE2-	0-9	22-27	1.35-1.55	0.6-2.0	0.20-0.24	5.1-6.5	Low----------	0.43	3	6	1-3
Morley	9-27	35-50	1.55-1.70	0.2-0.6	0.11-0.15	6.1-7.8	Moderate-----	0.43			
	27-60	27-40	1.60-1.80	0.06-0.2	0.07-0.12	6.1-8.4	Moderate-----	0.43			
MxD3----------	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	.5-2
Morley	6-22	35-50	1.55-1.70	0.2-0.6	0.11-0.15	6.1-7.8	Moderate-----	0.43			
	22-60	27-40	1.60-1.80	0.06-0.2	0.07-0.12	6.1-8.4	Moderate-----	0.43			
OcA, OcB2--------	0-15	11-22	1.30-1.45	0.6-2.0	0.20-0.24	5.6-6.5	Low----------	0.37	5	5	1-3
Ockley	15-39	24-35	1.45-1.60	0.6-2.0	0.15-0.20	5.6-7.3	Moderate-----	0.37			
	39-56	20-35	1.40-1.55	0.6-2.0	0.12-0.14	5.6-7.3	Moderate-----	0.24			
	56-60	2-5	1.60-1.80	6.0-20	0.02-0.04	7.4-8.4	Low----------	0.10			
OmA, OmB, OmC----	0-32	5-12	1.40-1.60	2.0-6.0	0.10-0.12	5.6-7.3	Low----------	0.17	5	2	1-3
Ormas	32-50	18-25	1.50-1.60	2.0-6.0	0.11-0.14	5.6-7.8	Low----------	0.32			
	50-60	1-8	1.55-1.70	>20	0.03-0.05	7.4-8.4	Low----------	0.15			
Or*.											
Orthents											
Pa, Pm----------	0-33	---	0.25-0.45	0.2-6.0	0.35-0.45	5.1-7.8	----------	----	2	3	>75
Palms	33-60	7-35	1.45-1.75	0.2-0.6	0.14-0.22	6.1-8.4	Low----------	----			
Pp----------	0-26	---	0.35-0.55	0.2-6.0	0.35-0.45	5.6-8.4	----------	----	---	3	30-75
Palms Variant	26-35	10-25	1.60-1.80	0.2-0.6	0.15-0.20	5.6-8.4	Low----------	0.28			
	35-60	3-10	1.60-1.80	2.0-6.0	0.05-0.10	6.1-8.4	Low----------	0.15			
Pt----------	0-15	27-35	1.10-1.30	0.6-2.0	0.21-0.23	6.1-7.8	Moderate-----	0.28	5	7	5-6
Pella	15-31	25-35	1.20-1.45	0.6-2.0	0.21-0.24	6.6-7.8	Moderate-----	0.28			
	31-60	15-30	1.40-1.70	0.6-2.0	0.10-0.22	7.4-8.4	Low----------	0.28			
Pw----------	0-9	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	9-43	35-50	1.40-1.70	0.2-0.6	0.12-0.20	5.6-7.8	Moderate-----	0.24			
	43-60	30-40	1.50-1.75	0.2-0.6	0.14-0.18	7.4-8.4	Moderate-----	0.24			
Px*, Py*.											
Pits											
RaA----------	0-10	16-27	1.30-1.45	0.6-2.0	0.17-0.22	5.1-7.3	Low----------	0.37	3	6	1-3
Randolph	10-28	35-50	1.40-1.70	0.2-0.6	0.13-0.16	5.1-7.8	High---------	0.37			
	28	---	---	---	---	---	----------	----			
RcA, RcB2, RcC2--	0-16	9-18	1.30-1.45	0.6-2.0	0.12-0.18	4.5-7.3	Low----------	0.24	4-3	3	1-3
Rawson	16-27	18-35	1.50-1.69	0.6-2.0	0.12-0.16	5.1-7.8	Low----------	0.32			
	27-60	35-55	1.60-1.82	0.06-0.2	0.08-0.12	6.6-8.4	Moderate-----	0.32			
Re----------	0-8	18-27	1.30-1.45	0.6-2.0	0.20-0.24	6.1-7.3	Low----------	0.28	5	5	3-6
Rensselaer	8-34	27-35	1.40-1.60	0.6-2.0	0.15-0.19	6.1-7.3	Moderate-----	0.28			
	34-60	2-30	1.50-1.70	0.6-2.0	0.19-0.21	7.3-8.4	Low----------	0.28			
RhA, RhB2, RhC2--	0-8	8-16	1.30-1.50	0.6-2.0	0.20-0.24	6.1-7.3	Low----------	0.32	5	5	1-3
Riddles	8-49	18-35	1.40-1.60	0.6-2.0	0.16-0.18	5.1-7.8	Moderate-----	0.32			
	49-60	8-25	1.40-1.60	0.6-2.0	0.05-0.19	6.6-8.4	Low----------	0.32			
RmG----------	0-5	8-25	1.20-1.50	2.0-6.0	0.10-0.12	6.6-7.8	Low----------	0.20	3	8	1-3
Rodman	5-15	5-25	1.10-1.50	2.0-6.0	0.09-0.12	6.6-7.8	Low----------	0.20			
	15-60	0-10	>1.80	>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
Se	0-14	10-25	1.15-1.60	0.6-2.0	0.18-0.22	6.1-7.8	Low	0.24	4	5	2-6
Sebewa	14-29	18-35	1.50-1.80	0.6-2.0	0.15-0.19	6.1-7.8	Low	0.24			
	29-60	0-3	1.55-1.75	6.0-20	0.02-0.04	7.4-8.4	Low	0.10			
Sf*:											
Sebewa	0-9	5-20	1.15-1.60	0.6-2.0	0.12-0.15	6.1-7.8	Low	0.24	4	3	2-6
	9-32	18-35	1.50-1.80	0.6-2.0	0.15-0.19	6.1-7.8	Low	0.24			
	32-60	0-3	1.55-1.75	6.0-20	0.02-0.04	7.4-8.4	Low	0.10			
Milford	0-11	35-42	1.30-1.50	0.6-2.0	0.12-0.23	5.6-7.3	High	0.28	5	4	5-6
	11-37	35-42	1.40-1.60	0.2-0.6	0.18-0.20	5.6-7.8	Moderate	0.43			
	37-60	20-30	1.50-1.70	0.2-0.6	0.20-0.22	6.6-8.4	Moderate	0.43			
Sh	0-16	18-27	1.30-1.50	0.6-2.0	0.22-0.24	6.1-7.8	Low	0.37	5	5	1-3
Shoals	16-43	18-32	1.35-1.55	0.6-2.0	0.17-0.22	6.1-7.8	Low	0.37			
	43-60	12-25	1.35-1.60	0.6-2.0	0.12-0.21	6.6-7.3	Low	0.37			
So	0-16	27-33	1.25-1.50	0.6-2.0	0.18-0.22	6.1-7.8	Moderate	0.37	5	6	3-6
Sloan	16-42	22-35	1.25-1.55	0.2-2.0	0.15-0.19	6.1-8.4	Moderate	0.37			
	42-60	10-30	1.20-1.50	0.2-2.0	0.13-0.18	6.6-8.4	Low	0.37			
Wc	0-25	10-27	1.15-1.40	0.6-2.0	0.16-0.21	5.1-7.8	Low	0.32	5	6	4-12
Wallkill	25-60	---	0.25-0.45	0.2-6.0	0.35-0.45	5.6-7.8	---	---			
Wh	0-10	15-27	1.30-1.45	0.6-2.0	0.22-0.24	6.1-7.3	Low	0.37	5	5	2-4
Washtenaw	10-25	15-27	1.30-1.50	0.2-0.6	0.20-0.22	6.1-7.3	Low	0.37			
	25-60	28-35	1.40-1.60	0.06-0.2	0.15-0.20	6.1-7.3	Moderate	0.37			
Ws	0-15	18-27	1.30-1.45	0.6-2.0	0.18-0.21	5.6-7.3	Moderate	0.28	5	6	2-6
Westland	15-31	27-35	1.45-1.60	0.2-0.6	0.15-0.19	5.6-7.3	Moderate	0.28			
	31-46	15-30	1.40-1.60	0.6-2.0	0.14-0.16	5.6-7.3	Moderate	0.28			
	46-60	1-7	1.50-1.75	6.0-20	0.02-0.04	7.4-8.4	Low	0.10			
Wt	0-8	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	8-41	18-30	1.40-1.60	0.6-2.0	0.15-0.19	5.1-7.3	Moderate	0.37			
	41-60	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

["Flooding" and "water table" and terms such as "occasional," "brief," "apparent," and "perched" are explained in the text. The symbol > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	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				
BaA, BaB2--------- Blount	C	None---------	---	---	1.0-3.0	Perched	Jan-May	>60	---	High-----	High-----	Moderate.
Br*--------- Brookston	B/D	None---------	---	---	+.5-1.0	Apparent	Dec-May	>60	---	High-----	High-----	Low.
ChC--------- Chelsea	A	None---------	---	---	>6.0	---	---	>60	---	Low------	Low------	Low.
CrA--------- Crosby	C	None---------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Moderate.
CsA--------- Crosier	C	None---------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Low.
Cy*--------- Cyclone	B/D	None---------	---	---	+.5-1.0	Apparent	Dec-May	>60	---	High-----	High-----	Low.
FnA--------- Fincastle	C	None---------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Moderate.
FsA, FsB2, FsC2, FsD2, FtC3, FtD3- Fox	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Moderate.
Ge--------- Genesee	B	Occasional	Brief-----	Oct-Jun	>6.0	---	---	>60	---	Moderate	Low------	Low.
GnB2, GoC3-------- Glynwood	C	None---------	---	---	2.0-3.5	Perched	Jan-Apr	>60	---	High-----	High-----	Moderate.
HaA--------- Haskins	C	None---------	---	---	1.0-2.5	Perched	Jan-Apr	>60	---	High-----	High-----	Moderate.
HeG--------- Hennepin	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Low.
Ho--------- Homer	B	None---------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Moderate.
Ht*, Hx*---------- Houghton	A/D	None---------	---	---	+1-1.0	Apparent	Sep-Jun	>60	---	High-----	High-----	Low.
KaA, KaB---------- Kalamazoo	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Low.
KsA, KsB, KsC----- Kosciusko	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Moderate.
MbA, MbB, MbC2---- Martinsville	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
Md*---------- Martisco	B/D	None--------	---	---	+.5-1.0	Apparent	Nov-May	>60	---	High-----	High-----	Low.
MeB, MeC---------- Metea	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
MfB2, MfC2, MfD2, MfE2, MhB2, MhC2, MkC3, MkD3, MlC3- Miami	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Mm*---------- Milford	B/D	None--------	---	---	+.5-1.0	Apparent	Mar-Jun	>60	---	High-----	High-----	Low.
Mp*---------- Millsdale	B/D	None--------	---	---	+1-1.0	Perched	Jan-Apr	20-40	Hard	High-----	High-----	Low.
MsA, MsB2, MsC2--- Milton	C	None--------	---	---	>6.0	---	---	20-40	Hard	Moderate	High-----	Moderate.
MtG---------- Milton Variant	D	None--------	---	---	>6.0	---	---	20-40	Hard	Moderate	Low------	Low.
MvC2, MvD2, MvE2, MxD3---------- Morley	C	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Moderate.
OcA, OcB2---------- Ockley	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
OmA, OmB, OmC----- Ormas	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Moderate.
Or. Orthents												
Pa*, Pm*---------- Palms	A/D	None--------	---	---	+1-1.0	Apparent	Nov-May	>60	---	High-----	High-----	Moderate.
Pp*---------- Palms Variant	B/D	None--------	---	---	+.5-1.0	Apparent	Nov-May	>60	---	High-----	High-----	Low.
Pt*---------- Pella	B/D	None--------	---	---	+.5-1.0	Apparent	Mar-Jun	>60	---	High-----	High-----	Moderate.
Pw*---------- Pewamo	C/D	None--------	---	---	+1-1.0	Apparent	Dec-May	>60	---	High-----	High-----	Low.
Px, Py. Pits												
RaA---------- Randolph	D	None--------	---	---	1.0-2.5	Perched	Jan-Apr	20-40	Hard	High-----	High-----	Moderate.

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
RcA, RcB2, RcC2--- Rawson	B	None	---	---	2.5-4.0	Perched	Jan-Apr	>60	---	Moderate	High	Moderate.
Re* Rensselaer	B/D	None	---	---	+.5-1.0	Apparent	Dec-May	>60	---	High	High	Low.
RhA, RhB2, RhC2--- Riddles	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
RmG Rodman	A	None	---	---	>6.0	---	---	>60	---	Low	Low	Low.
Se* Sebewa	B/D	None	---	---	+1-1.0	Apparent	Sep-May	>60	---	High	High	Low.
Sf*:												
Sebewa	B/D	None	---	---	+1-1.0	Apparent	Sep-May	>60	---	High	High	Low.
Milford	B/D	None	---	---	+.5-1.0	Apparent	Mar-Jun	>60	---	High	High	Low.
Sh Shoals	C	Occasional	Brief	Oct-Jun	1.0-3.0	Apparent	Jan-Apr	>60	---	High	High	Low.
So Sloan	B/D	Frequent	Brief	Nov-Jun	0-1.0	Apparent	Nov-Jun	>60	---	High	High	Low.
Wc* Wallkill	D	None	---	---	+.5-1.0	Apparent	Sep-Jun	>60	---	High	Moderate	Moderate.
Wh* Washtenaw	C/D	None	---	---	+.5-1.0	Apparent	Dec-May	>60	---	High	High	Low.
Ws* Westland	B/D	None	---	---	+.5-1.0	Apparent	Dec-May	>60	---	High	High	Low.
Wt Whitaker	C	None	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High	High	Moderate.

* In the "High water table--Depth" column, a plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

TABLE 19.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Blount	Fine, illitic, mesic Aeric Ochraqualfs
Brookston	Fine-loamy, mixed, mesic Typic Argiaquolls
Chelsea	Mixed, mesic Alfic Udipsamments
Crosby	Fine, mixed, mesic Aeric Ochraqualfs
Crosier	Fine-loamy, mixed, mesic Aeric Ochraqualfs
Cyclone	Fine-silty, mixed, mesic Typic Argiaquolls
Fincastle	Fine-silty, mixed, mesic Aeric Ochraqualfs
Fox	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Typic Hapludalfs
Genesee	Fine-loamy, mixed, nonacid, mesic Typic Udifluvents
Glynwood	Fine, illitic, mesic Aquic Hapludalfs
Haskins	Fine-loamy, mixed, mesic Aeric Ochraqualfs
Hennepin	Fine-loamy, mixed, mesic Typic Eutrochrepts
*Homer	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Aeric Ochraqualfs
Houghton	Euic, mesic Typic Medisaprists
Kalamazoo	Fine-loamy, mixed, mesic Typic Hapludalfs
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
Millsdale	Fine, mixed, mesic Typic Argiaquolls
Milton	Fine, mixed, mesic Typic Hapludalfs
Milton Variant	Loamy-skeletal, mixed, mesic Typic Eutrochrepts
Morley	Fine, illitic, mesic Typic Hapludalfs
Ockley	Fine-loamy, mixed, mesic Typic Hapludalfs
Ormas	Loamy, mixed, mesic Arenic Hapludalfs
Orthents	Fine-loamy, mixed, mesic Udorthents
Palms	Loamy, mixed, euic, mesic Terric Medisaprists
Palms Variant	Loamy over sandy, mixed, euic, mesic Terric Medisaprists
Pella	Fine-silty, mixed, mesic Typic Haplaquolls
Pewamo	Fine, mixed, mesic Typic Argiaquolls
Randolph	Fine, mixed, mesic Aeric Ochraqualfs
Rawson	Fine-loamy, mixed, mesic Typic Hapludalfs
Rensselaer	Fine-loamy, mixed, mesic Typic Argiaquolls
Riddles	Fine-loamy, mixed, mesic Typic Hapludalfs
*Rodman	Sandy-skeletal, mixed, mesic Typic Hapludolls
Sebewa	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Typic Argiaquolls
Shoals	Fine-loamy, mixed, nonacid, mesic Aeric Fluvaquents
Sloan	Fine-loamy, mixed, mesic Fluvaquentic Haplaquolls
Wallkill	Fine-loamy, mixed, nonacid, mesic Thapto-Histic Fluvaquents
Washtenaw	Fine-loamy, mixed, nonacid, mesic Aeric Fluvaquents
Westland	Fine-loamy, mixed, mesic Typic Argiaquolls
Whitaker	Fine-loamy, mixed, mesic Aeric Ochraqualfs

* The soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series.

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