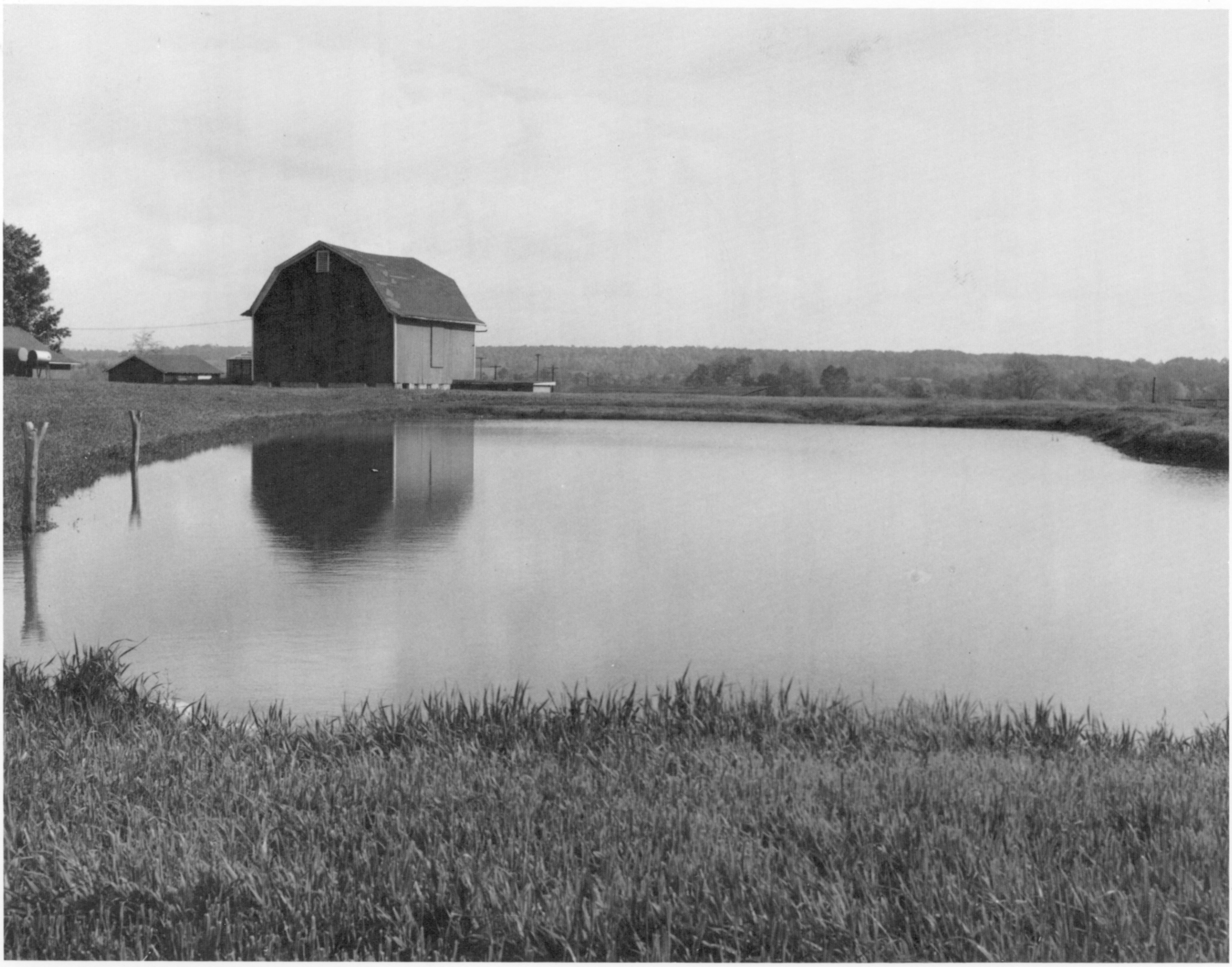
United States
Department of
Agriculture

Soil
Conservation
Service

In cooperation with
Ohio Department of
Natural Resources,
Division of Soil and Water
Conservation, and Ohio
Agricultural Research and
Development Center

Soil Survey of Trumbull County, Ohio



How To Use This Soil Survey

General Soil Map

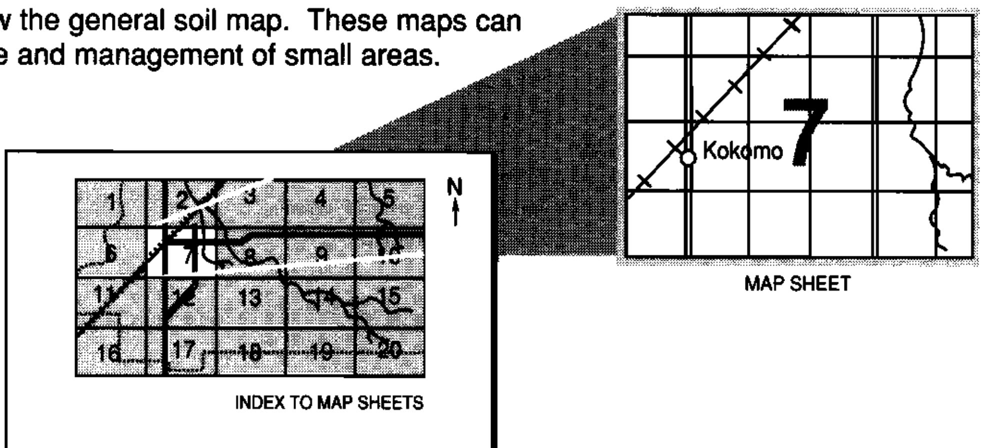
The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

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

Detailed Soil Maps

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

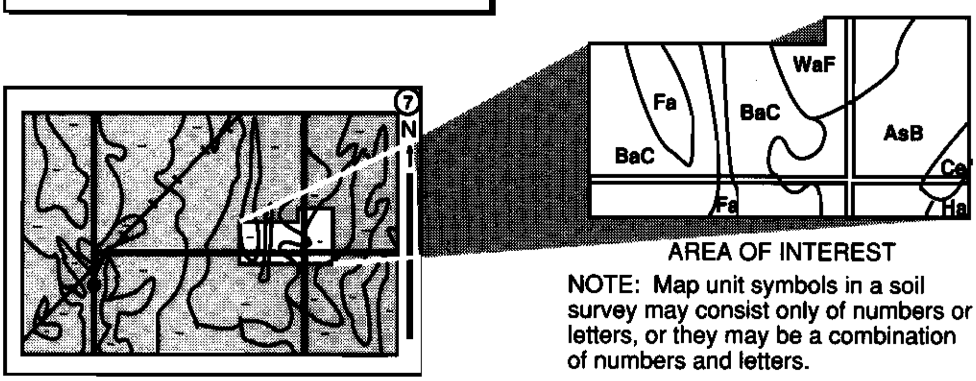
To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet, and turn to that sheet.



INDEX TO MAP SHEETS

MAP SHEET

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



MAP SHEET

AREA OF INTEREST

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

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

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

Major fieldwork for this soil survey was completed in 1985. Soil names and descriptions were approved in 1986. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1986. This survey was made cooperatively by the Soil Conservation Service; the Ohio Department of Natural Resources, Division of Soil and Water Conservation; and the Ohio Agricultural Research and Development Center. It is part of the technical assistance furnished to the Trumbull Soil and Water Conservation District. Financial assistance for the survey was provided by the Trumbull County Commissioners.

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

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

Cover: A farm pond in an area of Ravenna silt loam, 2 to 6 percent slopes.

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Issued March 1992

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Summary of Tables

Foreword

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

This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are 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 water table near the surface makes a soil poorly suited to basements or underground installations.

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

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State Conservationist
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Soil Survey of Trumbull County, Ohio

By Norris L. Williams, Ohio Department of Natural Resources, Division of Soil and Water Conservation

Fieldwork by Norris L. Williams, F.E. McCleary, L.E. Roth, W.L. Black, R.J. MacDonald, and R.T. Trivisonno, Ohio Department of Natural Resources, Division of Soil and Water Conservation, and P.W. Reese, Soil Conservation Service

United States Department of Agriculture, Soil Conservation Service,
in cooperation with
Ohio Department of Natural Resources, Division of Soil and Water Conservation, and
Ohio Agricultural Research and Development Center

General Nature of the County

Dan Ross, district conservationist, Soil Conservation Service, and R. Paul Hartley, county agent, Cooperative Extension Service, helped prepare this section.

TRUMBULL COUNTY is in the northeastern part of Ohio (fig. 1). It has an area of 389,120 acres, or about 608 square miles. Warren, the county seat, is in the south-central part of the county. In 1980, the population of the county was 241,863 *(21)*.

The southern part of the county is mainly metropolitan. Steel and other major heavy industries are the economic backbone of the urban area. The major agricultural enterprises in the northern part of the county are dairy and grain farming. Urban sprawl is competing with agriculture for use of the land, especially in the central part of the county.

The major soil management concerns affecting agriculture and urban development are erosion, drainage, and slow or very slow permeability, which results from a high content of clay or a compact layer in the subsoil. Surface and subsurface drainage systems are needed in areas used for crop production or housing developments.

This soil survey updates the survey of Trumbull County published in 1914 *(7)*. It provides additional information and has larger maps, which show the soils in greater detail.

Figure 1.—Location of Trumbull County in Ohio.

Climate

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

Trumbull County is cold in winter and 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. The normal annual precipition is adequate for all of the crops that are adapted to the temperature and growing season in the county.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Youngstown, Ohio, in the period 1951 to 1986. 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 19 degrees. The lowest temperature on record, which occurred at Youngstown on January 21, 1985, is -20 degrees. In summer, the average temperature is 69 degrees and the average daily maximum temperature is 80 degrees. The highest recorded temperature, which occurred on July 14, 1954, is 100 degrees.

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

Of the total annual precipitation, about 21 inches, or more than 55 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 18 inches. The heaviest 1-day rainfall during the period of record was 4.31 inches at Youngstown on October 15, 1954. Thunderstorms occur on about 35 days each year.

The average seasonal snowfall is nearly 58 inches. The greatest snow depth at any one time during the period of record was 18 inches. On the average, 38 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 65 percent of the time possible in summer and 30 percent in winter. The prevailing wind is from the southwest. Average windspeed is highest, 12 miles per hour, in spring.

Tornadoes and severe thunderstorms occur occasionally. These storms are usually local in extent and of short duration and cause damage in scattered areas.

Early History

A charter issued in 1662 by King Charles II of England granted to the colony of Connecticut all land between the 41st and 42d parallels of north latitude and from Providence Plantations on the east to the Pacific Ocean on the west *(12)*.

After the United States became independent, various claims caused controversy as to the ownership of certain lands. The United States finally relinquished all its claims and guaranteed Connecticut exclusive right to the land in the 3½ million acres known as the Connecticut Western Reserve, exclusive of the waters of Lake Erie. The United States reserved the right of jurisdiction and in time united the Western Reserve with the Northwest Territory. Part of this area eventually became the State of Ohio.

Treaties with the Indians in 1785 and 1789 ceded to the United States the part of Ohio that lies between the Cuyahoga River and the Pennsylvania state line. In 1795, after a war with the Indians, a third treaty signed by General Wayne in Greenville, Ohio, confirmed the ownership of land.

The Connecticut Land Company had the territory surveyed into 5-mile ranges running north and south, beginning at the Pennsylvania state line. The Western Reserve was then surveyed into townships by lines running east to west and north to south, each 5 miles from the other.

Trumbull County was named in honor of two successive Governors of Connecticut. When the county was formed in 1800, it included all of the Western Reserve. It was bounded on the north by Lake Erie, on the east by the Pennsylvania State Line, on the south by the parallel of the 41st degree of north latitude, and on the west by Sandusky and Seneca Counties. Out of this large territory, 10 additional counties eventually were formed *(15)*.

Agriculture was the main industry when Trumbull County was founded. Milling of grain became the first agricultural business. In 1801, Brockway's and Hawn's mills were established in Orangeville Township. Traveling dealers from Pittsburg exchanged goods for cheese, butter, and other agricultural products. Orchards were common, and fruit was plentiful. The first cheese factory in Ohio was started in Hartford Township in 1846. In June of 1802, the first gristmill within the present boundaries of Trumbull County was established in Warren, along the Mahoning River.

Ephrain Quimby purchased 441 acres along the

Mahoning River from the Connecticut Land Company on April 17, 1799. This land became what is now Warren. The town derived its name from Moses Warren, a surveyor who came to the Mahoning Valley in 1796. In 1812, a bank and a newspaper were established in Warren. These were the first such enterprises in the Western Reserve.

The iron industry was started early in Trumbull County. In 1870, a blast furnace was built in Warren. The discovery of coal in the Mahoning Valley later helped to develop the steel industry in Trumbull County.

Agriculture

In 1984, Trumbull County had approximately 1,100 farms, which averaged 111 acres in size. These farms made up about 31 percent of the county *(6)*.

The total cash receipts from farm enterprises in 1983 were $23,566,000. The leading agricultural products included dairy products, $11,159,000; cattle, $3,000,000; corn, $1,929,000; and soybeans, $1,908,000 *(11)*. In 1984, the main crops and the average yields per acre were corn, 106 bushels; soybeans, 35 bushels; oats, 56.3 bushels; wheat, 33.5 bushels; and hay, 3.1 tons *(6)*. Agriculture still plays a major role in Trumbull County.

Geology, Relief, and Drainage

Trumbull County is in the Glaciated Appalachian Plateau region of Ohio. Glacial advances during the Pleistocene deposited material that covers the underlying bedrock.

The bedrock occurs as three layers. The bottom layer, which is the oldest, is Devonian. The middle layer is Mississippian, and the top layer is Pennsylvanian *(4)*. The Devonian rocks are Ohio Shale. They are in the northwestern part of the county. Mississippian rocks are the shales and sandstones of the Berea Formation and the overlying Cuyahoga Formation. These formations underlie most of the county. Rocks of the Pennsylvanian-aged Pottsville Group underlie the southwestern and southeastern parts of the county. Sharon Sandstone, a crossbedded sandstone within the Pottsville Group, was deposited in low areas. Streams removed part of the Sharon Sandstone soon after the rock was formed, and Sharon (No. 2) Coal was deposited in the former stream channels. This coal was mined in the 1870's for fuel for steelmaking in the industrial cities of northeastern Ohio. Other economically important rocks are the Sharon and Berea Sandstones which are excellent aquifers and formerly were quarried for building stone.

Trumbull County was covered by several glaciers during the Pleistocene. The material deposited by the glaciers ranges from a few feet to almost 100 feet in thickness. It contains sandstone and shale fragments that were broken off from the bedrock locally as the glaciers advanced. It also contains limestone and igneous fragments, which originated from much farther north. The glacial material deposited by the two older glaciers is buried below that of the younger Wisconsinan Glacier.

A major feature deposited by the Wisconsinan Glacier is the Defiance End Moraine, which extends across Ohio *(8)*. This terminal moraine formed when the Wisconsinan Glacier temporarily halted its southward advance. In Trumbull County it extends from Southington and Farmington Townships to Johnston and Gustavus Townships.

The glacial till in which the soils on till plains formed generally is of late Wisconsinan age *(23)*. Hiram Till covers the somewhat older till in much of the western half of the county. The soils on most till plains in the eastern part of the county formed in the older Lavery and Kent Tills. Since these tills have less clay than the Hiram Till, the soils on till plains in the eastern part of the county generally have less clay in the subsoil than those in the western part.

The northern, western, and south-central parts of the county generally are nearly level and gently sloping. The rest of the county, including Hubbard, Brookfield, Liberty, and Hartford Townships, is more sloping and is dissected by streams. The lowest elevation in the county, 795 feet above sea level, is in an area along the Grand River where Trumbull and Ashtabula Counties meet. The highest, 1,280 feet, is on Trautman Hill, 2¼ miles north of Orangeville along the Pennsylvania State line.

The county is drained by the Mahoning and Grand Rivers and tributaries of the Shenango River. The Grand River runs northward to Lake Erie from the north base of the Defiance End Moraine. It runs through a basin of a former glacial lake. The Mahoning River and its tributaries drain areas on both sides of the Defiance End Moraine, but the direction of flow is generally southward. Yankee and Pymatuning Creeks drain the eastern part of the county. They flow into the Shenango River, most of which is in Pennsylvania. Most of the glacial outwash in the county is deposited along streams that run south and east from the Defiance End Moraine toward the Ohio River.

How This Survey Was Made

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

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

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

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

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

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

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

Map Unit Composition

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

Consequently, every map unit is made up of the soil or soils for which it is named and some soils that belong to other taxonomic classes. These latter soils are called inclusions or included soils.

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

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

Survey Procedures

The general procedures followed in making this survey are described in the National Soils Handbook of the Soil Conservation Service. The soil maps made for conservation planning on individual farms prior to the start of the project soil survey and the survey of the county published in 1914 *(7)* were among the references used.

Before the fieldwork began, preliminary boundaries of slopes and landforms were plotted on aerial photographs. The photographs used in the latter part of the survey were taken in 1977 at a scale of 1:40,000 and enlarged to a scale of 1:15,840. During the early part of the survey, photographs taken in 1966 and 1974 and enlarged to a scale of 1:12,000 were used for the fieldwork. U.S. Geological Survey topographic maps, at a scale of 1:24,000, were studied to relate land and image features.

Soil scientists traversed the landscape on foot, examining the soils. In areas of the Caneadea-Canadice complex and other areas where the soil pattern is very complex, the traverses were spaced as close as 100 yards.

As the traverses were made, the soil scientists divided the landscape into segments based on the use and management of the soils. For example, a hillside would be separated from a swale and a gently sloping ridgetop from a steep side slope. In most areas soil examinations along the traverses were made at points 50 to 200 yards apart, depending on the landscape and soil pattern.

Observations of such items as landforms, blown-down trees, vegetation, roadbanks, and animal burrows were made continuously without regard to spacing. Soil boundaries were determined on the basis of soil examinations, observations, and photo interpretation. With the aid of a hand auger or a spade, the soil material was examined to a depth of about 4 feet or to bedrock within a depth of 4 feet. The pedons described as typical were dug with shovels, mattocks, and digging bars to a depth of 6 feet.

Soil mapping was recorded on the photobase maps and later transferred to film positive mylars of aerial photographs taken in 1977. The drainageways were mapped in the field. Cultural features were recorded from visual observations of the maps and the landscape.

At the beginning of the survey, sample areas were selected to represent the major landscapes in the county. The rate of mapping in these areas was roughly half of that in the rest of the county. Extensive notes were taken on the composition of map units in these preliminary study areas. These notes were modified as mapping progressed and a final assessment of the composition of the individual map units was made.

Samples for chemical and physical analyses and for analysis of engineering properties were taken from representative sites of several of the soils in the county. The chemical and physical analyses were made by the Soil Characterization Laboratory, Department of Agronomy, Ohio State University, Columbus, Ohio. The results of the analyses are stored in a computerized data file at the laboratory. The analyses of engineering properties were made by the Ohio Department of Transportation, Division of Highways, Bureau of Testing, Soils and Foundation Section, Columbus, Ohio. A description of the laboratory procedures can be obtained on request from the two laboratories. The results of the laboratory analyses can be obtained from the Department of Agronomy, Ohio State University; the Ohio Department of Natural Resources, Division of Soil and Water Conservation; and the Soil Conservation Service, State Office, Columbus, Ohio.

General Soil Map Units

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

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

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

Some soil boundaries and soil names in this survey do not fully match those in the surveys of adjoining counties that were published at an earlier date. Differences are the result of changes and refinements in soil series concepts and the application of the latest soil classification system.

Soil Descriptions

Deep Soils on Till Plains

These soils make up about 64 percent of the county. They are nearly level to very steep, poorly drained to moderately well drained soils on till plains. The landscape is characterized by broad flats, undulating areas, and dissected areas along drainageways. Most areas are used for crops, pasture, woodland, or urban development. Moderately slow or very slow permeability, seasonal wetness, the hazard of erosion, and the slope are the major management concerns.

1. Mahoning-Ellsworth Association

Nearly level to very steep, somewhat poorly drained and moderately well drained soils formed in moderately fine textured glacial till

This association is in undulating areas on till plains that have steeper dissected areas along drainageways. Slopes range from 0 to 50 percent.

This association makes up about 19 percent of the county. It is about 65 percent Mahoning soils, 10 percent Ellsworth soils, and 25 percent soils of minor extent (fig. 2).

Mahoning soils are deep, nearly level to sloping, and somewhat poorly drained. They are on flats, knolls, ridgetops, and shoulder slopes and on side slopes parallel to drainageways. Typically, the surface layer is dark grayish brown silt loam. The subsoil is yellowish brown and dark yellowish brown, mottled silty clay loam. Permeability is slow or very slow, and available water capacity is moderate. A perched seasonal high water table is at a depth of 6 to 18 inches during extended wet periods.

Ellsworth soils are deep, gently sloping to very steep, and moderately well drained. They are on knolls, ridgetops, and shoulder slopes and on side slopes along drainageways in dissected areas. Typically, the surface layer is very dark brown silt loam. The subsurface layer is brown silt loam. The subsoil is silty clay loam. The upper part is yellowish brown, and the lower part is brown and yellowish brown and is mottled. Permeability is slow or very slow, and available water capacity is moderate. A perched seasonal high water table at a depth of 18 to 36 inches during extended wet periods.

The most extensive minor soils in this association are the Condit, Haskins, Lordstown, Loudonville, and Orrville soils. Condit soils are poorly drained and are lower on the landscape than the Mahoning and Ellsworth soils. Haskins soils are in landscape positions similar to those of the Mahoning soils. They have more sand and less clay in the upper part of the subsoil than the Mahoning soils. The moderately deep Lordstown and Loudonville soils are in bedrock-controlled areas. Orrville soils formed in alluvium on flood plains.

This association is used mainly as cropland, pasture, or woodland. Some areas are used as sites for buildings or parks. The nearly level and gently sloping areas are moderately well suited or well suited to row crops where drained and poorly suited or moderately well suited where undrained. The steeper areas are

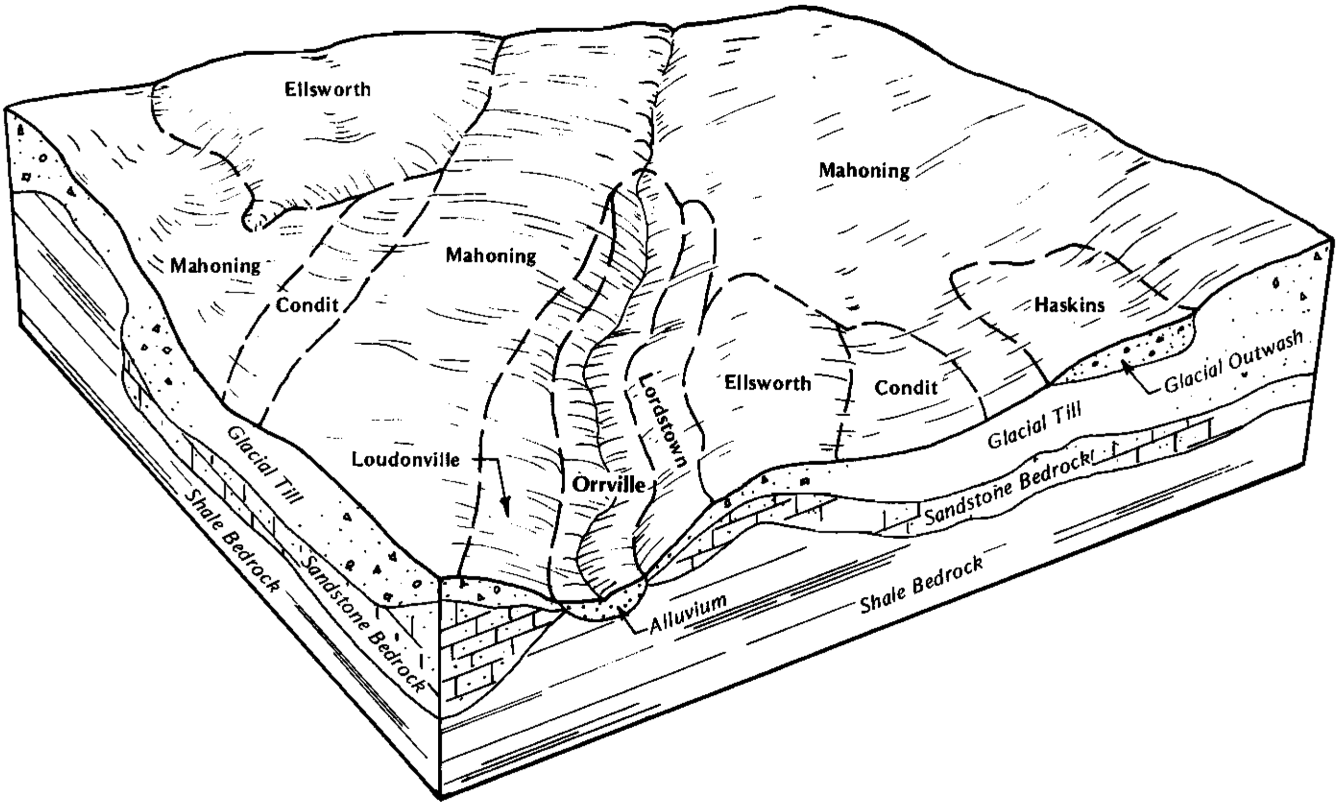

Figure 2.—Pattern of soils and parent material in the Mahoning-Ellsworth association.

poorly suited or generally unsuited to row crops. Most areas are moderately well suited to woodland. The gently sloping and sloping Ellsworth soils are moderately well suited to building site development, but most of the other areas in the association are poorly suited. Most areas are poorly suited to septic tank absorption fields. The slow or very slow permeability, the seasonal wetness, the hazard of erosion, and the slope are the major management concerns.

2. Wadsworth-Rittman Association

Nearly level to sloping, somewhat poorly drained and moderately well drained soils formed in medium textured and moderately fine textured glacial till

This association is in undulating areas on till plains that have sloping areas along drainageways. Slopes range from 0 to 12 percent.

This association makes up about 17 percent of the county. It is about 60 percent Wadsworth soils, 15 percent Rittman soils, and 25 percent soils of minor extent (fig. 3).

Wadsworth soils are deep, nearly level and gently sloping, and somewhat poorly drained. They are on flats, low knolls, and side slopes. Typically, the surface layer is dark grayish brown silt loam. The subsoil is yellowish brown and strong brown, mottled silt loam and silty clay loam in the upper part; a fragipan of yellowish brown and dark yellowish brown clay loam in the next part; and yellowish brown, mottled clay loam in the lower part. Permeability is moderate or moderately slow above the fragipan and slow or very slow in the fragipan. Available water capacity is low. A perched seasonal high water table is at a depth of 12 to 24 inches during extended wet periods.

Rittman soils are deep, gently sloping and sloping, and moderately well drained. They are on knolls and side slopes. Typically, the surface layer is dark grayish brown silt loam. The subsoil is yellowish brown and brown, mottled silt loam and clay loam in the upper part; a fragipan of dark yellowish brown clay loam in the next part; and dark yellowish brown silty clay loam in the lower part. Permeability is moderate above the fragipan and slow in the fragipan. Available water capacity is low. A perched seasonal high water table is at a depth of 18 to 36 inches during extended wet periods.

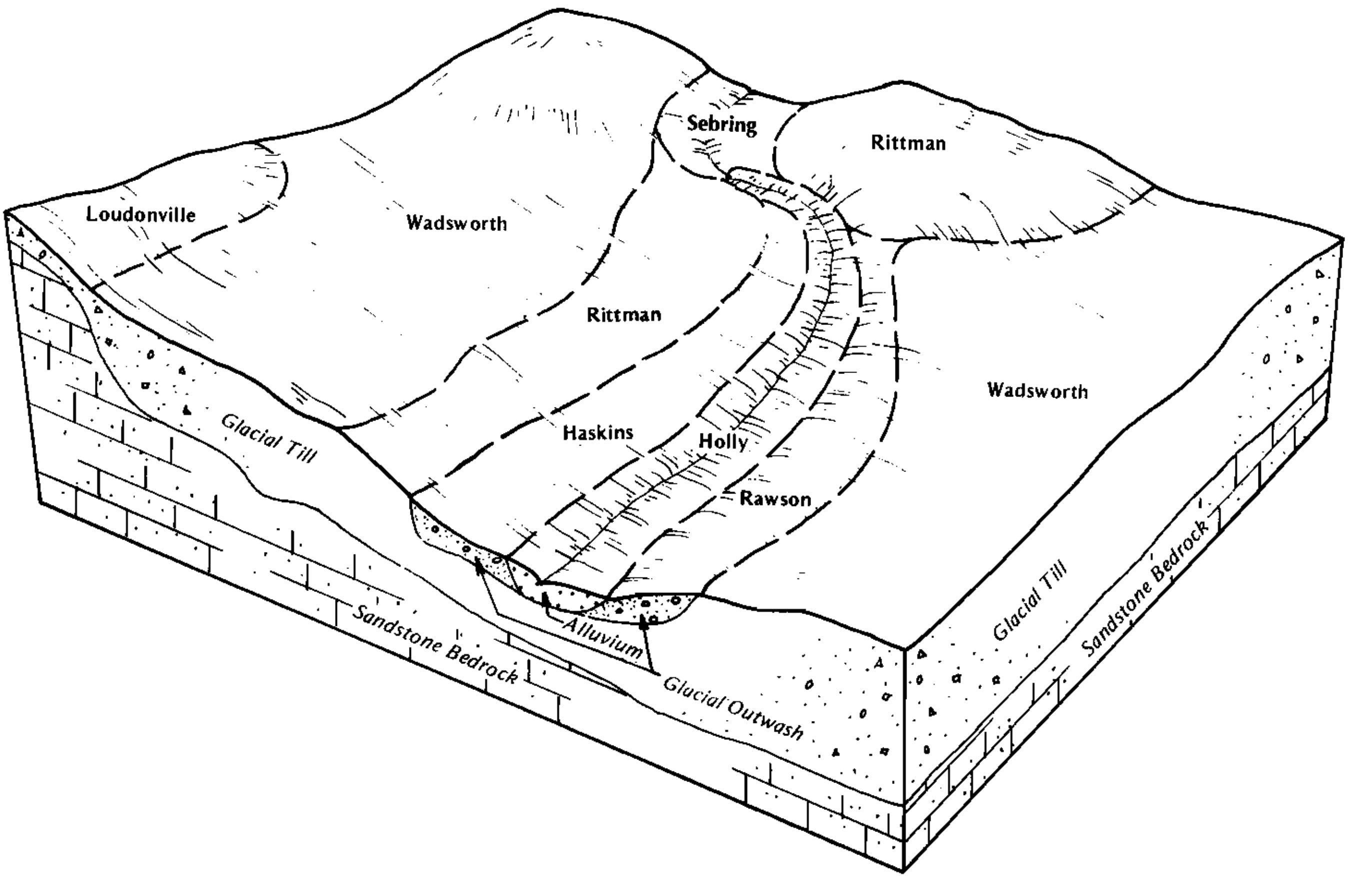

Figure 3.—Pattern of soils and parent material in the Wadsworth-Rittman association.

The most extensive minor soils in this association are the Haskins, Holly, Loudonville, Rawson, and Sebring soils. Haskins and Rawson soils are on till plains and terraces. They do not have a fragipan. Holly soils formed in alluvium on flood plains. The moderately deep Loudonville soils are in bedrock-controlled areas. Sebring soils are on the lower parts of the landscape and are poorly drained.

This association is used mainly as cropland, pasture, or woodland. Some areas are used as sites for buildings. The gently sloping and sloping areas are well suited or moderately well suited to row crops. The nearly level areas are well suited where drained and poorly suited where undrained. Most areas are well suited or moderately well suited to woodland. The Rittman soils are moderately well suited to building site development, but the Wadsworth soils are poorly suited. Most areas are poorly suited to septic tank absorption fields. The slow or very slow permeability, the seasonal wetness, and the hazard of erosion are the major management concerns.

3. Ravenna-Canfield Association

Nearly level to sloping, somewhat poorly drained and moderately well drained soils formed in medium textured and moderately coarse textured glacial till

This association is in undulating areas on till plains that have sloping areas along drainageways. Slopes are long and uniform in some areas. They range from 0 to 12 percent.

This association makes up about 12 percent of the county. It is about 45 percent Ravenna soils, 30 percent Canfield soils, and 25 percent soils of minor extent.

Ravenna soils are deep, nearly level and gently sloping, and somewhat poorly drained. They are on flats, low knolls, and side slopes. Typically, the surface layer is dark grayish brown silt loam. The subsoil is yellowish brown and mottled. It is silt loam in the upper part, a fragipan of loam in the next part, and loam in the lower part. Permeability is moderate above the fragipan and slow in the fragipan. Available water capacity is low. A perched seasonal high water table is at a depth of 6 to 18 inches during extended wet periods.

Canfield soils are deep, gently sloping and sloping, and moderately well drained. They are on knolls, ridgetops, and side slopes. Typically, the surface layer is dark grayish brown silt loam. The subsoil is yellowish brown silt loam in the upper part, a fragipan of dark yellowish brown loam and gravelly loam in the next part, and light olive brown silt loam in the lower part. The part of the subsoil below a depth of about 15 inches is mottled. Permeability is moderate above the fragipan and slow in the fragipan. Available water capacity is low. A perched seasonal high water table is at a depth of 18 to 36 inches during extended wet periods.

The most extensive minor soils in this association are the Holly, Mitiwanga, Orrville, Sebring, and Wooster soils. Holly and Orrville soils formed in alluvium on flood plains. Mitiwanga soils are moderately deep over bedrock. They are in positions on the landscape similar to those of the Ravenna soils. Sebring soils are on the lower parts of the landscape and are poorly drained. Wooster soils are well drained and are on very steep hillsides along drainageways in dissected areas.

This association is used mainly as cropland. Some areas are used for pasture, woodland, or building site development. The gently sloping and sloping areas are well suited or moderately well suited to row crops. The nearly level areas are well suited where drained and poorly suited where undrained. Most areas are well suited or moderately well suited to woodland. The Canfield soils are moderately well suited to building site development, but the Ravenna soils are poorly suited. Most areas are poorly suited to septic tank absorption fields. The slow permeability, the seasonal wetness, and the hazard of erosion are the major management concerns.

4. Platea-Sebring Association

Nearly level to sloping, somewhat poorly drained and poorly drained soils formed in medium textured and moderately fine textured glacial till and lacustrine material

This association is on broad flats and in undulating areas on till plains. Narrow strips of sloping soils are along drainageways. Slopes range from 0 to 12 percent.

This association makes up about 2 percent of the county. It is about 50 percent Platea soils, 20 percent Sebring soils, and 30 percent soils of minor extent.

Platea soils are deep, nearly level to sloping, and somewhat poorly drained. They are on flats, knolls, and side slopes. Typically, the surface layer is dark grayish brown silt loam. The subsoil is brown and yellowish brown, mottled silt loam and silty clay loam in the upper part and a fragipan of dark yellowish brown, mottled silt loam in the lower part. Permeability is moderately slow above the fragipan and very slow in the fragipan. Available water capacity is low. A perched seasonal high water table is at a depth of 6 to 24 inches during extended wet periods.

Sebring soils are deep, nearly level, and poorly drained. They are on flats, in slightly concave areas, and in depressions. Typically, the surface layer is dark gray silt loam. The subsurface layer is gray and light brownish gray, mottled silt loam. The subsoil is mottled silt loam. It is light brownish gray in the upper part and yellowish brown in the lower part. Permeability is slow or moderately slow, and available water capacity is high. A perched seasonal high water table is near or above the surface during extended wet periods.

The most extensive minor soils in this association are the Haskins, Holly, Orrville, and Rawson soils. Haskins and Rawson soils are in positions on the landscape similar to those of the Platea soils. They do not have a fragipan. Holly and Orrville soils formed in alluvium on flood plains.

This association is used mainly as cropland, pasture, or woodland. Most drained areas are moderately well suited or well suited to row crops. Undrained areas are poorly suited or moderately well suited. Most areas are moderately well suited to woodland and poorly suited to building site development. The Platea soils are poorly suited to septic tank absorption fields, and the Sebring soils are generally unsuited. The very slow to moderately slow permeability, the seasonal wetness, ponding, and the hazard of erosion are the major management concerns.

5. Darien-Sebring Association

Nearly level and gently sloping, somewhat poorly drained and poorly drained soils formed in medium textured and moderately fine textured glacial till and lacustrine material

This association is on broad flats and in undulating areas on till plains. Narrow, low-gradient streams dissect the association. Slopes range from 0 to 6 percent.

This association makes up about 4 percent of the county. It is 55 percent Darien soils, 30 percent Sebring soils, and 15 percent soils of minor extent.

Darien soils are deep, nearly level and gently sloping, and somewhat poorly drained. They are on flats, knolls, and side slopes and at the head of drainageways. Typically, the surface layer is dark grayish brown silt loam. The subsurface layer is grayish brown, mottled silt loam. The subsoil is brown and yellowish brown, mottled silt loam and clay loam in the upper part and dark yellowish brown and yellowish brown, mottled clay loam and silty clay loam in the lower part. Permeability is moderately slow, and available water capacity is moderate. A perched seasonal high water table is at a depth of 6 to 18 inches during extended wet periods.

Sebring soils are deep, nearly level, and poorly drained. They are on flats, in slightly concave areas, and in depressions. Typically, the surface layer is dark gray silt loam. The subsurface layer is gray and light brownish gray, mottled silt loam. The subsoil is mottled silt loam. It is light brownish gray in the upper part and yellowish brown in the lower part. Permeability is slow or moderately slow, and available water capacity is high. A perched seasonal high water table is near or above the surface during extended wet periods.

The most extensive minor soils in this association are the Haskins, Holly, Orrville, and Rawson soils. Haskins and Rawson soils are on side slopes along drainageways. Haskins soils have more clay in the substratum than the Darien soils. Rawson soils are moderately well drained. Holly and Orrville soils formed in alluvium on flood plains.

This association is used mainly as cropland, woodland, or pasture. Drained areas are well suited to row crops, and undrained areas are poorly suited or moderately well suited. Most areas are moderately well suited to woodland and poorly suited to building site development. The Darien soils are poorly suited to septic tank absorption fields, and the Sebring soils are generally unsuited. The very slow to moderately slow permeability, the seasonal wetness, ponding, and the hazard of erosion are the major management concerns.

6. Remsen-Geeburg Association

Nearly level to sloping, somewhat poorly drained and moderately well drained soils formed in fine textured glacial till

This association is in undulating areas on till plains that have sloping areas along dissected drainageways. Slopes range from 0 to 12 percent.

This association makes up about 9 percent of the county. It is about 60 percent Remsen soils, 20 percent Geeburg soils, and 20 percent soils of minor extent.

Remsen soils are deep, nearly level and gently sloping, and somewhat poorly drained. They are on slight rises, on knolls, in gently undulating areas, and at the head of drainageways. Typically, the surface layer is dark grayish brown silt loam. The subsoil is yellowish brown and brown, mottled silty clay loam and silty clay in the upper part and olive brown and grayish brown, mottled clay in the lower part. Permeability is very slow, and available water capacity is moderate. A perched seasonal high water table is at a depth of 6 to 18 inches during extended wet periods.

Geeburg soils are deep, gently sloping and sloping, and moderately well drained. They are on rises, ridgetops, shoulder slopes, and side slopes. Typically, the surface layer is brown silt loam. The subsoil is yellowish brown and dark yellowish brown, mottled silty clay loam and silty clay in the upper part and olive brown, mottled clay in the lower part. Permeability is very slow, and available water capacity is moderate. A perched seasonal high water table is at a depth of 18 to 36 inches during extended wet periods.

The most extensive minor soils in this association are the Holly, Lorain, Orrville, Tioga, and Trumbull soils. Holly, Orrville, and Tioga soils formed in alluvium on flood plains. The very poorly drained Lorain soils and the poorly drained Trumbull soils are in depressions and on flats.

This association is used mainly as cropland or pasture. A few areas are used for woodland or building site development. Most areas are moderately well suited to row crops, but sloping areas and undrained areas of the Remsen soils are poorly suited. Most areas are moderately well suited to woodland and poorly suited to septic tank absorption fields. The Geeburg soils are moderately well suited to building site development, but the Remsen soils are poorly suited. The very slow permeability, the seasonal wetness, and the hazard of erosion are the major management concerns.

7. Venango-Cambridge-Sebring Association

Nearly level to sloping, poorly drained to moderately well drained soils formed in medium textured glacial till and in medium textured and moderately fine textured lacustrine material

This association is on broad flats and in undulating areas on till plains that have sloping areas in widely separated valleys. Slopes are long and uniform in some areas. They range from 0 to 12 percent.

This association makes up about 1 percent of the county. It is about 35 percent Venango soils, 25 percent Cambridge soils, 20 percent Sebring soils, and 20 percent soils of minor extent.

Venango soils are deep, nearly level and gently sloping, and somewhat poorly drained. They are on broad flats, low knolls, and side slopes. Typically, the surface layer is dark grayish brown silt loam. The subsoil is pale brown and yellowish brown, mottled silt loam and loam in the upper part; a fragipan of dark yellowish brown loam and silt loam in the next part; and yellowish brown loam in the lower part. Permeability is moderate above the fragipan and slow or very slow in the fragipan. Available water capacity is low. A perched seasonal high water table is at a depth of 6 to 18 inches during extended wet periods.

Cambridge soils are deep, gently sloping and sloping, and moderately well drained. They are on knolls, ridgetops, and side slopes. Typically, the surface layer is brown silt loam. The subsoil is yellowish brown silt loam in the upper part, a fragipan of dark yellowish brown loam in the next part, and yellowish brown silt loam in the lower part. Permeability is moderate above the fragipan and slow or very slow in the fragipan. Available water capacity is low. A perched seasonal high water table is at a depth of 18 to 36 inches during extended wet periods.

Sebring soils are deep, nearly level, and poorly drained. They are on flats, in slightly concave areas, and in depressions. Typically, the surface layer is dark gray silt loam. The subsurface layer is gray and light brownish gray, mottled silt loam. The subsoil is mottled silt loam. It is light brownish gray in the upper part and yellowish brown in the lower part. Permeability is slow or moderately slow, and available water capacity is high. A perched seasonal high water table is near or above the surface during extended wet periods.

The most extensive minor soils in this association are the Chili, Holly, and Orrville soils. The well drained Chili soils are on terraces along streams. Holly and Orrville soils formed in alluvium on flood plains.

This association is used mainly as cropland. Some areas are used for pasture, woodland, or building site development. The nearly level areas are well suited to row crops where drained and poorly suited where undrained. Most of the other areas in the association are well suited or moderately well suited to row crops. The Venango and Sebring soils are moderately well suited to woodland and poorly suited to building site development. The Cambridge soils are well suited to woodland and moderately well suited to building site development. The Sebring soils are generally unsuited to septic tank absorption fields, and most of the other soils in the association are poorly suited. The very slow to moderately slow permeability, the seasonal wetness, ponding, and the hazard of erosion are the major management concerns.

Moderately Deep Soils on Till Plains

These soils make up about 5 percent of the county. They are nearly level to moderately steep, well drained and somewhat poorly drained soils on bedrock-controlled till plains. The landscape is characterized by flats, undulating areas, and dissected areas along drainageways. Most areas are used for woodland, pasture, or urban development. Hard bedrock at a depth of 20 to 40 inches, seepage, the hazard of erosion, the slope, and seasonal wetness are the major management concerns.

8. Loudonville-Mitiwanga Association

Nearly level to moderately steep, well drained and somewhat poorly drained soils formed in moderately fine textured to moderately coarse textured glacial till

This association is in areas on till plains where the shape of the landscape is controlled by the underlying sandstone bedrock. Most areas are undulating. Those along drainageways are dissected. Slopes range from 0 to 18 percent.

This association makes up about 5 percent of the county. It is about 45 percent Loudonville soils, 20 percent Mitiwanga soils, and 35 percent soils of minor extent.

Loudonville soils are moderately deep, gently sloping to moderately steep, and well drained. They are on side slopes, ridgetops, and knolls. Typically, the surface layer is brown silt loam. The subsoil is dark yellowish brown and yellowish brown silt loam in the upper part and yellowish brown loam in the lower part. Permeability is moderate, and available water capacity is low.

Mitiwanga soils are moderately deep, nearly level and gently sloping, and somewhat poorly drained. They are on flats, knolls, and side slopes. Typically, the surface layer is dark grayish brown silt loam. The subsurface layer is pale brown, mottled silt loam. The subsoil is yellowish brown, mottled silt loam and clay loam in the upper part and grayish brown, mottled clay loam in the lower part. Permeability is moderate, and available water capacity is low. A perched seasonal high water table is at a depth of 12 to 30 inches during extended wet periods.

The most extensive minor soils in this association are the deep Canfield, Ellsworth, Mahoning, Rittman, and Wadsworth soils on knolls, side slopes, and flats.

This association is used as woodland or pasture. Some areas are used as sites for buildings, and a few are used as cropland. Most areas are well suited or moderately well suited to row crops, but undrained, nearly level areas and moderately steep areas are poorly suited. Most areas are moderately well suited or well suited to woodland. The Mitiwanga soils and the moderately steep soils are poorly suited to building site development, but most of the other soils in the association are moderately well suited. Most areas are poorly suited to septic tank absorption fields. Hard bedrock at a depth of 20 to 40 inches, seepage, the hazard of erosion, the slope, and the seasonal wetness are the major management concerns.

Deep Soils on Stream Terraces, Outwash Plains, and Kames

These soils make up about 10 percent of the county. They are nearly level to very steep, well drained and somewhat poorly drained soils on broad flats, in undulating areas, and on the sides of valleys. Most areas are used for crops, pasture, woodland, or urban development. Droughtiness, the hazard of erosion, the slope, and seasonal wetness are the major management concerns.

9. Chili-Jimtown-Oshtemo Association

Nearly level to very steep, well drained and somewhat poorly drained soils formed in coarse textured and moderately coarse textured glacial outwash

This association is on broad flats, in undulating areas, and in dissected areas on stream terraces, outwash plains, and kames. Slopes range from 0 to 50 percent.

This association makes up about 10 percent of the county. It is about 35 percent Chili soils, 25 percent Jimtown soils, 10 percent Oshtemo soils, and 30 percent soils of minor extent.

Chili soils are deep, nearly level to very steep, and well drained. They are on stream terraces, outwash plains, and kames. Typically, the surface layer is dark grayish brown loam. The subsoil is yellowish brown loam in the upper part, strong brown sandy clay loam in the next part, and dark yellowish brown and brown gravelly sandy loam and very gravelly sandy loam in the lower part. Permeability is moderately rapid, and available water capacity is moderate or low.

Jimtown soils are deep, nearly level and gently sloping, and somewhat poorly drained. They are on stream terraces and outwash plains. Typically, the surface layer is dark grayish brown loam. The subsoil is brown and grayish brown, mottled loam in the upper part and dark yellowish brown and brown, mottled gravelly loam and gravelly sandy clay loam in the lower part. Permeability and available water capacity are moderate. A seasonal high water table is at a depth of 12 to 30 inches during extended wet periods.

Oshtemo soils are deep, gently sloping to very steep, and well drained. They are on stream terraces, outwash plains, and kames. Typically, the surface layer is brown sandy loam. The subsoil is yellowish brown and brown sandy loam in the upper part and brown and dark yellowish brown loamy sand in the lower part. Permeability is moderately rapid in the upper part of the subsoil and very rapid in the lower part and in the substratum. Available water capacity is moderate or low.

The most extensive minor soils in this association are the Damascus, Fitchville, Holly, Sebring, and Tioga soils. The poorly drained Damascus soils are in depressions and on flats. Fitchville and Sebring soils have more silt throughout than the major soils. They are in the basins of former glacial lakes. Holly and Tioga soils formed in alluvium on flood plains.

This association is used mainly for crops, pasture, woodland, or urban development. The principal crops are corn, wheat, oats, and hay. Many areas are used for truck crops, such as sweet corn, potatoes, and melons. The moderately steep to very steep soils are used as woodland or pasture. Most nearly level to sloping areas are moderately well suited or well suited to row crops, but the steeper areas are poorly suited or generally unsuited. Undrained, nearly level areas of the Jimtown soils are poorly suited to row crops. Most areas are well suited or moderately well suited to woodland. The Jimtown soils are poorly suited to building site development. The Chili and Oshtemo soils generally are well suited to building site development, but the very steep areas are generally unsuited and the moderately steep areas are only moderately well suited. The Jimtown soils are poorly suited to septic tank absorption fields, but most of the other soils in the association are well suited or moderately well suited. The very steep areas are generally unsuited. Droughtiness, the hazard of erosion, the seasonal wetness, and the slope are the major management concerns.

Deep Soils on Terraces, Flood Plains, and Till Plains and in Basins of Former Glacial Lakes

These soils make up about 21 percent of the county. They are level to gently sloping, very poorly drained to well drained soils on broad flats and in long, narrow areas. They are used for crops, pasture, woodland, urban development, or habitat for wetland wildlife. Flooding, seasonal wetness, ponding, low strength, seepage, and moderately slow or very slow permeability are the major management concerns.

10. Fitchville-Haskins-Sebring Association

Nearly level and gently sloping, somewhat poorly drained and poorly drained soils formed in medium textured and moderately fine textured lacustrine material and in medium textured to coarse textured glacial outwash over moderately fine textured and fine textured glacial till or lacustrine material

This association is on broad flats and in undulating areas on terraces and till plains and in the basins of former glacial lakes. Low-gradient, sluggish streams are common. Slopes range from 0 to 6 percent.

This association makes up about 15 percent of the county. It is about 30 percent Fitchville soils, 30 percent Haskins soils, 15 percent Sebring soils, and 25 percent soils of minor extent.

Fitchville soils are deep, nearly level and gently sloping, and somewhat poorly drained. They are on slight rises and low knolls in the basins of former glacial lakes. Typically, the surface layer is dark grayish brown silt loam. The subsoil is yellowish brown and grayish brown, mottled silt loam and silty clay loam. Permeability is moderately slow, and available water capacity is high. A perched seasonal high water table is at a depth of 12 to 30 inches during extended wet periods.

Haskins soils are deep, nearly level and gently sloping, and somewhat poorly drained. They are on terraces and till plains. Typically, the surface layer is dark grayish brown loam. The subsoil is yellowish brown and dark yellowish brown, mottled loam and clay loam in the upper part; dark yellowish brown, mottled sandy loam and sandy clay loam in the next part; and light olive brown, mottled silty clay in the lower part. Permeability is moderate in the upper part of the subsoil and slow or very slow in the lower part and in the substratum. Available water capacity is moderate. A perched seasonal high water table is at a depth of 12 to 30 inches during extended wet periods.

Sebring soils are deep, nearly level, and poorly drained. They are on flats and in slightly concave areas in the basins of former glacial lakes. Typically, the surface layer is dark gray silt loam. The subsurface layer is gray and light brownish gray, mottled silt loam. The subsoil is mottled silt loam. It is light brownish gray in the upper part and yellowish brown in the lower part. Permeability is slow or moderately slow, and available water capacity is high. A perched seasonal high water table is near or above the surface during extended wet periods.

The most extensive minor soils in this association are the Canadice, Caneadea, Damascus, Glenford, and Holly soils. Canadice and Caneadea soils have more clay in the upper part of the subsoil than the major soils. They are in the basins of former glacial lakes. Damascus soils have more sand in the subsoil than the Sebring soils. They are on terraces. The moderately well drained Glenford soils are on knolls and side slopes in the basins of former glacial lakes. Holly soils formed in alluvium on flood plains.

Most drained areas are used as cropland. Undrained areas support trees and brush. Most drained areas are well suited to row crops. Where undrained, the gently sloping areas are moderately well suited to row crops, but the nearly level areas are poorly suited. Most areas are moderately well suited to woodland and poorly suited to building site development. The Sebring soils are generally unsuited to septic tank absorption fields, and most of the other areas in the association are poorly suited. The seasonal wetness, the moderately slow or very slow permeability, the hazard of erosion, and ponding are the major management concerns.

11. Caneadea-Canadice Association

Nearly level and gently sloping, somewhat poorly drained and poorly drained soils formed in moderately fine textured and fine textured lacustrine material

This association is on broad flats and in undulating areas in the basins of former glacial lakes. Low-gradient, sluggish streams are common. Slopes range from 0 to 6 percent.

This association makes up about 3 percent of the county. It is about 60 percent Caneadea soils, 30 percent Canadice soils, and 10 percent soils of minor extent.

Caneadea soils are deep, nearly level and gently sloping, and somewhat poorly drained. They are on slight rises, low knolls, and convex slopes along drainageways. Typically, the surface layer is dark grayish brown silt loam. The subsurface layer is light brownish gray, mottled silty clay loam. The subsoil is yellowish brown, dark yellowish brown, and light olive brown, mottled silty clay loam and silty clay. Permeability is very slow, and available water capacity is moderate or high. A perched seasonal high water table is at a depth of 12 to 30 inches during extended wet periods.

Canadice soils are deep, nearly level, and poorly drained. They are in depressions and on flats. Typically, the surface layer is dark grayish brown silty clay loam. The subsoil is dark gray, mottled silty clay loam and silty clay in the upper part and yellowish brown, mottled silty clay in the lower part. Permeability is very slow, and available water capacity is moderate or high. A seasonal high water table is near or above the surface during extended wet periods.

The most extensive minor soils in this association are the Fitchville, Holly, Lorain, Orrville, and Sebring soils. Fitchville and Sebring soils have less clay in the subsoil than the major soils. They are in positions on the landscape similar to those of the major soils. Holly and Orrville soils formed in alluvium on flood plains. The very poorly drained Lorain soils are lower on the landscape than the major soils.

Some drained areas are used as cropland, but other drained areas and most undrained areas support trees and brush. Drained areas are moderately well suited to row crops, and undrained areas are poorly suited. Most areas are moderately well suited to woodland and poorly suited to building site development. The Canadice soils are generally unsuited to septic tank absorption fields, and most of the other soils in the association are poorly suited. The very slow permeability, the seasonal wetness, and ponding are the major management concerns.

12. Holly-Orrville-Tioga Association

Nearly level, poorly drained, somewhat poorly drained, and well drained soils formed in moderately fine textured to moderately coarse textured alluvium

This association is on flood plains bounded by sloping to very steep soils on slope breaks to the uplands. The landscape is characterized by narrow to relatively broad valley floors. Flooding occurs during extended rainy periods. Slopes are 0 to 2 percent.

This association makes up about 2 percent of the county. It is about 40 percent Holly soils, 30 percent Orrville soils, 20 percent Tioga soils, and 10 percent soils of minor extent.

Holly soils are deep, nearly level, and poorly drained. They are on the lowest and wettest part of the flood plains. Typically, the surface layer is dark grayish brown silt loam. The subsoil is dark gray, grayish brown, and gray, mottled silt loam and loam. Permeability is moderate or moderately slow in the subsoil and moderate or moderately rapid in the substratum. Available water capacity is high. These soils are frequently flooded. A seasonal high water table is near the surface during extended wet periods.

Orrville soils are deep, nearly level, and somewhat poorly drained. They are on flood plains. Typically, the surface layer is dark grayish brown silt loam. The subsoil is brown and grayish brown, mottled silt loam. It has thin strata of loam in the lower part. Permeability is moderate, and available water capacity is high. These soils are frequently flooded. A seasonal high water table is at a depth of 12 to 30 inches during extended wet periods.

Tioga soils are deep, nearly level, and well drained. They are on flood plains. Typically, the surface layer is dark grayish brown loam. The subsoil is brown and yellowish brown loam and sandy loam. Permeability is moderate or moderately rapid, and available water capacity is moderate. In the highest positions on the flood plains, these soils are occasionally flooded, but in other areas they are frequently flooded. A seasonal high water table is at a depth of 36 to 72 inches during extended wet periods.

The most extensive minor soils in this association are the Canadice, Caneadea, Damascus, Jimtown, and Sebring soils. Canadice and Caneadea soils have more clay in the subsoil than the major soils. They are in the basins of former glacial lakes. Damascus and Jimtown soils formed in stratified glacial outwash on stream terraces. Sebring soils have more silt and less sand in the subsoil than the Holly soils. They are on slack-water terraces.

Most areas of this association are used as woodland, but a few are used as pasture. Undrained areas of the Holly and Orrville soils are poorly suited to row crops, but drained areas of these soils and areas of the Tioga soils are moderately well suited or well suited. Most areas are well suited or moderately well suited to woodland. They are generally unsuited to building site development and septic tank absorption fields. The frequent or occasional flooding and the seasonal wetness are the major management concerns.

13. Carlisle Association

Level, very poorly drained soils formed in organic deposits

This association is in low areas in bogs and swales on terraces, on till plains, and in the basins of former glacial lakes. It is ponded much of the year. The vegetation is commonly water-tolerant reeds, sedges, and brush. Slopes are 0 to 1 percent.

This association makes up less than 1 percent of the county. It is about 85 percent Carlisle soils and 15 percent soils of minor extent.

Carlisle soils are deep, level, and very poorly drained. Typically, the surface layer is black muck. Layers of black and very dark gray muck are below the surface layer. Permeability is moderately slow to moderately rapid, and available water capacity is very high. A seasonal high water table is near or above the surface for long periods.

The most extensive minor soils in this association are the Canadice, Holly, Lorain, and Sebring soils. These soils formed in mineral material. The poorly drained Canadice and Sebring and very poorly drained Lorain soils are in the slightly higher areas in the basins of former glacial lakes. Holly soils are on flood plains.

Most areas of this association are used as habitat for wetland wildlife. The soils are generally unsuited to crops, pasture, woodland, building site development, and septic tank absorption fields. They are well suited to habitat for wetland wildlife. Ponding, low strength, and seepage are the major management concerns.

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 substratum, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the substratum. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Ellsworth silt loam, 2 to 6 percent slopes, is a phase of the Ellsworth series.

Some map units are made up of two or more major soils. These map units are called soil complexes. A *soil complex* consists of two or more soils, or one or more soils and a miscellaneous area, in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Caneadea-Canadice complex, 0 to 2 percent slopes, is an example.

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

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

Some soil boundaries and soil names in this survey do not fully match those in the surveys of adjoining counties that were published at an earlier date. Most differences result from a better knowledge of soils or from modifications and refinements of soil series concepts. Some differences result from the predominance of different soils in map units consisting of soils of two or more series and from variations in the range in slope allowed within the map units in different surveys.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

Soil Descriptions

BrF—Brecksville silt loam, 25 to 50 percent slopes. This moderately deep, very steep, well drained soil is in dissected areas on upland side slopes. Most areas are long and narrow and range from 5 to 25 acres in size.

Typically, the surface layer is black, very friable silt loam about 2 inches thick. The subsoil is about 24 inches thick. The upper part is yellowish brown and light yellowish brown, friable silt loam and firm silty clay loam, and the lower part is light olive brown, firm shaly silty clay loam and shaly silty clay. Very dark grayish brown and olive brown, thinly bedded, weathered shale is at a depth of about 26 inches.

Included with this soil in mapping are narrow bands of the well drained Chili and Oshtemo soils on the lower part of hillsides. Also included are strips of the poorly drained Holly and somewhat poorly drained Orrville soils on very narrow flood plains. Included soils make up about 10 percent of most areas.

Permeability is slow in the Brecksville soil, and runoff is very rapid. The root zone is moderately deep to soft shale bedrock and has a low available water capacity.

Most of the acreage is used as woodland. This soil is generally unsuited to farming because of the very steep slopes. It is highly susceptible to erosion. A good plant cover helps to control erosion.

This soil is moderately well suited to woodland and well suited to habitat for woodland wildlife. Building logging roads and skid trails on the contour facilitates the use of equipment and helps to control erosion. Water bars and a vegetative cover also help to control erosion. Frequent, light thinning and harvesting can increase the vigor of the stand and reduce the windthrow hazard.

This soil is generally unsuited to building site development and septic tank absorption fields because of the slope. The hazard of erosion is severe if vegetation is removed. Low strength, the susceptibility to slippage, the slow permeability, and the moderate depth to bedrock limit many uses.

Trails in recreational areas should be protected against erosion and established across the slope wherever possible.

The land capability classification is VIIe. The woodland ordination symbol is 4R.

CaB—Cambridge silt loam, 2 to 6 percent slopes. This deep, gently sloping, moderately well drained soil is on knolls, convex ridgetops, and side slopes on till plains. Most areas are irregularly shaped and range from 3 to 65 acres in size.

Typically, the surface layer is brown, friable silt loam about 8 inches thick. The subsoil is about 50 inches thick. The upper part is yellowish brown, friable and firm silt loam; the next part is a dense fragipan of dark yellowish brown, very firm loam; and the lower part is yellowish brown, firm silt loam. The substratum to a depth of about 70 inches is yellowish brown, firm silt loam. In some areas the soil is moderately eroded and has a surface layer of gravelly silt loam.

Included with this soil in mapping are small areas of the somewhat poorly drained Venango soils on foot slopes and along drainageways. These soils make up about 15 percent of most areas.

The Cambridge soil has a perched seasonal high water table at a depth of 18 to 36 inches during extended wet periods. Permeability is moderate above the fragipan and slow or very slow in the fragipan. Runoff is medium. The root zone is restricted mainly to the part of the profile above the fragipan. This zone has a low available water capacity.

This soil is used mainly for row crops, pasture, or woodland. It is well suited to corn, hay, and pasture. Row crops can be grown frequently if intensive management is used to control erosion. Properly managing crop residue and growing cover crops increase the content of organic matter, improve tilth, help to control erosion, and increase the rate of water infiltration. The seasonal wetness sometimes delays planting. The soil is subject to compaction if tillage and harvesting activities are performed during excessively wet periods. The surface layer crusts after heavy rainfall, especially in tilled areas. Shallow cultivation of intertilled crops breaks up the crust. A drainage system may be needed in seep areas and in the wetter included soils.

This soil is well suited to woodland. Machine planting of tree seedlings is practical on this soil. Harvesting procedures that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. The species that are tolerant of a root-restricting layer in the subsoil should be selected for planting.

This soil is moderately well suited to building site development, but it is poorly suited to septic tank absorption fields because of the seasonal wetness and the slowly permeable or very slowly permeable fragipan. It is better suited to dwellings without basements than to dwellings with basements. Properly landscaping building sites helps to keep surface water away from foundations. Drains at the base of footings and exterior basement wall coatings help to keep basements dry. Increasing the size of septic tank absorption fields and installing perimeter drains improve the effectiveness of the septic tank system. Local roads and streets can be improved by a drainage system and suitable base material, which minimize the damage caused by frost action.

The land capability classification is IIe. The woodland ordination symbol is 5D.

CaC—Cambridge silt loam, 6 to 12 percent slopes. This deep, sloping, moderately well drained soil is on ridgetops and side slopes along well defined drainageways on till plains. Most areas are long and narrow or irregularly shaped and range from 3 to 50 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The subsoil is about 45 inches thick. It is mottled below a depth of about 17 inches. The upper part is yellowish brown and dark yellowish brown, firm loam and silt loam; the next part is a dense fragipan of dark yellowish brown, very firm loam; and the lower part is yellowish brown, firm loam. The substratum to a depth of about 60 inches is yellowish brown and brown, firm silt loam and loam. In some areas the soil is moderately eroded and has a surface layer of gravelly silt loam.

Included with this soil in mapping are small areas of the somewhat poorly drained Venango soils on foot slopes and along drainageways. These soils make up about 15 percent of most areas.

The Cambridge soil has a perched seasonal high water table at a depth of 18 to 36 inches during extended wet periods. Permeability is moderate above the fragipan and slow or very slow in the fragipan. Runoff is rapid. The root zone is restricted mainly to the part of the profile above the fragipan. This zone has a low available water capacity.

This soil is used mainly for row crops, pasture, or woodland. It is well suited to corn, hay, and pasture. It can be cropped successfully, but the cropping system should include long-term hay or pasture. Erosion is a management concern, especially if slopes are long. The surface layer crusts after heavy rainfall, especially in tilled areas. Shallow cultivation of intertilled crops breaks up the crust. Applying a system of minimum tillage and growing cover crops increase the content of organic matter, improve tilth, reduce the hazard of erosion, and increase the rate of water infiltration. Grassed waterways are needed. Some areas with long slopes can be farmed on the contour. Random subsurface drains may be needed in the wetter included soils.

This soil is moderately well suited to building site development. Because of the seasonal wetness, it is better suited to dwellings without basements than to dwellings with basements. Buildings should be designed so that they conform to the natural slope of the land. Land shaping is needed in some areas. Drains at the base of footings and exterior basement wall coatings help to keep basements dry. Increased runoff and erosion occur during construction. They can be controlled by maintaining a plant cover wherever possible. Local roads can be improved by strengthening or replacing the base material and installing drains. These measures minimize the damage caused by frost action.

This soil is poorly suited to septic tank absorption fields because of the seasonal wetness and the slowly permeable or very slowly permeable fragipan. Increasing the size of the absorption fields and installing perimeter drains improve the effectiveness of the septic tank system. Installing the distribution lines across the slope helps to prevent seepage of the effluent to the surface.

The land capability classification is IIIe. The woodland ordination symbol is 5D.

Cb—Canadice silty clay loam. This deep, nearly level, poorly drained soil is in depressions and on flats in the basins of former glacial lakes. It receives runoff from the higher adjacent soils and is subject to ponding. Most areas are irregularly shaped and range from 5 to 200 acres in size. Slopes are 0 to 2 percent.

Typically, the surface layer is dark grayish brown, friable silty clay loam about 8 inches thick. The subsoil is dark gray, mottled, firm silty clay about 37 inches thick. The substratum to a depth of about 64 inches is olive brown, mottled, firm silty clay.

Included with this soil in mapping are small areas of the somewhat poorly drained Caneadea and Fitchville soils on slight rises and the very poorly drained Lorain soils in the lowest part of some depressions. Also included are scattered small areas of Sebring soils, which have less clay in the subsoil than the Canadice soil. Included soils make up about 15 percent of most areas.

The Canadice soil has a seasonal high water table near or above the surface during extended wet periods. Permeability is very slow. Runoff is very slow or ponded. The root zone is deep. Available water capacity is moderate or high.

Most areas are wooded or pastured. A few have been cleared and are used as cropland.

The excessive wetness and the very slow permeability are the major limitations that affect farming. They commonly delay tillage. Drained areas are moderately well suited to cropland, hay, and pasture, but undrained areas are poorly suited. Maintaining tilth and desirable forage stands is difficult in undrained areas. The very slow internal water movement reduces the effectiveness of subsurface drains. Outlets for these drains are not available in many areas. Surface drains can remove surface water. The soil is subject to compaction and hard clodding if tillage or harvesting activities are performed during wet periods. Properly managing crop residue and growing cover crops increase the rate of water infiltration and the content of organic matter and improve tilth.

This soil is moderately well suited to woodland. The trees can be logged when the soil is frozen or during the drier parts of the year. Planting techniques that spread the roots of the seedlings and improve the soil-root contact reduce the seedling mortality rate. Harvesting procedures that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard.

This soil is poorly suited to building site development because of the ponding and is generally unsuited to septic tank absorption fields because of the ponding and the very slow permeability. Drainage can be improved by surface drains, storm sewers, and open ditches. Properly landscaping building sites helps to keep surface water away from foundations. Backfilling around foundations with material that has a low shrink-swell potential helps to prevent the structural damage caused by shrinking and swelling. Local roads and streets can be improved by a drainage system and by suitable base material, which improves soil strength.

Play areas and walkways require special surfacing material.

The land capability classification is IVw. The woodland ordination symbol is 4W.

CcA—Caneadea silt loam, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil is on slightly convex rises in the basins of former glacial lakes. Most areas are irregularly shaped and range from 10 to 150 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is light brownish gray, mottled, friable silty clay loam about 4 inches thick. The subsoil is about 31 inches of yellowish brown, dark yellowish brown, and light olive brown, mottled, firm silty clay loam and silty clay. The substratum to a depth of about 79 inches is olive brown, mottled, firm silty clay.

Included with this soil in mapping are small areas of the poorly drained Sebring and Canadice soils in shallow depressions and drainageways. These soils make up about 15 percent of most areas.

The Caneadea soil has a perched seasonal high water table at a depth of 12 to 30 inches during extended wet periods. Permeability is very slow. Runoff is slow. The root zone is deep. Available water capacity is moderate.

Most areas are wooded or covered with brush. Drained areas of this soil are moderately well suited to cropland and pasture, but undrained areas are poorly suited. Planting is delayed in undrained areas. The slow internal water movement reduces the effectiveness of subsurface drains, so a combination of surface and subsurface drains is needed. Even if drained, the soil dries out slowly in spring. It can be easily tilled only within a narrow range of moisture content. It puddles and clods if it is worked when wet. Tilling and grazing should be controlled because of the hazard of excessive compaction.

This soil is moderately well suited to woodland. The species selected for planting should be those that are tolerant of the high content of clay in the subsoil and of some wetness. Planting techniques that spread the roots of the seedlings and improve the soil-root contact reduce the seedling mortality rate. Harvesting procedures that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard.

This soil is poorly suited to building site development. Because of the seasonal wetness and a moderate shrink-swell potential, it is better suited to dwellings without basements than to dwellings with basements. Ditches, storm sewers, and subsurface drains can improve drainage. Properly landscaping building sites helps to keep surface water away from foundations. Properly designing foundations and footings helps to prevent the structural damage caused by shrinking and swelling. Local roads can be improved by a drainage system and suitable base material, which minimize the damage caused by frost action and low strength.

This soil is poorly suited to septic tank absorption fields. The efficiency of the septic tank system can be improved by increasing the number and length of laterals. In areas where suitable outlets are available, curtain or perimeter drains can help to lower the seasonal high water table. Alternative disposal systems, such as mound systems, should be considered. A community sewage system is the most efficient, trouble-free method of sewage disposal.

Play areas and walkways require special surfacing material.

The land capability classification is IIIw. The woodland ordination symbol is 4C.

CcB—Caneadea silt loam, 2 to 6 percent slopes. This deep, gently sloping, somewhat poorly drained soil is on low knolls and in convex areas along drainageways in the basins of former glacial lakes. Most areas are irregularly shaped and range from 5 to 20 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 6 inches thick. The subsoil is about 36 inches of brown and yellowish brown, mottled, firm silty clay loam and clay. The substratum to a depth of about 60 inches is brown and olive brown, mottled, firm silty clay. In some areas the soil is eroded and has a surface layer of silty clay loam.

Included with this soil in mapping are small areas of the poorly drained Canadice soils in shallow depressions and drainageways. These soils make up about 15 percent of most areas.

The Caneadea soil has a perched seasonal high water table at a depth of 12 to 30 inches during extended wet periods. Permeability is very slow. Runoff is medium. The root zone is deep. Available water capacity is moderate.

Most areas are wooded or covered with brush. Drained areas of this soil are moderately well suited to crops and pasture, but undrained areas are poorly suited. Planting is delayed in undrained areas. The slow internal water movement reduces the effectiveness of subsurface drains, so a combination of surface and subsurface drains is needed. Erosion is a hazard if cultivated crops are grown. Properly managing crop residue and growing cover crops increase the rate of water infiltration and the content of organic matter and improve tilth. The soil puddles and clods if it is worked when wet. Tilling and grazing should be controlled because of the hazard of excessive compaction.

This soil is moderately well suited to woodland. The species selected for planting should be those that are tolerant of some wetness. Planting techniques that spread the roots of the seedlings and improve the soil-root contact reduce the seedling mortality rate. Harvesting procedures that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard.

This soil is poorly suited to building site development because of the seasonal wetness. It is better suited to dwellings without basements than to dwellings with basements. Ditches, storm sewers, and subsurface drains can improve drainage. Properly landscaping building sites helps to keep surface water away from foundations. Properly designing foundations and footings helps to prevent the structural damage caused by shrinking and swelling. Drains at the base of footings and exterior basement wall coatings help to keep basements dry. Local roads can be improved by a drainage system and suitable base material, which minimize the damage caused by frost action and low strength.

This soil is poorly suited to septic tank absorption fields because of the seasonal high water table and the very slow permeability. The efficiency of the septic tank system can be improved by increasing the number and length of laterals. In areas where suitable outlets are available, curtain or perimeter drains can help to lower the seasonal high water table. Alternative disposal systems, such as two separate absorption fields, aerobic digesting systems, and mound systems, should be considered. A community sewer system is the most efficient, trouble-free method of sewage disposal.

Play areas and walkways require special surfacing material.

The land capability classification is IIIw. The woodland ordination symbol is 4C.

CdA—Caneadea-Canadice complex, 0 to 2 percent slopes. These deep, nearly level soils are in the basins of former glacial lakes. The somewhat poorly drained Caneadea soil is in the broader, slightly convex or elevated areas. The poorly drained Canadice soil is in the smaller oval areas or in strips along the many small depressions and drainageways. It is subject to ponding. Most areas are irregularly shaped and range from a few hundred to several thousand acres in size. They are about 45 percent Caneadea silt loam and 35 percent Canadice silty clay loam. The two soils occur as areas so intricately mixed or so small that separating them at the scale used in mapping is not practical.

Typically, the Caneadea soil has a surface layer of grayish brown, friable silt loam about 10 inches thick. The subsoil is yellowish brown and dark yellowish brown, mottled, firm silty clay about 42 inches thick. The substratum to a depth of about 60 inches is olive brown, mottled, firm silty clay.

Typically, the Canadice soil has a surface layer of dark grayish brown, friable silty clay loam about 8 inches thick. The subsoil is about 37 inches thick. It is mottled. The upper part is dark gray, firm silty clay loam and silty clay, and the lower part is yellowish brown, firm silty clay. The substratum to a depth of about 80 inches is olive brown, mottled, firm silty clay.

Included with these soils in mapping are scattered small areas of the somewhat poorly drained Fitchville and poorly drained Sebring soils. These included soils have less clay in the subsoil than Caneadea and Canadice soils. They make up about 20 percent of most areas.

During extended wet periods, the Caneadea soil has a perched seasonal high water table at a depth of 12 to 30 inches and the Canadice soil has a water table near or above the surface. Permeability is very slow in both soils. Runoff is slow on the Caneadea soil and very slow or ponded on the Canadice soil. The root zone is deep in both soils. Available water capacity is moderate or high.

Most areas support trees or brush. Only a few areas have been cleared and are used as cropland.

Drained areas of these soils are moderately well suited to crops and pasture, and undrained areas are poorly suited. The wetness and the very slow permeability are the major limitations. They commonly delay tillage. The very slow internal water movement reduces the effectiveness of subsurface drains. Outlets for these drains are not available in most areas. Surface drains are the most effective means of removing surface water. Even if drained, the soils dry out slowly in the spring. They can be easily tilled only within a narrow range of moisture content. They puddle and become cloddy if they are worked when wet. Tilling and grazing should be controlled because of the hazard of excessive compaction.

These soils are moderately well suited to trees that are tolerant of some wetness. Water-tolerant species grow well. The lower areas can be logged when the soils are frozen or during the drier parts of the year.

Planting techniques that spread the roots of the seedlings and improve the soil-root contact reduce the seedling mortality rate. Harvesting procedures that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard.

These soils are poorly suited to building site development. The Caneadea soil is better suited than the Canadice soil, which is subject to ponding. Because of the seasonal wetness and a moderate shrink-swell potential, the soils are better suited to dwellings without basements than to dwellings with basements. Ditches, storm sewers, and subsurface drains can improve drainage. Properly landscaping building sites helps to keep surface water away from foundations. Properly designing foundations and footings helps to prevent the structural damage caused by shrinking and swelling. Local roads can be improved by a drainage system and suitable base material, which minimize the damage caused by wetness, frost action, and low strength.

The Canadice soil is generally unsuited to septic tank absorption fields, and the Caneadea soil is poorly suited. The efficiency of the septic tank system can be improved on the Caneadea soil by increasing the number and length of laterals. In areas where suitable outlets are available, curtain or perimeter drains can help to lower the seasonal high water table. Alternative disposal systems, such as two separate absorption fields, aerobic digesting systems, and mound systems, should be considered. A community sewer system is the most efficient, trouble-free method of sewage disposal.

Play areas and walkways require special surfacing material.

The land capability classification is IVw. The woodland ordination symbol assigned to the Caneadea soil is 4C, and that assigned to the Canadice soil is 4W.

CeA—Caneadea-Urban land complex, 0 to 2 percent slopes. This map unit consists of a deep, nearly level, somewhat poorly drained Caneadea soil intermingled with Urban land. The unit is in the basins of former glacial lakes. Most areas range from 20 to 200 acres in size. They are about 55 percent Caneadea silt loam and 30 percent Urban land. The Caneadea soil and Urban land occur as areas so intricately mixed or so small that separating them at the scale used in mapping is not practical.

Typically, the Caneadea soil has a surface layer of dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 32 inches thick. The upper part is yellowish brown, mottled, firm silty clay and silty clay loam, and the lower part is olive brown, mottled, firm silty clay. The substratum to a depth of about 60 inches is olive and olive brown, mottled, firm silty clay. In places the soil has been radically altered. Some of the low areas have been filled or leveled during construction, and some small areas have been cut, built up, or smoothed.

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

Included in mapping are small areas of the poorly drained Canadice and very poorly drained Lorain soils in depressions. These soils make up about 15 percent of most areas.

Most areas of this map unit are drained by sewer systems, gutters, subsurface drains, and surface ditches. Areas of the Caneadea soil that are not drained have a perched water table at a depth of 12 to 30 inches during extended wet periods. Permeability is very slow in this soil. Runoff is slow. The root zone is deep. Available water capacity is moderate.

The Caneadea soil is used for parks, lawns, or gardens. It is well suited to grasses, flowers, vegetables, trees, and shrubs where excess water is removed by a drainage system. Undrained areas are only moderately well suited to these uses. A combination of surface and subsurface drains works best. The perennial plants that are selected for planting should be those that are fairly tolerant of wetness. Erosion generally is a major problem only in areas where the surface is disturbed and exposed for a considerable period and in watercourses. Areas that have been cut and filled are poorly suited to lawns and gardens. In exposed subsoil and substratum material, tilth is very poor and the content of organic matter is low. This material is sticky when wet and hard when dry.

The Caneadea soil is poorly suited to building site development. Because of the seasonal wetness and a moderate shrink-swell potential, it is better suited to dwellings without basements than to dwellings with basements. Ditches, storm sewers, and subsurface drains can improve drainage. Properly designing the foundations and footings of dwellings and small commercial buildings helps to prevent the structural damage caused by shrinking and swelling. Local roads can be improved by a drainage system and suitable base material, which minimize the damage caused by frost action and low strength.

The Caneadea soil is poorly suited to septic tank absorption fields. All sanitary facilities should be connected to community sewers and sewage treatment facilities. In areas where sewers are not available, the efficiency of septic tank absorption fields can be improved in this very slowly permeable soil by increasing the number and length of laterals. In areas where suitable outlets are available, curtain or perimeter drains can help to lower the seasonal high water table.

No land capability classification or woodland ordination symbol is assigned.

CfB—Canfield silt loam, 2 to 6 percent slopes. This deep, gently sloping, moderately well drained soil is on knolls, convex ridgetops and side slopes on till plains. Most areas are irregularly shaped and range from 3 to 65 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The subsoil is about 49 inches thick. It is mottled below a depth of about 15 inches. The upper part is yellowish brown, friable silt loam; the next part is a dense, brittle fragipan of dark yellowish brown, very firm loam and gravelly loam; and the lower part is light olive brown, firm silt loam. The subtratum to a depth of about 78 inches is light olive brown, mottled, firm silt loam. In some areas the soil is moderately eroded and has a surface layer of gravelly silt loam. In other areas the subsoil has more clay.

Included with this soil in mapping are small areas of the somewhat poorly drained Ravenna soils on foot slopes and along drainageways. These soils make up about 15 percent of most areas.

The Canfield soil has a perched seasonal high water table at a depth of 18 to 36 inches during extended wet periods. Permeability is moderate above the fragipan and slow in the fragipan and the substratum. Runoff is medium. The root zone is restricted mainly to the part of the profile above the fragipan. This zone has a low available water capacity.

This soil is used mainly as cropland, pasture, or woodland. It is well suited to row crops, hay, and pasture. Row crops can be grown frequently if intensive management is used to control erosion. Properly managing crop residue and growing cover crops increase the content of organic matter, improve tilth, help to control erosion, and increase the rate of water infiltration. The soil is subject to compaction if tillage and harvesting activities are performed during excessively wet periods. The seasonal wetness sometimes delays planting. The surface layer crusts after heavy rainfall, expecially in tilled areas. Shallow cultivation of intertilled crops breaks up the crust. A drainage system may be needed in seep areas and in the wetter included soils.

This soil is well suited to woodland. Machine planting of tree seedlings is practical on this soil. Planting seedlings that have been transplanted once can reduce the seedling mortality rate. Harvesting procedures that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. The species selected for planting should be those that are tolerant of a root-restricting layer in the lower part of the subsoil.

This soil is moderately well suited to building site development, but it is poorly suited to septic tank absorption fields because of the seasonal wetness and the slowly permeable fragipan. It is better suited to dwellings without basements than to dwellings with basements. Properly landscaping building sites helps to keep surface water away from foundations. Drains at the base of footings and exterior basement wall coatings help to keep basements dry. Increasing the size of septic tank absorption fields and installing perimeter drains improve the effectiveness of the septic tank system. Local roads and streets can be improved by a drainage system and suitable base material, which minimize the damage caused by frost action.

The land capability classification is IIe. The woodland ordination symbol is 5D.

CfC—Canfield silt loam, 6 to 12 percent slopes. This deep, sloping, moderately well drained soil is on ridgetops and on side slopes along well defined drainageways on till plains. Most areas are long and narrow or irregularly shaped and range from 3 to 50 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The subsoil is about 45 inches thick. It is mottled below a depth of about 17 inches. The upper part is yellowish brown and dark yellowish brown, firm loam and silt loam; the next part is a dense, brittle fragipan of dark yellowish brown, very firm loam; and the lower part is yellowish brown, firm loam. The substratum to a depth of about 60 inches is brown, mottled, firm silt loam and loam. In some areas the soil is moderately eroded and has a surface layer of gravelly silt loam.

Included with this soil in mapping are small areas of the somewhat poorly drained Ravenna soils on foot slopes and along drainageways and small areas of the well drained Wooster soils on narrow ridges and the upper part of the slopes. Included soils make up about 15 percent of most areas.

The Canfield soil has a perched seasonal high water table at a depth of 18 to 36 inches during extended wet periods. Permeability is moderate above the fragipan and slow in the fragipan and the substratum. Runoff is rapid. The root zone is restricted mainly to the part of the profile above the fragipan. This zone has a low available water capacity.

This soil is used mainly for row crops, pasture, or woodland. It is well suited to hay and pasture and moderately well suited to row crops. It can be cropped successfully, but the cropping system should include long-term hay or pasture. Erosion is a management concern, especially if slopes are long. The surface layer crusts after heavy rainfall, especially in tilled areas. Shallow cultivation of intertilled crops breaks up the crust. Applying a system of minimum tillage and growing cover crops increase the content of organic matter, improve tilth, reduce the hazard of erosion, and increase the rate of water infiltration. Grassed waterways are needed. Some areas with long slopes can be farmed on the contour. Random subsurface drains may be needed in the wetter included soils.

This soil is well suited to woodland. Planting seedlings that have been transplanted once can reduce the seedling mortality rate. Harvesting procedures that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard.

This soil is moderately well suited to building site development. Because of the seasonal wetness, it is better suited to dwellings without basements than to dwellings with basements. Buildings should be designed so that they conform to the natural slope of the land. Land shaping is needed in some areas. Drains at the base of footings and exterior basement wall coatings help to keep basements dry. Increased runoff and erosion occur during construction. They can be controlled by maintaining a plant cover wherever possible. Local roads can be improved by strengthening or replacing the base material and by installing a drainage system, which minimizes the damage caused by frost action.

This soil is poorly suited to septic tank absorption fields. Increasing the size of the absorption fields and installing perimeter drains improve the effectiveness of the septic tank system. Installing the distribution lines across the slope helps to prevent seepage of the effluent to the surface.

The land capability classification is IIIe. The woodland ordination symbol is 5D.

CgB—Canfield-Urban land complex, 2 to 8 percent slopes. This map unit consists of a deep, gently sloping, moderately well drained Canfield soil intermingled with Urban land. The unit is on till plains. Most areas range from 5 to 90 acres in size. They are about 55 percent Canfield silt loam and 30 percent Urban land. The Canfield soil and Urban land occur as areas so intricately mixed or so small that separating them at the scale used in mapping is not practical.

Typically, the Canfield soil has a surface layer of dark grayish brown, friable silt loam about 6 inches thick. The subsoil is about 45 inches thick. It is mottled below a depth of about 15 inches. The upper part is yellowish brown, friable silt loam; the next part is a dense, brittle fragipan of dark yellowish brown, very firm loam; and the lower part is light olive brown, firm silt loam. The substratum to a depth of about 60 inches is brown and light olive brown, mottled, firm loam and silt loam. In places the soil has been radically altered. Some of the low areas have been filled or leveled during construction, and some small areas have been cut, built up, or smoothed.

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

Included in mapping are small areas of the somewhat poorly drained Ravenna soils. These soils are generally in depressions and nearly level areas. They make up about 15 percent of most areas.

Most areas of this map unit are drained by sewer systems, gutters, subsurface drains, and surface ditches. Areas of the Canfield soil that are not drained have a perched water table at a depth of 18 to 36 inches during extended wet periods. Permeability is moderate above the fragipan in this soil and slow in the fragipan and substratum. Runoff is medium. The root zone is restricted mainly to the part of the profile above the fragipan. This zone has a low available water capacity.

The Canfield soil is used for parks, lawns, or gardens. It is well suited to grasses, flowers, vegetables, trees, and shrubs. Erosion is a hazard, particularly in areas where the surface is disturbed and exposed for a considerable period and in watercourses. Tilth is very poor in exposed subsoil material. Areas that have been cut and filled are poorly suited to lawns and gardens.

The Canfield soil is moderately well suited to building site development. Drains around footings and other subsurface drains and a surface drainage system are needed. Basement walls should be waterproofed.

The Canfield soil is poorly suited to septic tank absorption fields because of the slow permeability and the seasonal wetness. The effectiveness of the septic tank system can be improved by increasing the size of the absorption field and by installing curtain drains. Installing the distribution lines across the slope helps to prevent seepage of the effluent to the surface. A community sewer system is a better alternative.

No land capability classification or woodland ordination symbol is assigned.

Ch—Carlisle muck, ponded. This deep, level, very poorly drained soil is in low areas in bogs and swales on till plains and terraces and in the basins of former glacial lakes. It is ponded much of the year. Slopes are 0 to 1 percent. Areas range from 3 to more than 500 acres in size. Most are broad and elongated, but a few are oval.

Typically, the surface layer is black, very friable muck about 9 inches thick. Below this to a depth of about 65 inches are layers of black and very dark gray, friable and very friable muck. In some areas mineral material is at a depth of 16 to 51 inches.

Included with this soil in mapping are narrow strips of Sebring and Canadice soils. These soils formed in mineral material on the periphery of many areas. Also included are some areas of frequently flooded soils adjacent to streams. Included soils make up about 15 percent of most areas.

The Carlisle soil has a seasonal high water table near or above the surface for long periods. Permeability is moderately slow to moderately rapid. Runoff is very slow or ponded. The root zone is deep. Available water capacity is very high.

Most areas are used as habitat for wetland wildlife. A few areas are wooded. Some drained areas in Bloomfield Township are used for row crops or sod production.

Because of the ponding, low strength, and seepage, this soil is generally unsuited to crops, pasture, woodland, building site development, and septic tank absorption fields. Establishing drainage outlets is difficult. The fluctuating water level limits the survival of most tree species. Most areas provide good habitat for ducks, beaver, muskrats, and other wetland wildlife.

The land capability classification is Vw. No woodland ordination symbol is assigned.

CnA—Chili loam, 0 to 2 percent slopes. This deep, nearly level, well drained soil is on outwash plains and stream terraces. It is in narrow to broad, irregularly shaped areas that range from 2 to 100 acres in size.

Typically, the surface layer is dark grayish brown, friable loam about 10 inches thick. The subsoil is about 45 inches thick. The upper part is dark yellowish brown, firm loam; the next part is yellowish red, reddish brown, and brown, firm gravelly sandy clay loam; and the lower part is reddish brown and brown, very friable gravelly sandy loam and loose very gravelly loamy sand. The substratum to a depth of about 60 inches is yellowish brown, loose gravelly sand. In some areas the surface layer is silt loam. In a few areas the soil is slightly wetter and has gray mottles in the lower part of the subsoil.

Included with this soil in mapping are small areas of the somewhat poorly drained Jimtown soils in shallow depressions and along drainageways. These soils make up about 15 percent of most areas.

Permeability is moderately rapid in the Chili soil. Runoff is slow. The root zone is deep. Available water capacity is moderate or low.

Most areas are used as cropland. This soil is well suited to corn, wheat, oats, hay, and pasture. It is especially well suited to crops planted early in spring and to grazing early in spring. Pasture grasses grow slowly in summer because the soil tends to be droughty. The soil is well suited to no-till farming or other kinds of minimum tillage. Returning crop residue to the soil and growing cover crops conserve moisture, improve tilth, and maintain the content of organic matter. Because nutrients are leached at a moderately rapid rate, the soil generally is better suited to smaller, more frequent or more timely applications of fertilizer than to one large application.

This soil is well suited to woodland. No major hazards or limitations affect planting or harvesting.

This soil is well suited to building site development and septic tank absorption fields. Sloughing is a hazard in excavations. Nearby ground water may be contaminated if the distribution lines in septic tank absorption fields are installed too deep in the soil. Local roads can be improved by replacing the subsoil with suitable base material, which minimizes the damage caused by frost action. The soil is a probable source of sand and gravel.

The land capability classification is IIs. The woodland ordination symbol is 4A.

CnB—Chili loam, 2 to 6 percent slopes. This deep, gently sloping, well drained soil is on stream terraces, outwash plains, and kames. Most areas are long and narrow or irregularly shaped and range from 10 to 85 acres in size.

Typically, the surface layer is dark grayish brown, friable loam about 7 inches thick. The subsoil is about 72 inches thick. The upper part is yellowish brown, friable loam; the next part is strong brown, firm sandy clay loam and gravelly sandy clay loam; and the lower part is dark yellowish brown and brown, friable gravelly and very gravelly sandy loam. The substratum to a depth of about 84 inches is yellowish brown, loose gravelly sand. In some areas the surface layer is silt loam, gravelly loam, or sandy loam. In a few areas the soil is slightly wetter and has gray mottles in the lower part of the subsoil.

Permeability is moderately rapid in the Chili soil. Runoff is slow or medium. The root zone is deep. Available water capacity is moderate or low.

Most areas are used as cropland. This soil is well suited to oats, wheat, and potatoes and to deep-rooted hay crops, such as alfalfa. Erosion is a moderate hazard if cultivated crops are grown. The soil is well suited to no-till farming or other kinds of minimum tillage, which generally are adequate in controlling erosion. Growing cover crops and establishing grassed waterways help to prevent excessive soil loss.

Figure 4.—An area of Chili loam, 6 to 12 percent slopes, on a kame. Chili loam, 2 to 6 percent slopes, is on an outwash plain in the foreground.

Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration. Plants often show evidence of moisture stress during the drier summer months. Because nutrients are leached at a moderately rapid rate, the soil generally is better suited to smaller, more frequent or more timely applications of fertilizer than to one large application. It is well suited to grazing early in spring.

This soil is well suited to woodland. No major hazards or limitations affect planting or harvesting.

This soil is well suited to building site development and septic tank absorption fields. Maintaining as much vegetation as possible on construction sites reduces the hazard of erosion. Sloughing is a hazard in excavations. Nearby ground water may be contaminated if the distribution lines in septic tank absorption fields are installed too deep in the soil. Local roads can be improved by replacing the subsoil with suitable base material, which minimizes the damage caused by frost action. The soil is a probable source of sand and gravel.

The land capability classification is IIe. The woodland ordination symbol is 4A.

CnC—Chili loam, 6 to 12 percent slopes. This deep, sloping, well drained soil is on stream terraces, outwash plains, and kames (fig. 4). Most areas are long and narrow or irregularly shaped and range from 3 to 35 acres in size.

Typically, the surface layer is brown, friable loam about 7 inches thick. The subsoil is about 35 inches thick. The upper part is brown and reddish brown, firm loam, and the lower part is brown, firm gravelly sandy clay loam and gravelly sandy loam. The substratum to a depth of about 60 inches is brown and yellowish brown, loose gravelly sand. In some areas the surface layer is gravelly loam or gravelly sandy loam.

Included with this soil in mapping are scattered small areas of Oshtemo soils. These soils have less clay in the upper part of the subsoil than the Chili soil. They make up about 10 percent of most areas.

Permeability is moderately rapid in the Chili soil. Runoff is medium. The root zone is deep. Available water capacity is moderate or low.

Most areas are used as cropland. This soil is moderately well suited to row crops, hay, and pasture. Erosion and drought are the main hazards. The soil is well suited to no-till farming or other kinds of minimum tillage. During dry periods the soil is droughty. Because of the limited available water capacity, it is better suited to early maturing crops than to crops that mature late in summer. Returning crop residue to the soil and growing cover crops conserve moisture, increase the content of organic matter, improve tilth, and help to control erosion. Because nutrients are leached at a moderately rapid rate, the soil generally is better suited to smaller, more frequent or more timely applications of fertilizer than to one large application. It is well suited to grazing early in spring.

This soil is well suited to woodland. No major hazards or limitations affect planting or harvesting. The species that are adapted to dry sites should be selected for planting.

This soil is well suited to building site development and moderately well suited to septic tank absorption fields. Buildings should be designed so that they conform to the natural slope of the land. Land shaping is needed in some areas. Maintaining as much vegetation on the site as possible during construction reduces the hazard of erosion. Installing the distribution lines in septic tank absorption fields across the slope helps to prevent seepage of the effluent to the surface. The effluent can pollute ground water if the distribution lines are installed too deep in the soil. Local roads can be improved by replacing the subsoil with suitable base material, which minimizes the damage caused by frost action. Sloughing is a hazard in excavations. The soil is a probable source of sand and gravel.

The land capability classification is IIIe. The woodland ordination symbol is 4A.

CoD—Chili gravelly loam, 12 to 18 percent slopes. This deep, moderately steep, well drained soil is on dissected outwash plains and stream terraces and on kames. Most areas are long and narrow or round and range from 5 to 25 acres in size.

Typically, the surface layer is brown, friable gravelly loam about 6 inches thick. The subsoil is about 34 inches thick. The upper part is dark brown and reddish brown, firm loam and gravelly sandy clay loam, and the lower part is reddish brown, firm gravelly sandy loam. The substratum to a depth of about 60 inches is brown and yellowish brown, loose gravelly loamy sand and gravelly sand. In some areas the surface layer is loam or sandy loam.

Included with this soil in mapping are scattered small areas of Wooster soils, which have a fragipan in the subsoil. Also included are scattered small areas of Oshtemo soils, which have less clay in the upper part of the subsoil than the Chili soil. Included soils make up about 15 percent of most areas.

Permeability is moderately rapid in the Chili soil. Runoff is rapid. The root zone is deep. Available water capacity is moderate or low.

Most areas are used as pasture or woodland. Some are used as cropland.

This soil is poorly suited to row crops because of the moderately steep slopes, the hazard of erosion, and the low or moderate available water capacity. Maintaining perennial vegetation is the best way to control erosion. Alfalfa grows well. A row crop can be grown occasionally if care is taken to prevent excessive erosion. Early season crops, such as oats, are better suited than crops that mature late in the summer. Trash-mulch or no-till methods of seeding pastures can reduce the risk of erosion and conserve moisture. Returning crop residue to the soil or regularly adding other organic material improves fertility and increases the rate of water infiltration.

This soil is moderately well suited to woodland. Building logging roads and skid trails on the contour facilitates the use of equipment and helps to control erosion. Water bars and a vegetative cover also help to control erosion. The species selected for planting should be those that are adapted to dry sites.

This soil is moderately well suited to building site development and septic tank absorption fields. Buildings should be designed so that they conform to the natural slope of the land. Maintaining as much vegetation on the site as possible during construction reduces the hazard of erosion. Installing the distribution lines in septic tank absorption fields across the slope helps to prevent seepage of the effluent to the surface. The effluent can pollute ground water if the distribution lines are installed too deep in the soil. Most local roads require considerable excavation, and sloughing is a hazard in excavations. The soil is a probable source of sand and gravel.

Trails in recreational areas should be protected against erosion and established across the slope if possible.

The land capability classification is IVe. The woodland ordination symbol is 4R.

CrF—Chili-Oshtemo complex, 25 to 50 percent slopes. These deep, very steep, well drained soils are on the dissected parts of terraces. Individual areas are long and narrow and range from 2 to 25 acres in size. Most are about 60 percent Chili gravelly loam and 30 percent Oshtemo sandy loam. The two soils occur as areas so intricately mixed or so small that separating them at the scale used in mapping is not practical.

Typically, the Chili soil has a surface layer of dark grayish brown, friable gravelly loam about 4 inches thick. The subsoil is about 36 inches thick. The upper part is dark yellowish brown, friable loam, clay loam, and gravelly clay loam, and the lower part is brown, friable gravelly loam. The substratum to a depth of about 60 inches is yellowish brown, loose, stratified gravelly loamy sand and gravelly sand.

Typically, the Oshtemo soil has a surface layer of dark grayish brown, friable sandy loam about 6 inches thick. The subsoil is dark brown, friable sandy loam about 34 inches thick. The substratum to a depth of about 60 inches is brown, loose loamy sand and sand. In some areas the subsoil has thin strata of loamy sand.

Included with these soils in mapping are small areas of soils that have 50 to 70 percent gravel in the subsoil and substratum. These included soils are more droughty than the Chili and Oshtemo soils. They make up about 10 percent of most areas.

Permeability is moderately rapid in the Chili soil. It is moderately rapid in the subsoil of the Oshtemo soil and very rapid in the substratum. Runoff is rapid on both soils. The root zone is deep. Available water capacity is low or moderate.

Most areas are wooded. Some are used as pasture.

These soils are generally unsuited to farming because of the very steep slopes. Operating tillage equipment is very difficult. The hazard of erosion is very severe if the plant cover is removed.

These soils are moderately well suited to woodland and to habitat for woodland wildlife. Planting trees in narrow strips helps to control erosion. The species selected for planting should be those that are adapted to dry sites. Building logging roads and skid trails on the contour facilitates the use of equipment and helps to control erosion. Water bars and a vegetative cover also help to control erosion.

These soils are generally unsuited to building site development and septic tank absorption fields. Construction is difficult, and the hazard of erosion is very severe if vegetation is removed. Sloughing is a hazard in excavations.

Trails in recreational areas should be protected against erosion and established across the slope where possible.

The land capability classification is VIIe. The woodland ordination symbol is 4R.

CsB—Chili-Urban land complex, 2 to 6 percent slopes. This map unit consists of a deep, gently sloping, well drained Chili soil intermingled with Urban land. The unit is on stream terraces and outwash plains. Most areas range from 10 to 50 acres in size. They are about 55 percent Chili soil and 30 percent Urban land. The Chili soil and Urban land occur as areas so intricately mixed or so small that separating them at the scale used in mapping is not practical.

Typically, the Chili soil has a surface layer of dark grayish brown, friable loam about 7 inches thick. The subsoil is about 63 inches thick. The upper part is dark yellowish brown and brown, firm loam, gravelly clay loam, and gravelly sandy clay loam. The lower part is dark yellowish brown and brown, very friable and loose gravelly and very gravelly sandy loam. The substratum to a depth of about 80 inches is brown and dark yellowish brown, loose gravelly loamy sand. In places the soil has been radically altered. Some of the low areas have been filled or leveled during construction, and some small areas have been cut, built up, or smoothed.

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

Included in mapping are small areas of Jimtown and Oshtemo soils. The somewhat poorly drained Jimtown soils are in the lower areas. Oshtemo soils have less clay in the upper part of the subsoil than the Chili soil. They are in scattered areas. Included soils make up about 15 percent of most areas.

Permeability is moderately rapid in the Chili soil. Runoff is slow or medium. The root zone is deep. Available water capacity is moderate or low.

The Chili soil is used for parks, lawns, or gardens. It is well suited to grasses, flowers, vegetables, trees, and shrubs and to parks, extensive play areas, and most other recreational uses. Plants may sometimes show evidence of moisture stress during the drier summer months. Erosion generally is a major problem in areas where the surface is disturbed and exposed for a considerable period and in watercourses. Areas that have been cut and filled are poorly suited to lawns and gardens. In exposed subsoil and substratum material, tilth is very poor and the content of organic matter is low.

The Chili soil is well suited to building site development and septic tank absorption fields. Sloughing is a hazard in excavations. The ground water can be contaminated if the distribution lines in septic tank absorption fields are installed too deep in the soil. A community sewer system is generally a better alternative.

No land capability classification or woodland ordination symbol is assigned.

CsC—Chili-Urban land complex, 6 to 12 percent slopes. This map unit consists of a deep, sloping, well drained Chili soil intermingled with Urban land. The unit is on stream terraces and outwash plains. Most areas range from 10 to 40 acres in size. They are about 55 percent Chili soil and 30 percent Urban land. The Chili soil and Urban land occur as areas so intricately mixed or so small that separating them at the scale used in mapping is not practical.

Typically, the surface layer is dark grayish brown, friable loam about 7 inches thick. The subsoil is about 35 inches thick. The upper part is dark yellowish brown, firm gravelly sandy clay loam, and the lower part is brown, firm gravelly loam. The substratum to a depth of about 60 inches is brown and dark yellowish brown, loose gravelly loamy sand and gravelly sand. In places the soil has been radically altered. Some of the low areas have been filled or leveled during construction, and some small areas have been cut, built up, or smoothed.

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

Included in mapping are small areas of Jimtown and Oshtemo soils. The somewhat poorly drained Jimtown soils are in the lower areas. Oshtemo soils have less clay in the upper part of the subsoil than the Chili soil. They are in scattered areas. Included soils make up about 15 percent of most areas.

Permeability is moderately rapid in the Chili soil. Runoff is medium. The root zone is deep. Available water capacity is moderate or low.

The Chili soil is used for parks, lawns, or gardens. It is well suited to lawns, vegetable and flower gardens, trees, and shrubs and to parks, extensive play areas, and most other recreational uses. Plants may sometimes show evidence of moisture stress during the drier summer months. Erosion is a hazard in areas where the surface is disturbed and exposed for a considerable period and in watercourses. Areas that have been cut and filled are poorly suited to lawns and gardens. In exposed subsoil and substratum material, tilth is poor and the content of organic matter is low.

The Chili soil is well suited to building site development and moderately well suited to septic tank absorption fields. Maintaining a plant cover on the site throughout construction minimizes erosion. Buildings should be designed so that they conform to the natural slope of the land. Sloughing is a hazard in excavations. Installing the distribution lines in septic tank absorption fields across the slope helps to prevent seepage of the effluent to the surface. The effluent can pollute ground water if the distribution lines are installed too deep in the soil. A community sewer system is generally a better alternative.

No land capability classification or woodland ordination symbol is assigned.

Ct—Condit silt loam. This deep, nearly level, poorly drained soil is in depressions and on flats on till plains. It receives runoff from the higher adjacent soils and is subject to ponding. Most areas are irregularly shaped and range from 5 to 200 acres in size. Slopes are 0 to 2 percent.

Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The subsurface layer is light brownish gray, mottled, friable silty clay loam about 4 inches thick. The subsoil is about 34 inches thick. It is mottled. The upper part is grayish brown, firm and very firm silty clay loam, and the lower part is dark yellowish brown, very firm silty clay loam. The substratum to a depth of about 80 inches is dark yellowish brown and yellowish brown, very firm silty clay loam. In places the surface layer is silty clay loam.

Included with this soil in mapping are small areas of the somewhat poorly drained Mahoning soils on slight rises and the very poorly drained Lorain soils in the lowest part of some depressions. Also included are scattered small areas of Sebring soils, which have less clay in the subsoil than the Condit soil. Included soils make up about 15 percent of most areas.

The Condit soil has a seasonal high water table near or above the surface during extended wet periods. Permeability is slow. Runoff is very slow or ponded. The root zone is deep. Available water capacity is moderate.

Most areas are wooded or pastured. A few have been cleared and are used as cropland.

The excessive wetness and the slow permeability are the major limitations in the areas used as cropland. They commonly delay tillage. Drained areas are moderately well suited to crops, hay, and pasture, but undrained areas are poorly suited. Maintaining tilth and desirable forage stands is difficult. The slow internal water movement reduces the effectiveness of subsurface drains. Outlets for these drains are not available in many areas. Surface drains can remove surface water. The soil is subject to compaction and hard clodding if tillage or harvesting activities are performed during wet periods. The surface layer crusts after heavy rainfall, especially in tilled areas. Shallow cultivation of intertilled crops breaks up the crust. Properly managing crop residue and growing cover crops increase the rate of water infiltration and the content of organic matter and improve tilth.

This soil is moderately well suited to woodland. The trees can be logged when the soil is frozen or during the drier parts of the year. Planting techniques that spread the roots of the seedlings and improve the soil-root contact reduce the seedling mortality rate. Harvesting procedures that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Plant competition can be controlled by removing vines and the less desirable trees and shrubs.

This soil is poorly suited to building site development because of the ponding and is generally unsuited to septic tank absorption fields because of the ponding and the slow permeability. Drainage can be improved by surface drains, storm sewers, and open ditches. Properly landscaping building sites helps to keep surface water away from foundations. Backfilling around foundations and footings with material that has a low shrink-swell potential helps to prevent the structural damage caused by shrinking and swelling. Local roads can be improved by a drainage system and suitable base material, which minimize the damage caused by frost action and low strength.

Play areas and walkways generally require special surfacing material.

The land capability classification is IIIw. The woodland ordination symbol is 5W.

Da—Damascus loam. This deep, nearly level, poorly drained soil is in depressions and on flats on stream terraces and outwash plains. It receives runoff from the higher adjacent soils and is subject to ponding. Most areas are irregularly shaped and range from 2 to 250 acres in size. Slopes are 0 to 2 percent.

Typically, the surface layer is dark grayish brown, friable loam about 8 inches thick. The subsoil is about 36 inches thick. It is mottled. The upper part is grayish brown and light brownish gray, friable and firm loam and clay loam, and the lower part is light olive brown and grayish brown, friable and firm clay loam and gravelly loam. The substratum to a depth of about 65 inches is grayish brown and brown, mottled, friable sandy loam and gravelly sandy loam. In some areas the surface layer is sandy loam. In a few areas the substratum has more clay.

Included with this soil in mapping are small areas of the somewhat poorly drained Jimtown soils on slight rises. Also included are areas of the somewhat poorly drained Orrville and Holly soils, which formed in alluvium on narrow flood plains. Included soils make up about 15 percent of most areas.

The Damascus soil has a seasonal high water table near or above the surface during extended wet periods. Permeability is moderate in the subsoil and rapid or moderately rapid in the substratum. Runoff is very slow or ponded. The root zone is deep. Available water capacity is moderate.

Most areas are wooded or pastured. A few areas are used as cropland.

The major limitation in the areas of this soil used for farming is the seasonal wetness. Drained areas are well suited to corn, hay, and pasture. Undrained areas are poorly suited to crops and to grazing early in spring. Surface drains can remove surface water. Subsurface drains can remove excess water from the root zone if outlets are available. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is moderately well suited to woodland. The trees can be logged when the soil is frozen or during the drier parts of the year. Planting seedlings that have been transplanted once reduces the seedling mortality rate. Harvesting procedures that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Plant competition can be controlled by removing vines and the less desirable trees and shrubs.

This soil is poorly suited to building site development because of the ponding and is generally unsuited to septic tank absorption fields because of the ponding and the possible contamination of ground water. Drainage can be improved by subsurface drains, storm sewers, and open ditches. Properly landscaping building sites helps to keep surface water away from foundations. Local roads can be improved by a drainage system and suitable base material, which help to control ponding and minimize the damage caused by frost action. Excavation is limited during winter and spring because of the wetness and the instability of cutbanks.

The land capability classification is IIIw. The woodland ordination symbol is 5W.

DrA—Darien silt loam, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil is in broad areas on flats and in small areas at the head of drainageways on till plains. Most areas are irregularly shaped and range from 10 to 200 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 9 inches thick. The subsurface layer is grayish brown, mottled, friable silt loam about 4 inches thick. The subsoil is about 34 inches thick. It is mottled. The upper part is brown and yellowish brown, firm silt loam and clay loam, and the lower part is dark yellowish brown and yellowish brown, firm clay loam and silty clay loam. The substratum to a depth of about 70 inches is yellowish brown, mottled, firm silty clay loam glacial till.

Included with this soil in mapping are small areas of the poorly drained Sebring and Condit soils in depressions. These soils make up about 15 percent of most areas.

The Darien soil has a perched seasonal high water table at a depth of 6 to 18 inches during extended wet periods. Permeability is moderately slow. Runoff is slow. The root zone is restricted mainly to the 30 to 55 inches above compact glacial till. Available water capacity is moderate.

Most areas are used for row crops, hay, or pasture. Some areas are reverting to natural vegetation.

The major limitations in the areas of this soil used for row crops are the seasonal wetness and the moderately slow permeability. Drained areas are well suited to corn and to grasses and legumes for hay or pasture, but undrained areas are poorly suited. Planting commonly is delayed in undrained areas. Both surface and subsurface drains can improve drainage. Because of the moderately slow permeability in the subsoil, subsurface drains should be properly spaced for uniform drainage. Hard clods form if the soil is cultivated when wet. The surface layer crusts after heavy rainfall, especially in tilled areas. Shallow cultivation of intertilled crops breaks up the crust. Because of a hazard of compaction, grazing should be controlled. Returning crop residue to the soil and growing cover crops increase the rate of water infiltration and the content of organic matter and improve tilth.

This soil is moderately well suited to woodland. The trees can be logged when the soil is frozen or during the drier parts of the year. Planting seedlings that have been transplanted once can reduce the seedling mortality rate. Harvesting procedures that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard.

This soil is poorly suited to building site development. Because of the seasonal wetness, it is better suited to dwellings without basements than to dwellings with basements. Ditches and subsurface drains can improve drainage. Properly landscaping building sites helps to keep surface water away from foundations. Properly designing foundations and footings helps to prevent the structural damage caused by shrinking and swelling in the subsoil. Drains at the base of footings and exterior basement wall coatings help to keep basements dry. Local roads can be improved by a drainage system and suitable base material, which minimize the damage caused by frost action.

This soil is poorly suited to septic tank absorption fields. The efficiency of the septic tank system can be improved by increasing the number and length of laterals. In areas where suitable outlets are available, curtain or perimeter drains can help to lower the seasonal high water table. Alternative disposal systems, such as two separate absorption fields, aerobic digesting systems, and mound systems, should be considered. A community sewer system is the most efficient, trouble-free method of sewage disposal.

Play areas and walkways require special surfacing material.

The land capability classification is IIIw. The woodland ordination symbol is 4W.

DrB—Darien silt loam, 2 to 6 percent slopes. This deep, gently sloping, somewhat poorly drained soil is on knolls and side slopes along drainageways on till plains. Most areas are irregularly shaped and range from 10 to 50 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 28 inches of dark yellowish brown, yellowish brown, and grayish brown, mottled, firm silty clay loam and clay loam. The substratum to a depth of about 60 inches is dark yellowish brown, yellowish brown, and brown, firm clay loam and silty clay loam glacial till.

Included with this soil in mapping are small areas of the poorly drained Condit and Sebring soils in depressions. These soils make up about 15 percent of most areas.

The Darien soil has a perched seasonal high water table at a depth of 6 to 18 inches during extended wet periods. Permeability is moderately slow. Runoff is medium. The root zone is restricted mainly to the 30 to 55 inches above compact glacial till. Available water capacity is moderate.

Most areas are used for row crops, hay, or pasture. Some areas are wooded or are reverting to natural vegetation.

Drained areas of this soil are well suited to row crops, hay, and pasture, and undrained areas are moderately well suited. The wetness and the moderately slow permeability limit the suitability for crops that are planted early in spring. Minimizing soil compaction and maintaining desirable forage stands are difficult in undrained areas. Both surface and subsurface drains can improve drainage. Because of the moderately slow permeability, subsurface drains should be properly spaced for uniform drainage. Hard clods form if the soil is cultivated when too wet. The surface layer crusts after heavy rainfall, especially in tilled areas. Shallow cultivation of intertilled crops breaks up the crust. Maintaining good tilth and controlling erosion are difficult in intensively cultivated areas. Tilling and harvesting at the proper moisture content, growing cover crops, and incorporating crop residue into the soil improve tilth, increase the content of organic matter, and help to control erosion.

This soil is moderately well suited to woodland. The trees can be logged when the soil is frozen or during the drier parts of the year. Planting seedlings that have been transplanted once can reduce the seedling mortality rate. Harvesting procedures that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard.

This soil is poorly suited to building site development. Because of the seasonal wetness, it is better suited to dwellings without basements than to dwellings with basements. Ditches and subsurface drains can improve drainage. Properly landscaping building sites helps to keep surface water away from foundations. Properly designing foundations and footings helps to prevent the structural damage caused by shrinking and swelling in the subsoil. Drains at the base of footings and exterior basement wall coatings help to keep basements dry. Excavation is limited by the wetness in winter and spring. A drainage system and suitable base material can minimize the damage to local roads caused by frost action.

This soil is poorly suited to septic tank absorption fields. The efficiency of the septic tank system can be improved by increasing the number and length of laterals. In areas where suitable outlets are available, curtain or perimeter drains can help to lower the seasonal high water table. Alternative disposal systems, such as two separate absorption fields, aerobic digesting systems, and mound systems, should be considered. A community sewer system is the most efficient, trouble-free method of sewage disposal.

Play areas and walkways require special surfacing material.

The land capability classification is IIIw. The woodland ordination symbol is 4W.

Du—Dumps. This map unit is mainly in slag dumps near local steel mills. It also is in areas of concrete chunks, bricks, asphalt, and other nonorganic waste from local construction projects. Areas generally are 10 to 40 acres in size, but the slag dump in Newton and Lordstown Townships is more than 200 acres.

This unit commonly supports only limited vegetation, such as some local spots of locust trees, sweet clover, and noxious weeds. Erosion of the existing fine soil material is a hazard unless the area is adequately covered by a suitable soil layer and vegetation is established.

No land capability classification or woodland ordination symbol is assigned.

EhB—Ellsworth silt loam, 2 to 6 percent slopes. This deep, gently sloping, moderately well drained soil is on knolls and side slopes at the head of drainageways on till plains. Most areas are irregularly shaped and range from 5 to 40 acres in size.

Typically, the surface layer is very dark brown, friable silt loam about 3 inches thick. The subsurface layer is brown, friable silt loam about 4 inches thick. The subsoil is yellowish brown and brown, firm silty clay loam about 32 inches thick. It is mottled below a depth of about 11 inches. The substratum to a depth of about 76 inches is yellowish brown, firm silty clay loam glacial till. In a few eroded areas, the surface layer is silty clay loam.

Included with this soil in mapping are small areas of the somewhat poorly drained Mahoning soils. These soils are in nearly level areas. They make up about 15 percent of most areas.

The Ellsworth soil has a perched seasonal high water table at a depth of 18 to 36 inches during extended wet periods. Permeability is slow or very slow. Runoff is medium. The root zone is restricted mainly to the 28 to 46 inches above compact glacial till. Available water capacity is moderate.

This soil is used for crops, pasture, or woodland. It is moderately well suited to row crops, hay, and pasture. Erosion is the main management concern. Farming on the contour, applying a system of minimum tillage, growing cover crops, incorporating crop residue into the soil, and tilling and harvesting at the optimum moisture content reduce the hazard of erosion, improve tilth, and maintain the content of organic matter. Scattered subsurface drains are needed in the wetter included soils and in wet-weather seeps. Hard clods form if the soil is cultivated when it is too wet. The surface layer crusts after heavy rainfall, especially in tilled areas. Shallow cultivation of intertilled crops breaks up the crust. Grazing when the soil is soft and sticky causes compaction and reduces the growth rate of the plants.

This soil is moderately well suited to woodland. Machine planting of tree seedlings is practical on this soil.

This soil is moderately well suited to building site development. Because of the seasonal wetness, it is better suited to dwellings without basements than to dwellings with basements. Properly designing foundations and footings helps to prevent the structural damage caused by frost action and by shrinking and swelling. Properly landscaping building sites helps to keep surface water away from foundations. Drains at the base of footings and exterior basement wall coatings help to keep basements dry. Local roads can be improved by a drainage system and suitable base material, which minimize the damage caused by low strength and frost action.

This soil is poorly suited to septic tank absorption fields. The efficiency of the septic tank system can be improved by increasing the number and length of laterals. In areas where suitable outlets are available, curtain or perimeter drains can help to lower the seasonal high water table. Alternative disposal systems, such as two separate absorption fields, aerobic digesting systems, and mound systems, should be considered. A community sewer system is the most efficient, trouble-free method of sewage disposal.

The land capability classification is IIIe. The woodland ordination symbol is 4A.

EhB2—Ellsworth silt loam, 2 to 6 percent slopes, eroded. This deep, gently sloping, moderately well drained soil is on knolls and side slopes parallel to drainageways on till plains. Erosion has removed part of the original surface layer, and the present plow layer contains some subsoil material. Most areas are irregularly shaped and range from 5 to 20 acres in size.

Typically, the surface layer is brown, friable silt loam about 6 inches thick. The subsoil is about 25 inches thick. It is mottled below a depth of about 12 inches. The upper part is dark yellowish brown and dark brown, firm silty clay loam, and the lower part is brown and dark yellowish brown, firm clay and silty clay loam. The substratum to a depth of about 60 inches is brown, firm silty clay loam glacial till. In places the surface layer is silty clay loam.

Included with this soil in mapping are narrow strips of the poorly drained Condit and somewhat poorly drained Mahoning soils in slight depressions and on foot slopes. These soils make up about 10 percent of most areas.

The Ellsworth soil has a perched seasonal high water table at a depth of 18 to 36 inches during extended wet periods. Permeability is slow or very slow. Runoff is medium. The root zone is restricted mainly to the 28 to 46 inches above compact glacial till. Available water capacity is moderate.

Most areas have been cleared and are cultivated. Some areas are reverting to natural vegetation.

This soil is moderately well suited to row crops, hay, and pasture. Erosion is the main management concern. Applying a system of minimum tillage, growing cover crops, incorporating crop residue into the soil, and tilling and harvesting at the optimum moisture content reduce the hazard of erosion, improve tilth, and maintain the content of organic matter. The soil is commmonly wet in spring and dry in midsummer. Scattered subsurface drains are needed in the wetter included soils and wet-weather seeps. Hard clods form if the soil is cultivated when it is too wet. The surface layer crusts after heavy rainfall, especially in tilled areas. Shallow cultivation of intertilled crops breaks up the crust. Grazing when the soil is soft and sticky causes compaction and reduces the growth rate of the plants.

This soil is moderately well suited to woodland. Machine planting of tree seedlings is practical on this soil.

This soil is moderately well suited to building site development. Because of the seasonal wetness, it is better suited to dwellings without basements than to dwellings with basements. Properly designing foundations and footings helps to prevent the structural damage caused by frost action and by shrinking and swelling. Properly landscaping building sites helps to keep surface water away from foundations. Drains at the base of footings and exterior basement wall coatings help to keep basements dry. Local roads can be improved by a drainage system and suitable base material, which minimize the damage caused by low strength and frost action.

This soil is poorly suited to septic tank absorption fields. The efficiency of the septic tank system can be improved by increasing the number and length of laterals. In areas where suitable outlets are available, curtain or perimeter drains can help to lower the seasonal high water table. Alternative disposal systems, such as two separate absorption fields, aerobic digesting systems, and mound systems, should be considered. A community sewer system is the most efficient, trouble-free method of sewage disposal.

The land capability classification is IIIe. The woodland ordination symbol is 4A.

EhC2—Ellsworth silt loam, 6 to 12 percent slopes, eroded. This deep, sloping, moderately well drained soil is on ridgetops, on uneven shoulder slopes, and along well defined drainageways on till plains. Erosion has removed part of the original surface layer, and the present plow layer contains some subsoil material. Most areas are long and narrow or irregularly shaped and range from 5 to 25 acres in size.

Typically, the surface layer is brown, friable silt loam about 5 inches thick. The subsoil is about 26 inches thick. It is mottled below a depth of about 12 inches. The upper part is dark yellowish brown and brown, firm silty clay loam, and the lower part is brown and dark yellowish brown, firm clay. The substratum to a depth of about 60 inches is brown, firm silty clay loam glacial till. In places the surface layer is silty clay loam.

Included with this soil in mapping are small areas of the somewhat poorly drained Mahoning soils. These soils are in and along drainageways. They make up about 10 percent of most areas.

The Ellsworth soil has a perched seasonal high water table at a depth of 18 to 36 inches during extended wet periods. Permeability is slow or very slow. Runoff is rapid. The root zone is restricted mainly to the 28 to 46 inches above compact glacial till. Available water capacity is moderate.

Most areas are used as cropland. Some formerly cropped areas are reverting to natural vegetation.

This soil is well suited to hay and pasture. It is poorly suited to row crops. Cropping systems should include a high proportion of long-term hay or pasture. Erosion is a serious hazard, especially if the slopes are long. Random subsurface drains may be needed in the wetter included soils. Hard clods form if the soil is cultivated when it is too wet. The surface layer crusts after heavy rainfall, especially in tilled areas. Shallow cultivation of intertilled crops breaks up the crust. Minimizing tillage, growing cover crops, and tilling at the optimum moisture content reduce the hazard of erosion, improve tilth, and maintain the content of organic matter. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is moderately well suited to woodland. No major hazards or limitations affect planting or harvesting.

This soil is moderately well suited to building site development. Because of the seasonal wetness, it is better suited to dwellings without basements than to dwellings with basements. Buildings should be designed so that they conform to the natural slope of the land. Land shaping is needed in some areas. Properly designing foundations and footings helps to prevent the structural damage caused by frost action and by shrinking and swelling. Drains at the base of footings and exterior basement wall coatings help to keep basements dry. Increased runoff and erosion occur during construction. They can be controlled by maintaining a plant cover wherever possible. Local roads can be improved by strengthening or replacing the base material and by installing a drainage system. These measures minimize the damage caused by frost action and low strength.

This soil is poorly suited to septic tank absorption fields. The efficiency of the septic tank system can be improved by increasing the number and length of laterals. Installing interceptor drains upslope from the absorption field reduces the seasonal wetness. Alternative disposal systems, such as two separate absorption fields, aerobic digesting systems, and mound systems, should be considered. A community sewer system is the most efficient, trouble-free method of sewage disposal.

The land capability classification is IVe. The woodland ordination symbol is 4A.

EhD2—Ellsworth silt loam, 12 to 18 percent slopes, eroded. This deep, moderately steep, moderately well drained soil is in dissected areas on side slopes along drainageways on till plains. Erosion has removed part of the original surface layer, and the present plow layer contains some subsoil material. Most areas are long and narrow and range from 5 to 30 acres in size.

Typically, the surface layer is brown, friable silt loam about 5 inches thick. The subsoil is about 26 inches thick. It is mottled below a depth of about 10 inches. The upper part is dark yellowish brown and brown, firm silty clay loam, and the lower part is brown and dark yellowish brown, firm clay. The substratum to a depth of about 60 inches is brown, firm silty clay loam glacial till. In places the surface layer is silty clay loam.

Included with this soil in mapping are small areas of the somewhat poorly drained Mahoning soils. These soils are on foot slopes, along drainageways, and in seep spots. They make up about 10 percent of most areas.

The Ellsworth soil has a perched seasonal high water table at a depth of 18 to 36 inches during extended wet periods. Permeability is slow or very slow. Runoff is rapid. The root zone is restricted mainly to the 28 to 46 inches above compact glacial till. Available water capacity is moderate.

Most areas are used as pasture or are reverting to natural vegetation. This soil is moderately well suited to grasses and legumes for pasture. It is generally unsuited to row crops because of the slope and the hazard of erosion. Operating tillage equipment, especially large machines, is very difficult. Reseeding with cover crops or companion crops or by trash-mulch or no-till seeding methods can reduce the risk of erosion. Minimum tillage, applications of fertilizer, and controlled grazing help to control erosion, improve tilth, and maintain the content of organic matter.

This soil is moderately well suited to woodland. Building logging roads and skid trails on the contour facilitates the use of equipment and helps to control erosion. Water bars and a vegetative cover also help to control erosion.

Because of the slope and the seasonal wetness, this soil is poorly suited to building site development. Land shaping is needed in many areas. The buildings should be designed so that they conform to the natural slope of the land. Drains at the base of footings and exterior basement wall coatings help to keep basements dry. Properly designing foundations and footings helps to prevent the structural damage caused by shrinking and swelling. Most local roads require considerable excavation. Maintaining as much vegetation on the site as possible during construction reduces the hazard of erosion.

This soil is poorly suited to septic tank absorption fields because of the slope, the seasonal wetness, and the slow or very slow permeability. Installing interceptor drains upslope from the absorption field reduces the seasonal wetness. Increasing the number and length of laterals helps to overcome the slow or very slow permeability. Installing the distribution lines on the contour helps to prevent seepage of the effluent to the surface.

The land capability classification is VIe. The woodland ordination symbol is 4R.

EhF—Ellsworth silt loam, 25 to 50 percent slopes. This deep, very steep, moderately well drained soil is in dissected areas on side slopes along drainageways on till plains. Most areas are long and narrow and range from 5 to 20 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 2 inches thick. The subsurface layer is brown, friable silt loam about 2 inches thick. The subsoil is about 24 inches thick. It is mottled below a depth of about 10 inches. The upper part is dark yellowish brown and brown, firm silty clay loam, and the lower part is brown and dark yellowish brown, firm clay. The substratum to a depth of about 60 inches is brown, firm silty clay loam glacial till. In a few eroded areas, the surface layer is silty clay loam. In places the substratum is clay or silty clay.

Included with this soil in mapping are narrow strips of the moderately deep Lordstown and Brecksville soils on the lower part of the slopes. Also included are strips of the somewhat poorly drained Orrville and well drained Tioga soils on very narrow flood plains. Included soils make up about 10 percent of most areas.

The Ellsworth soil has a perched seasonal high water table at a depth of 18 to 36 inches during extended wet periods. Permeability is slow or very slow. Runoff is very rapid. The root zone is restricted mainly to the 28 to 46 inches above compact glacial till. Available water capacity is moderate.

Most areas are wooded. Because of the very steep slopes, this soil is generally unsuited to crops and pasture. It is moderately well suited to trees and well suited to habitat for woodland wildlife. Erosion is a serious hazard. Building logging roads and skid trails on the contour facilitates the use of equipment and helps to control erosion. Water bars and a vegetative cover also help to control erosion.

This soil is generally unsuited to building site development and septic tank absorption fields because of the very steep slopes and the seasonal wetness. The slow or very slow permeability also is a limitation on sites for septic tank absorption fields. Construction for recreation and urban development is very difficult, and the hazard of erosion is very severe if vegetation is removed.

Trails in recreational areas should be protected against erosion and established across the slope if possible.

The land capability classification is VIIe. The woodland ordination symbol is 4R.

ExB—Ellsworth-Urban land complex, 2 to 8 percent slopes. This map unit consists of a deep, gently sloping, moderately well drained Ellsworth soil intermingled with Urban land. The unit is on till plains. Most areas range from 10 to 350 acres in size. They are about 55 percent Ellsworth silt loam and 30 percent Urban land. The Ellsworth soil and Urban land occur as areas so intricately mixed or so small that separating them at the scale used in mapping is not practical.

Typically, the Ellsworth soil has a surface layer of dark grayish brown, friable silt loam about 7 inches thick. The subsoil is about 32 inches thick. It is mottled below a depth of about 12 inches. The upper part is yellowish brown, firm silty clay loam, and the lower part is dark brown and dark yellowish brown, firm clay and silty clay. The substratum to a depth of about 60 inches is brown, firm silty clay loam and clay loam glacial till. In places the soil has been radically altered. Some of the low areas have been filled or leveled during construction, and other areas have been cut, built up, or smoothed.

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

Included in mapping are small areas of the somewhat poorly drained, nearly level Mahoning soils. These soils make up about 15 percent of most areas.

Most areas of this map unit are drained by sewer systems, gutters, subsurface drains, and surface ditches. Areas of the Ellsworth soil that are not drained have a perched seasonal high water table at a depth of 18 to 36 inches during extended wet periods. Permeability is slow or very slow in this soil. Runoff is medium. The root zone is restricted mainly to the 28 to 46 inches above compact glacial till. Available water capacity is moderate.

The Ellsworth soil is used for parks, woodland, lawns, or gardens. It is moderately well suited to grasses, flowers, vegetables, trees, and shrubs. Erosion is a hazard, particularly in areas where the surface is disturbed and exposed for a considerable period and in watercourses. Tilth is very poor in exposed subsoil material. Areas that have been cut and filled are poorly suited to lawns and gardens.

Because of the wetness and a moderate shrink-swell potential, the Ellsworth soil is only moderately well suited to building site development. If dwellings with basements are constructed, drains around footings and other subsurface drains, adequate waterproofing of basement walls, and a sump pump are needed because of the seasonal high water table. A surface drainage system is needed around all buildings. Properly reinforced foundations, backfill, and drains help to prevent the structural damage caused by shrinking and swelling. Local roads can be improved by a drainage system and suitable base material, which minimize the damage caused by low strength and frost action.

The Ellsworth soil is poorly suited to septic tank absorption fields because of the slow or very slow permeability and the seasonal wetness. Community sewage systems should be used wherever available. In areas where sewers are not available, the efficiency of the sewage system can be improved by increasing the number and length of laterals. In areas where suitable outlets are available, curtain or perimeter drains can help to lower the seasonal high water table.

No land capability classification or woodland ordination symbol is assigned.

EyB—Elnora loamy fine sand, 2 to 6 percent slopes. This deep, gently sloping, moderately well drained soil is on stream terraces. Most areas are irregularly shaped and range from 10 to 30 acres in size.

Typically, the surface layer is very dark grayish brown, very friable loamy fine sand about 4 inches thick. The subsoil is brown, strong brown, and yellowish brown, very friable loamy fine sand about 27 inches thick. The substratum to a depth of about 62 inches is light olive brown and dark yellowish brown, mottled, very friable and loose fine sand and loamy fine sand. In some places the surface layer is fine sandy loam. In other places gravelly loamy fine sand or gravelly fine sand is in part of the subsoil or substratum.

Included with this soil in mapping are small areas of the somewhat poorly drained Jimtown soils. These soils are in depressions and low areas. Also included are areas of the excessively drained Lakin soils on small dunes. Included soils make up about 15 percent of most areas.

The Elnora soil has a seasonal high water table at a depth of 18 to 24 inches during extended wet periods. Permeability is rapid. Runoff is slow or medium. The root zone is deep. Available water capacity is low.

This soil formerly was used mainly as cropland. Currently, most of the acreage is idle land or is used as pasture or woodland.

This soil is moderately well suited to row crops and pasture. Plants often show evidence of moisture stress during the summer. Early season crops, such as oats and winter wheat, and vegetable crops that can be planted early grow well on this soil. Because of a good infiltration rate, the soil is well suited to irrigation. Frost heaving seldom affects deep-rooted perennials, such as alfalfa. Plant nutrients should be added as needed but not in excess as leaching losses are high. Soil blowing is a hazard where the soil is not covered with vegetation. Lack of moisture during the summer of some years is the only limitation in pastured areas.

This soil is moderately well suited to woodland. Mulching around seedlings can reduce the seedling mortality rate.

This soil is moderately suited to building site development. It is one of the more desirable sites for development in the county because it is gently sloping and moderately well drained and is good foundation material. Drains at the base of footings and protective exterior wall coatings help to keep basements dry. Sloughing is a hazard in excavations. Local roads can be improved by a drainage system and suitable base material, which minimize the damage caused by frost action.

This soil is moderately well suited to septic tank absorption fields. In areas where suitable outlets are available, curtain or perimeter drains can help to lower the seasonal high water table. The soil readily absorbs but does not adequately filter the effluent from septic tanks. The effluent can pollute ground water. Installing the absorption field in suitable fill material can improve filtration.

The land capability classification is IIIw. The woodland ordination symbol is 3S.

FcA—Fitchville silt loam, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil is on slightly convex rises in the basins of former glacial lakes. Most areas are oblong, broad, or irregularly shaped and range from 10 to 200 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The subsoil is about 48 inches of yellowish brown and grayish brown, mottled, friable and firm silt loam and silty clay loam. The substratum to a depth of about 72 inches is yellowish brown, mottled, friable silt loam.

Included with this soil in mapping are small areas of the moderately well drained Glenford soils on slight rises and the poorly drained Sebring soils in shallow depressions and along drainageways. Included soils make up about 15 percent of most areas.

The Fitchville soil has a perched seasonal high water table at a depth of 12 to 30 inches during extended wet periods. Permeability is moderately slow. Runoff is slow. The root zone is deep. Available water capacity is high.

Most areas are used as cropland. Drained areas of this soil are well suited to row crops, hay, and pasture, but undrained areas are poorly suited. Row crops can be grown year after year in drained areas. Planting is delayed in undrained areas. Surface drains can remove excess surface water, and subsurface drains can lower the water table. The soil is subject to compaction and hard clodding if tillage or harvesting activities are performed during wet periods. The surface layer crusts after heavy rainfall, especially in tilled areas. Shallow cultivation of intertilled crops breaks up the crust. Properly managing crop residue and growing cover crops increase the content of organic matter, improve tilth, and increase the rate of water infiltration. Because of compaction, grazing should be limited to periods when the surface layer is not soft and sticky.

This soil is moderately well suited to woodland. The species selected for planting should be those that are tolerant of some wetness. No major hazards or limitations affect planting or harvesting.

This soil is poorly suited to building site development because of the seasonal wetness. It is better suited to dwellings without basements than to dwellings with basements. Storm sewers and ditches can help to lower the water table. Drains at the base of footings and exterior basement wall coatings help to keep basements dry. Local roads can be improved by a drainage system and suitable base material, which minimize the damage caused by frost action and low strength.

This soil is poorly suited to septic tank absorption fields because of the seasonal wetness and the moderately slow permeability. The efficiency of the septic tank system can be improved by increasing the number and length of laterals. In areas where suitable outlets are available, curtain or perimeter drains can help to lower the seasonal high water table. Alternative disposal systems, such as two separate absorption fields, aerobic digesting systems, and mound systems, should be considered. A community sewer system is the most efficient, trouble-free method of sewage disposal.

Play areas and walkways require special surfacing material.

The land capability classification is IIw. The woodland ordination symbol is 5A.

FcB—Fitchville silt loam, 2 to 6 percent slopes. This deep, gently sloping, somewhat poorly drained soil is on low knolls in the basins of former glacial lakes. Most areas are irregularly shaped and range from 5 to 80 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The subsoil is about 36 inches of yellowish brown and strong brown, mottled, firm silt loam and silty clay loam. The substratum to a depth of about 60 inches is yellowish brown and brown, mottled, friable silt loam and firm silty clay loam.

Included with this soil in mapping are small areas of the moderately well drained Glenford soils on slight rises and the poorly drained Sebring soils in shallow depressions and along drainageways. Also included are scattered small areas of Caneadea soils, which have more clay in the subsoil than the Fitchville soil. Included soils make up about 15 percent of most areas.

The Fitchville soil has a perched seasonal high water table at a depth of 12 to 30 inches during extended wet periods. Permeability is moderately slow. Runoff is medium. The root zone is deep. Available water capacity is high.

Most areas are used as cropland. Drained areas of this soil are well suited to row crops, hay, and pasture. Undrained areas are moderately well suited to row crops. Erosion is a hazard if cultivated crops are grown. Minimum tillage, crop residue management, and cover crops help to control erosion, maintain the content of organic matter, and improve tilth. The surface layer crusts after heavy rainfall, especially in tilled areas. Shallow cultivation of intertilled crops breaks up the crust. Planting is delayed in undrained areas. The grasses and legumes grown for hay or pasture should be those that are tolerant of wetness. Because of compaction, grazing should be limited to periods when the surface layer is not soft and sticky.

This soil is moderately well suited to woodland. The species selected for planting should be those that are tolerant of some wetness. No major hazards or limitations affect planting or harvesting.

This soil is poorly suited to building site development because of the seasonal wetness. It is better suited to dwellings without basements than to dwellings with basements. Drainage can be improved by subsurface drains, storm sewers, and open ditches. Properly landscaping building sites helps to keep surface water away from foundations. Drains at the base of footings and exterior basement wall coatings help to keep basements dry. Maintaining as much vegetation on the site as possible during construction reduces the hazard of erosion. Local roads can be improved by a drainage system and suitable base material, which minimize the damage caused by frost action and low strength.

This soil is poorly suited to septic tank fields because of the seasonal wetness and the moderately slow permeability. The efficiency of the septic tank system can be improved by increasing the number and length of laterals. In areas where suitable outlets are available, curtain or perimeter drains can help to lower the seasonal high water table. Alternative disposal systems, such as two separate absorption fields, aerobic digesting systems, and mound systems, should be considered. A community sewer system is the most efficient, trouble-free method of sewage disposal.

Play areas and walkways require special surfacing material.

The land capability classification is IIe. The woodland ordination symbol is 5A.

FdA—Fitchville-Urban land complex, 0 to 3 percent slopes. This map unit consists of a deep, nearly level, somewhat poorly drained Fitchville soil intermingled with Urban land. The unit is in broad areas in the basins of former glacial lakes. Most areas range from 10 to 150 acres in size. They are about 55 percent Fitchville silt loam and 30 percent Urban land. The Fitchville soil and Urban land occur as areas so intricately mixed or so small that separating them at the scale used in mapping is not practical.

Typically, the Fitchville soil has a surface layer of dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 36 inches of yellowish brown and strong brown, mottled, firm silt loam and silty clay loam. The substratum to a depth of about 60 inches is yellowish brown and brown, friable silt loam and firm silty clay loam. In places the soil has been radically altered. Some of the low areas have been filled or leveled during construction, and some small areas have been cut, built up, or smoothed.

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

Included in mapping are small areas of the poorly drained Sebring soils in depressions and the moderately well drained Glenford soils on the higher, convex parts of the landscape. Included soils make up about 15 percent of most areas.

Most areas of this map unit are drained by sewer systems, gutters, subsurface drains, and surface ditches. Areas of the Fitchville soil that are not drained have a perched water table at a depth of 12 to 30 inches during extended wet periods. Permeability is moderately slow in this soil. Runoff is slow. The root zone is deep. Available water capacity is high.

The Fitchville soil is used for parks, lawns, or gardens. It is well suited to grasses, flowers, vegetables, trees, and shrubs where excess water is removed by a drainage system. Undrained areas are only moderately well suited to these uses. A combination of surface and subsurface drains works best. The perennial plants that are selected for planting should be those that are fairly tolerant of wetness. Erosion generally is a major problem only in areas where the surface is disturbed and exposed for a considerable period and in watercourses. Areas that have been cut and filled are poorly suited to lawns and gardens. Tilth is very poor in exposed subsoil material.

The Fitchville soil is poorly suited to building site development and septic tank absorption fields. Because of the seasonal wetness, it is better suited to dwellings without basements than to dwellings with basements. Ditches, storm sewers, and subsurface drains can improve drainage. All sanitary facilities should be connected to commercial sewers and treatment facilities. In areas where commercial facilities are not available, the efficiency of septic tank absorption fields can be improved by enlarging the absorption field and installing curtain drains. Local roads can be improved by a drainage system and suitable base material, which minimize the damage caused by frost action and low strength.

Play areas and walkways require special surfacing material.

No land capability classification or woodland ordination symbol is assigned.

GbB—Geeburg silt loam, 2 to 6 percent slopes. This deep, gently sloping, moderately well drained soil is on the top and sides of rises on broad, undulating till plains. Most areas are irregularly shaped and range from 5 to 120 acres in size.

Typically, the surface layer is brown, friable silt loam about 7 inches thick. The subsoil is about 25 inches thick. It is mottled below a depth of about 11 inches. The upper part is yellowish brown and dark yellowish brown, firm silty clay loam and silty clay, and the lower part is olive brown, very firm clay. The substratum to a depth of about 72 inches is olive brown and light olive brown, mottled, very firm silty clay and clay glacial till.

Included with this soil in mapping are small areas of the somewhat poorly drained Remsen soils. These soils are in the less sloping areas. They make up about 15 percent of most areas.

The Geeburg soil has a perched seasonal high water table at a depth of 18 to 36 inches during extended wet periods. Permeability is very slow. Runoff is medium. The root zone generally is moderately deep to compact glacial till. Available water capacity is moderate.

Most areas are used as cropland. This soil is moderately well suited to corn, wheat, oats, hay, and pasture. Row crops can be grown frequently under optimum management. Minimizing tillage, growing cover crops, and incorporating crop residue into the soil help to control erosion, improve tilth, and maintain the content of organic matter. Scattered subsurface drains are needed in the wetter included soils and in wet-weather seeps. Hard clods form if the soil is cultivated when it is too wet. The surface layer crusts after heavy rainfall, especially in tilled areas. Shallow cultivation of intertilled crops breaks up the crust. Grazing during wet periods destroys soil structure, depletes the protective plant cover, and decreases forage production.

This soil is moderately well suited to woodland.

Planting techniques that spread the roots of the seedlings and improve the soil-root contact reduce the seedling mortality rate. Harvesting procedures that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard.

This soil is moderately well suited to building site development. Because of the seasonal wetness and a moderate shrink-swell potential, it is better suited to dwellings without basements than to dwellings with basements. Properly designing foundations and footings helps to prevent the structural damage caused by shrinking and swelling. Excavations around basements and foundations should be backfilled with material that has a low shrink-swell potential. Drains at the base of footings and exterior basement wall coatings help to keep basements dry. Increased runoff and erosion occur during construction. They can be controlled by maintaining a plant cover wherever possible. A drainage system and suitable base material can minimize the damage to local roads and streets caused by low strength and by shrinking and swelling.

This soil is poorly suited to septic tank absorption fields. The efficiency of the septic tank system can be improved by increasing the number and length of laterals. In areas where suitable outlets are available, curtain or perimeter drains can help to lower the seasonal high water table. Alternative disposal systems, such as two separate absorption fields, aerobic digesting systems, and mound systems, should be considered. A community sewer system is the most efficient, trouble-free method of sewage disposal.

The land capability classification is IIIe. The woodland ordination symbol is 4C.

GbB2—Geeburg silt loam, 2 to 6 percent slopes, eroded. This gently sloping, deep, moderately well drained soil is on the tops of ridges, between steep-sided valleys and on knolls on till plains. Erosion has removed part of the original surface layer, and the present plow layer contains some subsoil material. Most areas are irregularly shaped and range from 2 to 60 acres in size.

Typically, the surface layer is brown and dark brown, friable silt loam about 6 inches thick. The subsoil is about 24 inches thick. It is mottled below a depth of about 10 inches. The upper part is yellowish brown, firm silty clay loam and silty clay, and the lower part is dark yellowish brown, very firm clay. The substratum to a depth of about 60 inches is brown and yellowish brown, mottled, firm clay and silty clay glacial till. In some spots the substratum has thin layers of sand and gravel. In places the subsoil is dominantly silty clay loam.

Included with this soil in mapping are small areas of the somewhat poorly drained Remsen soils. These soils are in low spots and around the base of knolls. They make up about 15 percent of most areas.

The Geeburg soil has a perched seasonal high water table at a depth of 18 to 36 inches during extended wet periods. Permeability is very slow. Runoff is medium. The root zone generally is moderately deep to compact till. Available water capacity is moderate.

Most areas are used as cropland. This soil is moderately well suited to corn, wheat, oats, hay, and pasture. Erosion is a moderate hazard if cultivated crops are grown. Minimum tillage, winter cover crops, and grassed waterways help to prevent excessive soil loss. In some areas slopes are too irregular for stripcropping. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration. Random tile lines can drain wet spots.

This soil is moderately well suited to woodland. Planting techniques that spread the roots of the seedlings and improve the soil-root contact reduce the seedling mortality rate. Harvesting procedures that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard.

This soil is moderately well suited to building site development. Because of the seasonal wetness and a moderate shrink-swell potential, it is better suited to dwellings without basements than to dwellings with basements. Properly designing foundations and footings helps to prevent the structural damage caused by shrinking and swelling. Excavations around basements and foundations should be backfilled with material that has a low shrink-swell potential. Drains at the base of footings and exterior basement wall coatings help to keep basements dry. Increased runoff and erosion occur during construction. They can be controlled by maintaining a plant cover wherever possible. Local roads can be improved by a drainage system and by suitable base material, which minimizes the damage caused by low strength.

This soil is poorly suited to septic tank absorption fields because of the seasonal wetness and the very slow permeability. The efficiency of the septic tank system can be improved by increasing the number and length of laterals. Curtain or perimeter drains can help to lower the seasonal high water table. Alternative disposal systems, such as two separate absorption fields, aerobic digesting systems, and mound systems, should be considered. A community sewer system is the most efficient, trouble-free method of sewage disposal.

The land capability classification is IIIe. The woodland ordination symbol is 4C.

GbC—Geeburg silt loam, 6 to 12 percent slopes. This deep, sloping, moderately well drained soil is on ridgetops, uneven shoulder slopes, and side slopes along well defined drainageways on till plains. Most areas are irregularly shaped and range from 10 to 75 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The subsoil is about 20 inches thick. It is mottled below a depth of about 12 inches. The upper part is yellowish brown, firm silty clay loam and silty clay, and the lower part is dark yellowish brown, firm silty clay. The substratum to a depth of about 60 inches is brown and yellowish brown, mottled, firm clay and silty clay glacial till. In some small areas the subsoil and substratum have less clay.

Included with this soil in mapping are small areas of the somewhat poorly drained Remsen soils. These soils are in the less sloping areas. They make up about 15 percent of most areas.

The Geeburg soil has a perched seasonal high water table at a depth of 18 to 36 inches during extended wet periods. Permeability is very slow. Runoff is rapid. The root zone generally is moderately deep to compact till. Available water capacity is moderate.

Most areas are used as cropland. This soil is well suited to hay and pasture but is poorly suited to row crops. It can be cropped successfully, but the cropping system should include a high proportion of long-term hay or pasture. Erosion is a serious hazard, especially if the slopes are long. Random subsurface drains may be needed in the wetter included soils. Hard clods form if the soil is cultivated when it is too wet. The surface layer crusts after heavy rainfall, especially in tilled areas. Shallow cultivation of intertilled crops breaks up the crust. Minimizing tillage, growing cover crops, and tilling at the proper moisture content help to control erosion, improve tilth, and maintain the content of organic matter.

This soil is moderately well suited to woodland. The species selected for planting should be those that are tolerant of a high content of clay in the subsoil. Planting techniques that spread the roots of the seedlings and improve the soil-root contact reduce the seedling mortality rate. Harvesting procedures that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard.

This soil is moderately well suited to building site development. Because of the seasonal wetness and a moderate shrink-swell potential, it is better suited to dwellings without basements than to dwellings with basements. Properly designing foundations and footings helps to prevent the structural damage caused by shrinking and swelling. Excavations around basements and foundations should be backfilled with material that has a low shrink-swell potential. Drains at the base of footings and exterior basement wall coatings help to keep basements dry. Erosion is a serious hazard during construction. As a result, as much vegetation as possible should be maintained on the site. Local roads and streets can be improved by a drainage system and by suitable base material, which minimizes the damage caused by low strength.

This soil is poorly suited to septic tank absorption fields. The efficiency of the septic tank system can be improved by increasing the number and length of laterals. In areas where suitable outlets are available, curtain or perimeter drains can help to lower the seasonal high water table. Installing the distribution lines across the slope helps to prevent seepage of the effluent to the surface. Alternative disposal systems, such as two separate absorption fields, aerobic digesting systems, and mound systems, should be considered. A community sewer system is the most efficient, trouble-free method of sewage disposal.

The land capability classification is IVe. The woodland suitability subclass is 4C.

GbC2—Geeburg silt loam, 6 to 12 percent slopes, eroded. This deep, sloping, moderately well drained soil is on ridgetops and uneven shoulder slopes and along well defined drainageways on till plains. Erosion has removed part of the original surface layer, and tillage has mixed more clayey subsoil material into the present surface layer. Most areas are long and narrow or irregular in shape and range from 5 to 25 acres in size.

Typically, the surface layer is brown and grayish brown silt loam about 5 inches thick. The subsoil is about 20 inches thick. It is mottled below a depth of about 10 inches. The upper part is yellowish brown, firm silty clay loam, and the lower part is dark yellowish brown, very firm clay. The substratum to a depth of about 60 inches is brown and yellowish brown, mottled, firm clay and silty clay glacial till. Slopes are 12 to 18 percent in a few areas. In some areas the subsoil and substratum have less clay.

Included with this soil in mapping are narrow strips of the poorly drained Holly and somewhat poorly drained Orrville soils on flood plains and the somewhat poorly drained Remsen soils at the head of small drainageways. Included soils make up about 15 percent of most areas.

The Geeburg soil has a perched seasonal high water table at a depth of 18 to 36 inches during extended wet periods. Permeability is very slow. Runoff is rapid. The root zone generally is moderately deep to compact till. Available water capacity is moderate.

Most areas formerly were used for crops but are now used as permanent pasture or woodland. A few areas are still used for crops, such as corn, wheat, and oats.

This soil is poorly suited to row crops because of the slope and a severe hazard of erosion. Minimum tillage, winter cover crops, and grassed waterways help to control erosion.

This soil is moderately well suited to woodland. Planting techniques that spread the roots of the seedlings and improve the soil-root contact reduce the seedling mortality rate. Harvesting procedures that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard.

This soil is moderately well suited to building site development. Because of the seasonal wetness and a moderate shrink-swell potential, it is better suited to dwellings without basements than to dwellings with basements. Properly designing foundations and footings helps to prevent the structural damage caused by shrinking and swelling. Excavations around basements and foundations should be backfilled with material that has a low shrink-swell potential. Drains at the base of footings and exterior basement wall coatings help to keep basements dry. Erosion is a serious hazard during construction. As a result, as much vegetation as possible should be maintained on the site. Local roads and streets can be improved by a drainage system and by suitable base material, which minimizes the damage caused by low strength.

This soil is poorly suited to septic tank absorption fields. The efficiency of the septic tank system can be improved by increasing the number and length of laterals. In areas where suitable outlets are available, curtain or perimeter drains can help to lower the seasonal high water table. Installing the distribution lines across the slope helps to prevent seepage of the effluent to the surface. Alternative disposal systems, such as two separate absorption fields, aerobic digesting systems, and mound systems, should be considered. A community sewer system is the most efficient, trouble-free method of sewage disposal.

The land capability classification is IVe. The woodland ordination symbol is 4C.

GfB—Glenford silt loam, 2 to 6 percent slopes. This deep, gently sloping, moderately well drained soil is on knolls in the basins of former glacial lakes. Most areas are long and narrow or irregularly shaped and range from 10 to 60 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 40 inches of yellowish brown and dark yellowish brown, friable silt loam and firm silty clay loam. It is mottled below a depth of about 16 inches. The substratum to a depth of about 64 inches is dark yellowish brown, mottled, friable, stratified silt and silt loam.

Included with this soil in mapping are small areas of the somewhat poorly drained Fitchville soils in shallow depressions and along drainageways. Also included are small areas of Rawson soils, which have a higher content of sand in the upper part of the subsoil than the Glenford soil. Included soils make up about 15 percent of most areas.

The Glenford soil has a perched seasonal high water table at a depth of 24 to 42 inches during extended wet periods. Permeability is moderately slow. Runoff is medium. The root zone is deep. Available water capacity is high.

Most areas are used as cropland. This soil is well suited to row crops, hay, and pasture. It can be easily farmed but is susceptible to surface crusting and erosion. Minimizing tillage, returning crop residue to the soil, and growing cover crops help to control erosion, maintain the content of organic matter, and improve tilth. Shallow cultivation of intertilled crops breaks up a surface crust. Random subsurface drains are needed in the wetter included soils.

This soil is well suited to woodland. No major hazards or limitations affect planting or harvesting.

This soil is moderately well suited to building site development. Because of the seasonal wetness, it is better suited to dwellings without basements than to dwellings with basements. Drains at the base of footings and protective exterior wall coatings help to keep basements dry. Backfilling around foundations with material that has a low shrink-swell potential helps to prevent the structural damage caused by shrinking and swelling. Local roads can be improved by a drainage system and suitable base material, which minimize the damage caused by frost action and low strength.

This soil is moderately well suited to septic tank absorption fields. The moderately slow permeability and the seasonal high water table are limitations. Increasing the size of the absorption area and installing curtain drains where outlets are available improve the efficiency of the septic tank system.

The capability classification is IIe. The woodland ordination symbol is 5A.

GfC—Glenford silt loam, 6 to 12 percent slopes. This deep, sloping, moderately well drained soil is on side slopes along drainageways in the basins of former glacial lakes. Most areas are long and narrow and range from 5 to 40 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 6 inches thick. The subsoil is about 28 inches of yellowish brown and brown, firm silt loam and silty clay loam. It is mottled below a depth of about 15 inches. The substratum to a depth of about 60 inches is yellowish brown, friable, stratified silt loam, silt, and silty clay loam.

Included with this soil in mapping are small areas of the somewhat poorly drained Fitchville soils in shallow depressions and along drainageways. Also included are small areas of Rawson soils, which have a higher content of sand in the upper part of the subsoil than the Glenford soil. Included soils make up about 15 percent of most areas.

The Glenford soil has a perched seasonal high water table at a depth of 24 to 42 inches during extended wet periods. Permeability is moderately slow. Runoff is rapid. The root zone is deep. Available water capacity is high.

Most areas are used as cropland or pasture. This soil is well suited to hay and pasture and moderately well suited to row crops. It can be cropped successfully, but the cropping system should include long-term hay or pasture. Erosion is a management concern, especially if slopes are long. Applying a system of minimum tillage and growing cover crops increase the content of organic matter, improve tilth, help to control erosion, and increase the rate of water infiltration. The surface layer crusts after heavy rainfall, especially in tilled areas. Shallow cultivation of intertilled crops breaks up the crust. Surface compaction, poor tilth, and increased runoff result from overgrazing or grazing when the soil is soft and sticky. Random subsurface drains are needed in the wetter included soils.

This soil is well suited to woodland. No major hazards or limitations affect planting or harvesting.

This soil is moderately well suited to building site development. Because of the seasonal wetness, it is better suited to dwellings without basements than to dwellings with basements. Buildings should be designed so that they conform to the natural slope of the land. Land shaping is needed in some areas. Drains at the base of foundations and protective exterior wall coatings help to keep basements dry. Backfilling around foundations with material that has a low shrink-swell potential helps to prevent the structural damage caused by shrinking and swelling. Maintaining as much vegetation on the site as possible during construction reduces the hazard of erosion. Local roads can be improved by a drainage system and suitable base material, which minimize the damage caused by frost action and low strength.

This soil is moderately well suited to septic tank absorption fields. The moderately slow permeability and the seasonal high water table are limitations. Increasing the size of the absorption area and installing curtain drains where outlets are available improve the efficiency of the septic tank system. Installing the distribution lines across the slope helps to prevent seepage of the effluent to the surface.

The land capability classification is IIIe. The woodland ordination symbol is 5A.

GnB—Glenford-Urban land complex, 2 to 6 percent slopes. This map unit consists of a deep, gently sloping, moderately well drained Glenford soil intermingled with Urban land. The unit is in the basins of former glacial lakes. Most areas range from 20 to 100 acres in size. They are about 55 percent Glenford silt loam and 35 percent Urban land. The Glenford soil and Urban land occur as areas so intricately mixed or so small that separating them at the scale used in mapping is not practical.

Typically, the Glenford soil has a surface layer of dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 34 inches of yellowish brown and dark yellowish brown, friable silt loam and firm silty clay loam. It is mottled below a depth of about 16 inches. The substratum to a depth of about 60 inches is yellowish brown and brown, mottled, firm, stratified silt loam, silt, and silty clay loam. In places the soil has been radically altered. Some of the low areas have been filled or leveled during construction, and some small areas have been cut, built up, or smoothed.

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

Included in mapping are small areas of Fitchville and Sebring soils. The somewhat poorly drained Fitchville soils are in nearly level areas. The poorly drained Sebring soils are in depressions and along drainageways. Included soils make up about 10 percent of most areas.

Most areas of this map unit are drained by sewer systems, gutters, subsurface drains, and surface ditches. Areas of the Glenford soil that are not drained have a perched water table at a depth of 24 to 42 inches during extended wet periods. Permeability is moderately slow in this soil. Runoff is medium. The root zone is deep. Available water capacity is high.

The Glenford soil is used for parks, lawns, or gardens. It is well suited to grasses, flowers, vegetables, trees, and shrubs. Erosion is a hazard, particularly in areas where the surface is disturbed and exposed for a considerable period and in watercourses. Areas that have been cut and filled are poorly suited to lawns and gardens. Tilth is very poor in exposed subsoil and substratum material.

The Glenford soil is moderately well suited to building site development. Drains around footings and other subsurface drains and a surface drainage system are needed. Basement walls should be waterproofed. Backfilling around foundations with material that has a low shrink-swell potential helps to prevent the structural damage caused by shrinking and swelling. Local roads can be improved by a drainage system and suitable base material, which minimize the damage caused by frost damage and low strength.

The Glenford soil is moderately well suited to septic tank absorption fields. Sanitary facilities should be connected to community sewers and sewage treatment facilities where they are available. In areas where they are not available, the moderately slow permeability of this soil can be overcome by increasing the size of the absorption area. Curtain drains can lower the seasonal high water table.

No land capability classification or woodland ordination symbol is assigned.

HaA—Haskins loam, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil is on terraces and till plains. Most areas are irregularly shaped and range from 10 to 40 acres in size.

Typically, the surface layer is dark grayish brown, friable loam about 10 inches thick. The subsoil is about 26 inches thick. It is mottled. The upper part is yellowish brown and dark yellowish brown, firm loam and clay loam; the next part is dark yellowish brown, firm and friable sandy loam and sandy clay loam; and the lower part is light olive brown, firm silty clay. The substratum to a depth of about 73 inches is light olive brown and yellowish brown, mottled, firm silty clay. In some areas the surface layer is sandy loam or silt loam. In other areas the lower part of the subsoil and the substratum are sandy loam or gravelly loam.

Included with this soil in mapping are small areas of the poorly drained Sebring and Damascus soils. These soils are in the lower areas or in depressions. Also included are small areas of Darien soils, which are in positions on the landscape similar to those of the Haskins soil. Included soils make up about 15 percent of most areas.

The Haskins soil has a perched seasonal high water table at a depth of 12 to 30 inches during extended wet periods. Permeability is moderate in the upper part of the subsoil and slow or very slow in the lower part and in the substratum. Runoff is slow. The root zone is restricted mainly to the 32 to 48 inches above compact glacial till or lacustrine material. Available water capacity is moderate.

Most areas are used for crops, pasture, or woodland. The seasonal wetness and the slow or very slow permeability are the major limitations in the areas used for farming. The wetness delays planting and limits the choice of crops. Drained areas are well suited to corn, hay, and pasture, but undrained areas are poorly suited. Maintaining desirable forage stands and minimizing soil compaction are difficult in undrained areas, especially in those used as permanent pasture. Surface drains are needed. Subsurface drains can lower the perched water table. These drains are more effective if they are installed on or above the slowly permeable or very slowly permeable glacial till or lacustrine material. Tilling at the proper moisture content, properly managing crop residue, and growing cover crops improve tilth and increase the content of organic matter.

This soil is moderately well suited to woodland. The species selected for planting should be those that are tolerant of some wetness. No major hazards or limitations affect planting or harvesting.

This soil is poorly suited to building site development. It is better suited to dwellings without basements than to dwellings with basements because of the seasonal wetness and the lateral movement of water above the slowly permeable or very slowly permeable glacial till or lacustrine material in the lower part of the profile. Ditches and subsurface drains can improve drainage. Properly landscaping building sites helps to keep surface water away from foundations. Drains at the base of footings and exterior basement wall coatings help to keep basements dry. Local roads can be improved by a drainage system and suitable base material, which minimize the damage caused by frost action.

This soil is poorly suited to septic tank absorption fields. The efficiency of the septic tank system can be improved by increasing the number and length of laterals. In areas where suitable outlets are available, curtain or perimeter drains can help to lower the seasonal high water table. Alternative disposal systems, such as two separate absorption fields, aerobic digesting systems, and mound systems, should be considered. A community sewer system is the most efficient, trouble-free method of sewage disposal.

The land capability classification is IIw. The woodland ordination symbol is 4A.

HaB—Haskins loam, 2 to 6 percent slopes. This deep, gently sloping, somewhat poorly drained soil is on terraces and till plains. Most areas are irregularly shaped and range from 2 to 85 acres in size.

Typically, the surface layer is dark grayish brown, friable loam about 7 inches thick. The subsoil is about 33 inches thick. It is mottled. The upper part is yellowish brown and brown, friable loam and firm sandy clay loam and gravelly sandy clay loam, and the lower part is brown, firm silty clay. The substratum to a depth of about 60 inches is brown, mottled, firm silty clay. In some areas the surface layer is silt loam or sandy loam. In other areas the lower part of the subsoil and the substratum are sandy loam or gravelly loam.

Included with this soil in mapping are small areas of the moderately well drained Rawson soils. These soils are in the higher, convex areas. Also included are small areas of Darien soils, which are in positions on the landscape similar to those of the Haskins soil. Included soils make up about 15 percent of most areas.

The Haskins soil has a perched seasonal high water table at a depth of 12 to 30 inches during extended wet periods. Permeability is moderate in the upper part of the subsoil and slow or very slow in the lower part and in the substratum. Runoff is medium. The root zone is restricted mainly to the 32 to 48 inches above compact glacial till or lacustrine material. Available water capacity is moderate.

Most areas are used for crops, pasture, or woodland. Drained areas of this soil are well suited to row crops, such as corn, and to small grain and hay. Undrained areas are moderately well suited to cropland. Planting is often delayed in undrained areas. Erosion is a hazard on long slopes that are used for row crops. Minimizing tillage, properly managing crop residue, and growing cover crops help to control erosion, maintain the content of organic matter, and improve tilth. Subsurface drains can lower the perched water table. These drains are more effective if they are installed on or above the slowly permeable or very slowly permeable glacial till or lacustrine material. Controlled grazing, especially when the soil is soft and sticky, helps to prevent excessive compaction.

This soil is moderately well suited to woodland. The species selected for planting should be those that are tolerant of some wetness. No major hazards or limitations affect planting or harvesting.

This soil is poorly suited to building site development. It is better suited to dwellings without basements than to dwellings with basements. Drainage ditches, storm sewers, and subsurface drains can improve drainage. Drains at the base of footings and protective exterior wall coatings help to keep basements dry. Local roads can be improved by a drainage system and suitable base material, which minimize the damage caused by frost action.

This soil is poorly suited to septic tank absorption fields. The efficiency of the septic tank system can be improved by increasing the number and length of laterals. In areas where suitable outlets are available, curtain or perimeter drains can help to lower the seasonal high water table. Alternative disposal systems, such as two separate absorption fields, aerobic digesting systems, and mound systems, should be considered. A community sewer system is the most efficient, trouble-free method of sewage disposal.

The land capability classification is IIe. The woodland ordination symbol is 4A.

HbB—Haskins-Urban land complex, 2 to 6 percent slopes. This map unit consists of a deep, gently sloping, somewhat poorly drained Haskins soil intermingled with Urban land. The unit is on terraces and till plains. Most areas range from 25 to 150 acres in size. They are about 50 percent Haskins loam and 35 percent Urban land. The Haskins soil and Urban land occur as areas so intricately mixed or so small that separating them at the scale used in mapping is not practical.

Typically, the Haskins soil has a surface layer of dark grayish brown, friable loam about 9 inches thick. The subsoil is about 30 inches thick. It is mottled. The upper part is yellowish brown and brown, firm sandy clay loam and friable loam, and the lower part is brown, firm silty clay and silty clay loam. The substratum to a depth of about 60 inches is brown and dark yellowish brown, mottled, firm and very firm silty clay and silty clay loam. In places the soil has been radically altered. Some of the low areas have been filled or leveled during construction, and some small areas have been cut, built up, or smoothed.

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

Included in mapping are small areas of Sebring and Rawson soils. The poorly drained Sebring soils are in depressions. The moderately well drained Rawson soils are in convex areas. Included soils make up about 15 percent of most areas.

Most areas of this map unit are drained by sewer systems, gutters, subsurface drains, and surface ditches. Areas of the Haskins soil that are not drained have a perched high water table at a depth of 12 to 30 inches during extended wet periods. Permeability is moderate in the upper part of the subsoil in this soil and slow or very slow in the lower part and in the substratum. Runoff is medium. The root zone is restricted mainly to the 32 to 48 inches above compact glacial till or lacustrine material. Available water capacity is moderate.

The Haskins soil is used for parks, lawns, or gardens. It is well suited to grasses, flowers, vegetables, trees, and shrubs, especially where excess water is removed by a drainage system. Undrained areas are only moderately well suited to these uses. A combination of surface and subsurface drains works best. The perennial plants that are selected for planting should be those that are fairly tolerant of wetness. Erosion generally is a major problem only in areas where the surface is disturbed and exposed for a considerable period and in watercourses. Areas that have been cut and filled are poorly suited to lawns and gardens because of very poor tilth.

The Haskins soil is poorly suited to building site development. It is better suited to dwellings without basements than to dwellings with basements because of the seasonal wetness. If dwellings with basements are constructed, drains around footings and other subsurface drains, adequate waterproofing of basement walls, and a sump pump are needed because of the seasonal high water table. Providing suitable backfill material and properly designing foundations and footings help to prevent the structural damage caused by shrinking and swelling. Local steeets can be improved by a drainage system and suitable base material, which minimize the damage caused by frost action.

The Haskins soil is poorly suited to septic tank absorption fields. All sanitary facilities should be connected to commercial sewers and treatment facilities. Where these treatment facilities are not available, the effectiveness of the septic tank system can be improved by installing longer tile lines, by enlarging the absorption area, and by installing curtain drains around the field.

No land capability classification or woodland ordination symbol is assigned.

Ho—Holly silt loam, frequently flooded. This deep, nearly level, poorly drained soil is on flood plains. It commonly is on the lowest and wettest part of the flood plains. Slopes are 0 to 2 percent. Most areas are long and narrow and range from 10 to 100 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The subsoil is about 26 inches of dark gray, grayish brown, and gray, mottled, friable silt loam and loam. The substratum to a depth of about 68 inches is gray and dark gray, very friable sandy loam, loose gravelly loamy sand, and firm loam. It is mottled in the lower part. In some areas the surface layer is loam or sandy loam. In a few areas the subsoil and substratum have more clay.

Included with this soil in mapping are narrow strips of the somewhat poorly drained Orrville soils on slight rises. Also included are small areas of soils that are subject to ponding. Included soils make up about 15 percent of most areas.

The Holly soil has a seasonal high water table near the surface during extended wet periods. Permeability is moderate or moderately slow in the subsoil and moderate or moderately rapid in the substratum. Runoff is very slow. The root zone is deep. Available water capacity is high.

Most areas support wetland vegetation or are used as woodland. If drained and protected from flooding, this soil is moderately well suited to crops and pasture. Undrained and unprotected areas are poorly suited to row crops, hay, and pasture. Surface drains commonly remove surface water. Subsurface drains are used in areas where outlets are available. The perennial plants selected for planting should be those that are tolerant of wetness. The soil is poorly suited to grazing early in spring. Overgrazing or grazing when the soil is soft and sticky results in compaction and poor tilth.

This soil is moderately well suited to woodland. The trees can be logged when the soil is frozen or during the drier parts of the year. Planting seedlings that have been transplanted once can reduce the seedling mortality rate. Harvesting procedures that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Plant competition can be controlled by removing vines and the less desirable trees and shrubs.

This soil is generally unsuited to building site development and septic tank absorption fields because of the frequent flooding, the prolonged wetness, and the moderate or moderately slow permeability. Diking to control flooding is difficult. Local roads can be improved by installing a drainage system and providing suitable base material. These measures can raise the road above the level of flooding and minimize the damage caused by frost action.

The land capability classification is IIIw. The woodland ordination symbol is 5W.

JtA—Jimtown loam, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil is on stream terraces and outwash plains. Most areas are irregularly shaped and range from 2 to 250 acres in size.

Typically, the surface layer is dark grayish brown, friable loam about 9 inches thick. The subsoil is about 33 inches thick. It is mottled. The upper part is brown and grayish brown, friable loam, and the lower part is dark yellowish brown and brown, firm gravelly loam and gravelly sandy clay loam. The substratum to a depth of about 72 inches is grayish brown and gray, mottled, loose very gravelly loamy sand and very friable very gravelly sandy loam. In some areas the surface layer is silt loam or sandy loam. In other areas the substratum is silty clay loam or clay loam.

Included with this soil in mapping are small areas of the poorly drained Damascus soils in slight depressions. These soils make up about 15 percent of most areas.

The Jimtown soil has a seasonal high water table at a depth of 12 to 30 inches during extended wet periods. Permeability is moderate. Runoff is slow. The root zone is deep. Available water capacity is moderate.

Many areas are used for farming. A considerable acreage is wooded.

Drained areas of this soil are well suited to corn, hay, and pasture, but undrained areas are poorly suited. The major limitation is the seasonal wetness, which delays planting and limits the choice of crops. Maintaining tilth and desirable forage stands is difficult in undrained areas. Subsurface drains can lower the water table. Minimizing tillage, growing cover crops, and incorporating crop residue into the soil improve tilth and increase the content of organic matter. Grazing early in spring when the soil is soft, can damage pasture plants. These plants grow well during the dry part of summer.

This soil is moderately well suited to woodland. The species selected for planting should be those that are tolerant of some wetness.

This soil is poorly suited to building site development. Because of the seasonal wetness, it is better suited to dwellings without basements than to dwellings with basements. Buildings should be located in the highest available areas. Properly landscaping building sites helps to keep surface water away from foundations. Drainage can be improved by subsurface drains, storm sewers, and open ditches. Local roads can be improved by a drainage system and suitable base material, which minimize the damage caused by frost action. Excavation is limited during winter and spring because of the wetness and the instability of cutbanks.

This soil is poorly suited to septic tank absorption fields. In areas where suitable outlets are available, curtain or perimeter drains can help to lower the seasonal high water table. Alternative disposal systems, such as two separate absorption fields, aerobic digesting systems, and mound systems, should be considered. A community sewer system is the most efficient, trouble-free method of sewage disposal.

The land capability classification is IIw. The woodland ordination symbol is 5A.

JtB—Jimtown loam, 2 to 6 percent slopes. This deep, gently sloping, somewhat poorly drained soil is along drainageways and in gently undulating areas on stream terraces and outwash plains. Areas are irregular in shape and range from 2 to 75 acres in size.

Typically, the surface layer is dark grayish brown, friable loam about 8 inches thick. The subsoil is about 29 inches thick. It is mottled. The upper part is yellowish brown and brown, friable loam and sandy clay loam, and the lower part is brown, firm gravelly sandy clay loam. The substratum to a depth of about 60 inches is brown and grayish brown gravelly loamy sand and gravelly sandy loam. In some areas the surface layer is sandy loam or silt loam.

Included with this soil in mapping are small areas of the poorly drained Damascus soils in depressions and in narrow strips along drainageways. Also included are scattered small areas of the somewhat poorly drained Haskins and Fitchville soils. Included soils make up about 15 percent of most areas.

The Jimtown soil has a seasonal high water table at a depth of 12 to 30 inches during extended wet periods. Permeability is moderate. Runoff is slow or medium. The root zone is deep. Available water capacity is moderate.

Most areas are used as cropland. A considerable acreage is used as woodland or permanent pasture or is reverting to woodland.

Drained areas of this soil are well suited to pasture and row crops, and undrained areas are moderately well suited. Erosion is a hazard on long slopes that are used for row crops. Minimizing tillage, properly managing crop residue, and growing cover crops help to control erosion, maintain the content of organic matter, and improve tilth. A subsurface drainage system can reduce the wetness if a suitable outlet is available. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is moderately well suited to woodland. The species selected for planting should be those that are tolerant of wetness.

This soil is poorly suited to building site development. Drains around footings and other subsurface drains, adequate waterproofing of basement walls, and a sump pump are needed because of the high water table. Local roads can be improved by a drainage system and suitable base material, which minimize the damage caused by frost action. Excavation is limited during winter and spring because of the wetness and the instability of cutbanks.

This soil is poorly suited to septic tank absorption fields. In areas where suitable outlets are available, curtain or perimeter drains can help to lower the seasonal high water table. Community sewage treatment plants should be used wherever possible if homes are built on this soil.

The land capability classification is IIe. The woodland ordination symbol is 5A.

JuA—Jimtown-Urban land complex, 0 to 3 percent slopes. This map unit consists of a deep, nearly level, somewhat poorly drained Jimtown soil intermingled with Urban land. The unit is on stream terraces and outwash plains. Most areas range from 25 to 150 acres in size. They are about 55 percent Jimtown loam and 35 percent Urban land. The Jimtown soil and Urban land occur as areas so intricately mixed or so small that separating them at the scale used in mapping is not practical.

Typically, the Jimtown soil has a surface layer of dark grayish brown, friable loam about 8 inches thick. The subsoil is about 35 inches thick. It is mottled. The upper part is yellowish brown and brown, firm sandy clay loam and loam, and the lower part is brown and dark yellowish brown, firm gravelly loam. The substratum to a depth of about 60 inches is dark yellowish brown and grayish brown, mottled, loose gravelly loamy sand and very friable gravelly sandy loam. In places the soil has been radically altered. Some of the low areas have been filled or leveled during construction, and some small areas have been cut, built up, or smoothed.

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

Included in mapping are small areas of Chili and Damascus soils. The well drained Chili soils are in the higher, convex areas. The poorly drained Damascus soils are in depressions. Included soils make up 10 percent of most areas.

Most areas of this map unit are drained by sewer systems, gutters, subsurface drains, and surface ditches. Areas of the Jimtown soil that are not drained have a water table at a depth of 12 to 30 inches during extended wet periods. Permeability is moderate in this soil. Runoff is slow or medium. The root zone is deep. Available water capacity is moderate.

The Jimtown soil is used for parks, lawns, or gardens. It is well suited to grasses, flowers, vegetables, trees, and shrubs, especially where excess water is removed. Undrained areas are only moderately well suited to these uses. Several methods of artificial drainage, either surface or subsurface, can be used successfully on this soil. The perennial plants that are selected for planting should be those that are fairly tolerant of wetness. Erosion generally is a major problem only in areas where the surface is disturbed and exposed for a considerable period and in watercourses. Tilth is very poor in exposed subsoil and substratum material. Areas that have been cut and filled are poorly suited to lawns and gardens because of the very poor tilth.

The Jimtown soil is poorly suited to building site development. It is better suited to dwellings without basements than to dwellings with basements. Drains around footings and other subsurface drains and a surface drainage system are needed. Basement walls should be waterproofed. Local roads can be improved by a drainage system and suitable base material, which minimize the damage caused by frost action. Excavation is limited during winter and spring because of the wetness and the instability of cutbanks.

The Jimtown soil is poorly suited to septic tank absorption fields. All sanitary facilities should be connected to commercial sewers and treatment facilities. Where these treatment facilities are not available, the effectiveness of a septic tank absorption field can be improved by installing curtain drains.

No land capability classification or woodland ordination symbol is assigned.

LaB—Lakin loamy fine sand, 2 to 8 percent slopes. This deep, gently sloping, excessively drained soil is on stream terraces and narrow dunes. Most areas are irregularly shaped and range from 10 to 30 acres in size.

Typically, the surface layer is brown, very friable loamy fine sand about 8 inches thick. The subsurface layer is strong brown, very friable loamy fine sand about 4 inches thick. The subsoil is about 40 inches of yellowish brown, brown, and light yellowish brown, very friable and loose loamy fine sand and fine sand. The substratum to a depth of about 80 inches is yellowish brown, loose sand and fine sand.

Included with this soil in mapping are small areas of the somewhat poorly drained Jimtown soils. These soils are in depressions and low areas. Also included are scattered small areas of the moderately well drained Elnora soils. Included soils make up about 15 percent of most areas.

Permeability is rapid in the Lakin soil. Runoff is slow or medium. The root zone is deep. Available water capacity is low.

This soil is used mainly as cropland. It is moderately well suited to row crops and pasture. Plants often show evidence of moisture stress during the summer. Early season crops, such as oats and winter wheat, and vegetable crops that can be planted early grow well on this soil. Because of a good infiltration rate, the soil is well suited to irrigation. Soil blowing is a hazard where the soil is not covered with vegetation. Frost heaving seldom affects deep-rooted perennials, such as alfalfa. Plant nutrients should be added as needed but not in excess as leaching losses are high. Lack of moisture during the summer of some years is the only limitation in pastured areas.

This soil is well suited to woodland. Mulching around seedlings can reduce the seedling mortality rate.

Because of the sandy surface layer, special planting and harvesting equipment should be used.

This soil is well suited to building site development and septic tank absorption fields. It is one of the most desirable sites for development in the county because it is gently sloping, is not excessively wet, and is good foundation material. Sloughing is a hazard in excavations. The soil readily absorbs but does not adequately filter the effluent from septic tanks. The effluent can pollute ground water. Installing the absorption field in suitable fill material can improve filtration. The soil is a probable source of sand.

The land capability classification is IIIs. The woodland ordination symbol is 3S.

Lo—Lorain silty clay loam. This deep, nearly level, very poorly drained soil is in depressions and on flats in the basins of former glacial lakes on both slack-water terraces and till plains. It receives runoff from the higher adjacent soils and is subject to ponding. Most areas are irregularly shaped and range from 5 to 35 acres in size. Slopes are 0 to 2 percent.

Typically, the surface layer is very dark gray, firm silty clay loam about 7 inches thick. The subsoil is dark gray, yellowish brown, and gray, mottled, very firm silty clay about 47 inches thick. The substratum to a depth of about 62 inches is olive gray, very firm silty clay. In some extensive depressions the surface layer is very dark gray and is more than than 10 inches thick.

Included with this soil in mapping are small areas of the poorly drained Canadice and Sebring soils on slight rises. Also included are scattered small areas of soils that have less clay in the subsoil than the Lorain soil. Included soils make up about 15 percent of most areas.

The Lorain soil has a perched seasonal high water table near or above the surface during extended wet periods. Permeability is slow. Runoff is very slow or ponded. The root zone is deep. Available water capacity is moderate. The shrink-swell potential is high.

Most areas are wooded or pastured. A few have been cleared and are used as cropland.

The excessive wetness and the slow permeability are the major limitations that affect farming. They commonly delay tillage. Drained areas are well suited to row crops, hay, and pasture, but undrained areas are poorly suited. Maintaining tilth and desirable forage stands is difficult in undrained areas. The slow internal water movement reduces the effectiveness of subsurface drains. Outlets for these drains are not available in many areas. Surface drains can remove surface water. The soil is subject to compaction and hard clodding if tillage or harvesting activities are performed during wet periods. Properly managing crop residue and growing cover crops increase the rate of water infiltration and the content of organic matter and improve tilth.

This soil is moderately well suited to woodland. The trees can be logged when the soil is frozen or during the drier parts of the year. Planting techniques that spread the roots of the seedlings and improve the soil-root contact reduce the seedling mortality rate. Harvesting procedures that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Plant competition can be controlled by removing vines and the less desirable trees and shrubs.

This soil is poorly suited to building site development because of the ponding and the shrink-swell potential in the subsoil and substratum and is generally unsuited to septic tank absorption fields because of the ponding and the slow permeability. Drainage can be improved by surface drains, storm sewers, and open ditches. Properly landscaping building sites helps to keep surface water away from foundations. Local roads can be improved by a drainage system and suitable base material, which minimize the damage caused by low strength and by shrinking and swelling.

Play areas and walkways require special surfacing material.

The land capability classification is IIIw. The woodland ordination symbol is 5W.

Lp—Lorain silty clay loam, loamy substratum. This deep, nearly level, very poorly drained soil is in depressions and on flats on slack-water terraces along streams. It receives runoff from the higher adjacent soils and is subject to ponding. Most areas are irregularly shaped and range from 5 to 35 acres in size. Slopes are 0 to 2 percent.

Typically, the surface layer is black, firm silty clay loam about 7 inches thick. The subsoil is gray and grayish brown, mottled, firm silty clay about 40 inches thick. The substratum to a depth of about 60 inches is dark gray, friable sandy loam. In some extensive depressions the surface layer is black and is more than 10 inches thick. In some areas the soil has 2 to 10 inches of muck or an organic surface layer. In other areas the substratum has more clay.

Included with this soil in mapping are small areas of the poorly drained Canadice and Sebring soils on slight rises. These soils make up about 15 percent of most areas.

The Lorain soil has a perched seasonal high water table near or above the surface during extended wet periods. Permeability is slow in the subsoil and moderately rapid in the substratum. Runoff is very slow or ponded. The root zone is deep. Available water capacity is moderate. The shrink-swell potential is high in the subsoil and low in the substratum.

Most areas are wooded or pastured. A few have been cleared and are used as cropland.

The excessive wetness and the slow permeability are the major limitations that affect farming. They commonly delay tillage. Drained areas are well suited to crops, hay, and pasture, but undrained areas are poorly suited. Maintaining tilth and desirable forage stands is difficult in undrained areas. The slow internal water movement reduces the effectiveness of subsurface drains. Outlets for these drains are not available in many areas. Surface drains can remove surface water. The soil is subject to compaction and hard clodding if tillage or harvesting activities are performed during wet periods. Properly managing crop residue and growing cover crops increase the rate of water infiltration and the content of organic matter and improve tilth.

This soil is moderately well suited to woodland. The trees can be logged when the soil is frozen or during the drier parts of the year. Planting techniques that spread the roots of the seedlings and improve the soil-root contact reduce the seedling mortality rate. Harvesting procedures that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Plant competition can be controlled by removing vines and the less desirable trees and shrubs.

This soil is poorly suited to building site development because of the ponding and the shrink-swell potential in the subsoil and is generally unsuited to septic tank absorption fields because of the ponding and the slow permeability. Drainage can be improved by surface drains, storm sewers, and open ditches. Properly landscaping building sites helps to keep surface water away from foundations and footings. The buildings should be constructed without basements. Local roads can be improved by a drainage system and suitable base material, which minimize the damage caused by low strength and by shrinking and swelling.

Play areas and walkways require special surfacing material.

The land capability classification is IIIw. The woodland ordination symbol is 5W.

LrB—Lordstown loam, 2 to 6 percent slopes. This moderately deep, gently sloping, well drained soil is on side slopes and ridgetops on bedrock-controlled till plains. Most areas are long and narrow or irregularly shaped and range from 10 to 100 acres in size.

Typically, the surface layer is very dark grayish brown, friable loam about 5 inches thick. The subsoil is about 26 inches of dark yellowish brown and yellowish brown, friable channery loam and channery silt loam. The substratum is brown and light yellowish brown, friable channery fine sandy loam. Thinly bedded sandstone bedrock is at a depth of about 35 inches. In some areas the surface layer is channery loam or silt loam.

Included with this soil in mapping are small areas where the depth to bedrock is less than 20 inches and a few areas where it is more than 40 inches. Included soils make up about 15 percent of most areas.

Permeability is moderate in the Lordstown soil. Runoff is medium. The root zone is moderately deep over sandstone bedrock. Available water capacity is low.

Most areas are used as pasture or woodland. This soil is moderately well suited to corn and well suited to wheat, oats, hay, and pasture and to grazing early in spring. It is not naturally highly productive, but it responds to good management. The hazard of erosion is moderate in cultivated areas. The soil is suited to no-till farming and other kinds of minimum tillage. Returning crop residue to the soil and growing cover crops conserve moisture, help to control erosion, and improve tilth.

This soil is moderately well suited to woodland. Machine planting of tree seedlings is practical on this soil. Frequent, light thinning and harvesting can increase the vigor of the stand and reduce the windthrow hazard.

This soil is moderately well suited to building site development. It is better suited to dwellings without basements than to dwellings with basements. The bedrock at a depth of 20 to 40 inches interferes with excavation for basements and utility lines. Local roads can be improved by suitable base material, which minimizes the damage caused by frost action.

Because of the moderate depth to bedrock, this soil is poorly suited to septic tank absorption fields. The layer of suitable soil material is not thick enough to filter the effluent adequately. Installing the distribution lines in suitable fill material reduces the hazard of seepage, which can result in water pollution.

The land capability classification is IIe. The woodland ordination symbol is 4D.

LrC—Lordstown loam, 6 to 12 percent slopes. This moderately deep, sloping, well drained soil is on the upper part of hillsides on bedrock-controlled till plains. Most areas are long and narrow and range from 15 to 35 acres in size.

Typically, the surface layer is very dark grayish brown, friable loam about 5 inches thick. The subsoil is about 21 inches of dark yellowish brown and yellowish brown, friable channery loam and channery silt loam. The substratum is brown and light yellowish brown channery and very channery fine sandy loam. Thinly bedded sandstone bedrock is at a depth of about 30 inches. In some areas the surface layer is channery loam or silt loam.

Included with this soil in mapping are small areas where the depth to bedrock is less than 20 inches and a few areas where it is more than 40 inches. Also included are small areas of bedrock outcrop. The included soils and rock outcrop make up about 15 percent of most areas.

Permeability is moderate in the Lordstown soil. This soil warms and dries out early in spring and is droughty during dry periods. Runoff is rapid. The root zone is moderately deep over sandstone bedrock. Available water capacity is low.

Most of the acreage is used as woodland or pasture. This soil is well suited to hay and pasture. It is especially well suited to grazing early in spring. It is moderately well suited to row crops. Erosion is a hazard, especially on long slopes. It reduces the depth to bedrock and thus the volume of soil from which plants can extract water and nutrients. Most areas are suited to no-till farming and other kinds of minimum tillage. Returning crop residue to the soil and growing cover crops help to control erosion, conserve moisture, and maintain the content of organic matter.

This soil is moderately well suited to woodland. The slope does not interfere with the common methods of woodland improvement or harvesting. Frequent, light thinning and harvesting can increase the vigor of the stand and reduce the windthrow hazard.

This soil is moderately well suited to building site development. It is better suited to dwellings without basements than to dwellings with basements. The bedrock at a depth of 20 to 40 inches interferes with excavation for basements and utility lines. Buildings should be designed so that they conform to the natural slope of the land. Because of droughtiness, establishing lawns is difficult during much of the year. Erosion is a hazard during construction. This hazard can be reduced by maintaining a plant cover wherever possible. Local roads can be improved by suitable base material, which minimizes the damage caused by frost action.

This soil is poorly suited to septic tank absorption fields because of the moderate depth to bedrock. Inadequate filtration and downslope seepage of the effluent are likely. Installing the absorption fields in suitable fill material reduces the hazard of seepage, which can result in water pollution.

The land capability classification is IIIe. The woodland ordination symbol is 4D.

LxF—Lordstown-Rock outcrop complex, 18 to 50 percent slopes. This map unit consists of a moderately deep, well drained, steep and very steep Lordstown soil intermingled with areas of exposed bedrock. The unit is on hillsides on the dissected parts of till plains. The Lordstown soil is mainly on the middle and lower parts of side slopes, and the Rock outcrop is on the upper parts. Areas are mainly long and narrow and range from 3 to 25 acres in size. They are about 50 percent Lordstown channery loam and 30 percent Rock outcrop. The Lordstown soil and Rock outcrop occur as areas so intricately mixed or so small that separating them at the scale used in mapping is not practical.

Typically, the Lordstown soil has a surface layer of very dark grayish brown and very dark brown, friable and very friable channery loam about 4 inches thick. The subsoil is light yellowish brown and brown, friable channery loam and very channery loam about 22 inches thick. Thinly bedded sandstone bedrock is at a depth of about 26 inches.

The Rock outcrop is on vertical cliffs and ledges. Discontinuous ledges and overhangs 5 to 10 feet high are numerous.

Included in mapping are small areas of shallow, somewhat excessively drained soils in which bedrock is at a depth of 10 to 20 inches. Also included are narrow bands of the somewhat poorly drained Orrville and poorly drained Holly soils on very narrow flood plains. Included soils make up about 20 percent of most areas.

Permeability is moderate in the Lordstown soil. This soil warms and dries out early in spring and is droughty during dry periods. Runoff is very rapid. The root zone is moderately deep over sandstone bedrock. Available water capacity is low.

Most of the acreage is used as woodland. The Lordstown soil is generally unsuited to cropland and moderately well suited to woodland. It is well suited to habitat for woodland wildlife. Logging and establishing new plantations are very difficult. Constructing logging roads and skid trails on the contour facilitates the use of equipment. Frequent, light thinning and harvesting can increase the vigor of the stand and reduce the windthrow hazard.

The Lordstown soil is generally unsuited to building site development and septic tank absorption fields. Construction for urban development and recreation is difficult, and the hazard of erosion is very severe if vegetation is removed. Trails in recreational areas should be protected against erosion and established across the slope wherever possible.

The land capability classification is VIIe. The woodland ordination symbol assigned to the Lordstown soil is 4R. The Rock outcrop is not assigned a woodland ordination symbol.

LyB—Loudonville silt loam, 2 to 6 percent slopes. This moderately deep, gently sloping, well drained soil is on side slopes and ridgetops on bedrock-controlled till plains. Most areas are long and narrow or irregularly shaped and range from 3 to 10 acres in size.

Typically, the surface layer is brown, friable silt loam about 6 inches thick. The subsoil is about 26 inches thick. The upper part is dark yellowish brown and yellowish brown, friable and firm silt loam, and the lower part is yellowish brown, firm loam. Sandstone bedrock is at a depth of about 32 inches. In some areas the surface layer is channery silt loam. In a few areas the bedrock is at a depth of 40 to 60 inches.

Included with this soil in mapping are small areas of the somewhat poorly drained Mitiwanga soils. These soils are in the less sloping areas. Also included are small areas of the deep, moderately well drained Canfield, Ellsworth, and Rittman soils. Included soils make up about 15 percent of most areas.

Permeability is moderate in the Loudonville soil. Runoff is medium. The root zone is moderately deep over sandstone bedrock. Available water capacity is low.

Most areas are used as permanent pasture or woodland. A few areas are used for cultivated crops.

This soil is well suited to corn, small grain, hay, and pasture and to grazing early in spring. The hazard of erosion is moderate if cultivated crops are grown. The soil is not naturally highly productive, but it responds to good management. It is suited to no-till farming and other kinds of minimum tillage. Returning crop residue to the soil and growing cover crops conserve moisture, help to control erosion, and improve tilth. The surface layer crusts after heavy rainfall, especially in tilled areas. Shallow cultivation of intertilled crops breaks up the crust. Pasture rotation and restricted grazing during wet periods help to keep the pasture in good condition.

This soil is well suited to woodland. The slope does not interfere with the common methods of woodland improvement or harvesting. Frequent, light thinning and harvesting can increase the vigor of the stand and reduce the windthrow hazard.

This soil is moderately well suited to building site development. It is better suited to dwellings without basements than to dwellings with basements. The bedrock at a depth of 20 to 40 inches interferes with excavations for basements and utility lines. Backfilling around foundations with material that has a low shrink-swell potential helps to prevent the structural damage caused by shrinking and swelling. Local roads can be improved by suitable base material, which minimizes the damage caused by low strength.

Because of the moderate depth to bedrock, this soil is poorly suited to septic tank absorption fields. The layer of suitable soil material is not thick enough to filter the effluent adequately. Installing the distribution lines in suitable fill material reduces the hazard of seepage, which can result in water pollution.

The land capability classification is IIe. The woodland ordination symbol is 4D.

LyC—Loudonville silt loam, 6 to 12 percent slopes. This moderately deep, sloping, well drained soil is on side slopes and ridgetops on bedrock-controlled till plains. Most areas are irregularly shaped and range from 5 to 45 acres in size.

Typically, the surface layer is brown, friable silt loam about 7 inches thick. The subsoil is about 23 inches thick. The upper part is brown and yellowish brown, firm loam and clay loam, and the lower part is yellowish brown, firm loam. Sandstone bedrock is at a depth of about 30 inches. In some areas the surface layer is channery silt loam. In a few areas the bedrock is at a depth of 40 to 60 inches.

Included with this soil in mapping are small areas of the deep, moderately well drained Canfield, Ellsworth, and Rittman soils. These soils make up about 15 percent of most areas.

Permeability is moderate in the Loudonville soil. Runoff is rapid. The root zone is moderately deep over sandstone bedrock. Available water capacity is low.

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

This soil is moderately well suited to corn, hay, and pasture. It is especially well suited to grazing early in spring. Erosion is a hazard if cultivated crops are grown. The amount of available water commonly is not sufficient for good crop growth during long dry periods, especially in areas where the depth to bedrock is only about 20 inches. Erosion reduces the depth to bedrock and thus the volume of soil from which plants can extract water and nutrients. Most areas are suited to no-till farming and other kinds of minimum tillage. Returning crop residue to the soil and growing cover crops help to control erosion, conserve moisture, and maintain the content of organic matter. The surface layer crusts after heavy rainfall, especially in tilled areas. Shallow cultivation of intertilled crops breaks up the crust.

This soil is well suited to woodland. Frequent, light thinning and harvesting can increase the vigor of the stand and reduce the windthrow hazard. The slope does not interfere with the common methods of woodland improvement or harvesting.

This soil is moderately well suited to building site development. It is better suited to dwellings without basements than to dwellings with basements. The bedrock at a depth of 20 to 40 inches interferes with excavations for basements and utility lines. Buildings should be designed so that they conform to the natural slope of the land. Erosion is a hazard during construction. This hazard can be reduced by maintaining a plant cover wherever possible. Backfilling around foundations with material that has a low shrink-swell potential helps to prevent the structural damage caused by shrinking and swelling. Local roads can be improved by suitable base material, which minimizes the damage caused by low strength.

This soil is poorly suited to septic tank absorption fields because of the moderate depth to bedrock. Inadequate filtration and downslope seepage of the effluent are likely. Installing the distribution lines in suitable fill material reduces the hazard of seepage, which can result in water pollution.

The land capability classification is IIIe. The woodland ordination symbol is 4D.

LyC2—Loudonville silt loam, 6 to 12 percent slopes, eroded. This moderately deep, sloping, well drained soil is on convex, narrow ridgetops, on knolls, on narrow to broad side slopes, and along drainageways on bedrock-controlled till plains. Erosion generally has removed part of the original surface layer, and the present plow layer contains some subsoil material. Most areas are irregularly shaped and range from 5 to 30 acres in size.

Typically, the surface layer is brown, friable silt loam about 5 inches thick. The subsoil is about 23 inches thick. The upper part is brown and yellowish brown, firm loam and clay loam, and the lower part is firm loam. Sandstone bedrock is at a depth of about 28 inches. In some areas the surface layer is channery silt loam. In a few areas the bedrock is at a depth of 40 to 60 inches. In places the subsoil has less clay.

Included with this soil in mapping are small areas of the deep, moderately well drained Canfield, Ellsworth, and Rittman soils. These soils make up about 15 percent of most areas.

Permeability is moderate in the Loudonville soil. Runoff is rapid. The root zone is moderately deep over sandstone bedrock. Available water capacity is low.

Most areas are used as permanent pasture or woodland. Some areas have been cleared and are used for cultivated crops, such as corn and small grain, or for grasses and legumes for hay or pasture.

This soil is moderately well suited to row crops. Erosion is a severe hazard. It has reduced the natural fertility of the surface layer and made it difficult to prepare as a seedbed during periods of unfavorable moisture conditions. The hazard of erosion can be reduced by winter cover crops and crop rotations that include grasses and legumes. Minimizing tillage and incorporating crop residue into the plow layer increase the rate of water infiltration and decrease the runoff rate. Applications of lime and fertilizer are needed if optimum production is to be achieved.

This soil is well suited to woodland. The slope does not interfere with the common methods of woodland improvement or harvesting. Frequent, light thinning and harvesting can increase the vigor of the stand and reduce the windthrow hazard.

This soil is moderately well suited to building site development. It is better suited to dwellings without basements than to dwellings with basements. The bedrock at a depth of 20 to 40 inches interferes with excavations for basements and utility lines. Erosion is a hazard during construction unless a vegetative cover is maintained. Buildings should be designed so that they conform to the natural slope of the land. Backfilling around foundations with material that has a low shrink-swell potential helps to prevent the structural damage caused by shrinking and swelling. Local roads can be improved by suitable base material, which minimizes the damage caused by low strength.

This soil is poorly suited to septic tank absorption fields because the effluent can pollute ground water if it seeps through cracks in the bedrock. Installing the distribution lines in suitable fill material reduces the hazard of seepage.

The land capability classification is IIIe. The woodland ordination symbol is 4D.

LyD—Loudonville silt loam, 12 to 18 percent slopes. This moderately deep, moderately steep, well drained soil is on side slopes and the sides of well defined drainageways on bedrock-controlled till plains. Most areas are irregularly shaped and range from 5 to 30 acres in size.

Typically, the surface layer is brown, friable silt loam about 7 inches thick. The subsoil is about 23 inches thick. The upper part is brown and yellowish brown, firm loam and clay loam, and the lower part is firm loam. Sandstone bedrock is at a depth of about 30 inches. In some areas the surface layer is channery silt loam. In other areas the subsoil has less clay.

Included with this soil in mapping are small areas of the deep, moderately well drained Canfield, Ellsworth, and Rittman soils. Also included are small areas of exposed bedrock at the base of slopes. The included soils and exposed bedrock make up about 15 percent of most areas.

Permeability is moderate in the Loudenville soil. Runoff is rapid. The root zone is moderately deep over sandstone bedrock. Available water capacity is low.

Most areas are used as permanent pasture or woodland. Some areas have been cleared and are used for cultivated crops, such as corn and small grain, or for grasses and legumes for hay or pasture. A considerable acreage is developed for urban uses.

This soil is poorly suited to row crops because of a severe hazard of erosion, moderate to low natural fertility, and very high lime and fertilizer requirements. Growing winter cover crops and including grasses and legumes in the crop rotation help to control erosion. Ideally, the soil should remain in permanent pasture or woodland.

This soil is moderately well suited to woodland. Building logging roads and skid trails on the contour facilitates the use of equipment and helps to control erosion. Water bars and a vegetative cover also help to control erosion. Frequent, light thinning and harvesting can increase the vigor of the stand and reduce the windthrow hazard.

Because of the moderate depth to sandstone bedrock, the slope, and the hazard of erosion, this soil is poorly suited to building site development. A good vegetative cover is needed at all times to control erosion. Housing developments should be established on the contour wherever possible. Construction of dwellings with basements entails costly excavation of the bedrock. Backfilling around foundations with material that has a low shrink-swell potential helps to prevent the structural damage caused by shrinking and swelling.

Downslope seepage is a hazard if this soil is used as a site for septic tank absorption fields. The effluent can pollute ground water if it seeps through cracks in the bedrock. Installing the distribution lines on the contour and in suitable fill material reduces the hazard of seepage.

The land capability classification is IVe. The woodland ordination symbol is 4R.

LzB—Loudonville-Urban land complex, 2 to 6 percent slopes. This map unit consists of a moderately deep, gently sloping, well drained Loudonville soil intermingled with Urban land. The unit is on bedrock-controlled till plains. Most areas range from 25 to 50 acres in size. They are about 55 percent Loudonville silt loam and 30 percent Urban land. The Loudonville soil and Urban land occur as areas so intricately mixed or so small that separating them at the scale used in mapping is not practical.

Typically, the Loudonville soil has a surface layer of dark grayish brown, friable silt loam about 9 inches thick. The subsoil is about 25 inches of brown, yellowish brown, and dark yellowish brown, friable and firm silt loam, clay loam, and silty clay loam. It is underlain by sandstone bedrock at a depth of about 34 inches. In some areas the subsoil has less clay. In places the soil has been radically altered. Some of the low areas have been filled or leveled during construction, and some small areas have been cut, built up, or smoothed.

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

Included in mapping are small areas of the somewhat poorly drained Mitiwanga soils, generally in depressions. These soils make up about 15 percent of most areas.

Permeability is moderate in the Loudonville soil. Surface runoff is medium. The root zone is moderately deep over sandstone bedrock. Available water capacity is low.

The Loudonville soil is used for parks, lawns, or gardens. It is moderately well suited to parks and extensive play areas and to grasses, flowers, vegetables, trees, and shrubs. Erosion generally is a major problem only in areas where the surface is disturbed and exposed for a considerable period and in watercourses. Tilth is very poor in exposed subsoil and substratum material. Areas that have been cut and filled are poorly suited to lawns and gardens.

The Loudonville soil is moderately well suited to building site development. It is better suited to dwellings without basements than to dwellings with basements. Building foundations or basements generally require costly excavation of the bedrock. Backfilling around foundations with material that has a low shrink-swell potential helps to prevent the structural damage caused by shrinking and swelling. Local roads can be improved by suitable base material, which minimizes the damage caused by low strength.

Because of the moderate depth to bedrock, the Loudonville soil is poorly suited to septic tank absorption fields. The layer of suitable soil material is not thick enough to filter the effluent adequately. The effluent can pollute ground water if it seeps through cracks in the bedrock. Installing the distribution lines in suitable fill material reduces the hazard of seepage. All sanitary facilities should be connected to community sewers and sewage treatment facilities.

No land capability classification or woodland ordination symbol is assigned.

LzC—Loudonville-Urban land complex, 6 to 18 percent slopes. This map unit consists of a moderately deep, sloping and moderately steep, well drained Loudonville soil intermingled with Urban land. The unit is on bedrock-controlled till plains. Most areas range from 25 to 50 acres in size. They are 55 percent Loudonville silt loam and 30 percent Urban land. The

Loudonville soil and Urban land occur as areas so intricately mixed or so small that separating them at the scale used in mapping is not practical.

Typically, the Loudonville soil has a surface layer of dark grayish brown, friable silt loam about 9 inches thick. The subsoil is about 25 inches of yellowish brown and dark yellowish brown, firm clay loam and loam. Sandstone bedrock is at a depth of about 34 inches. In some areas the subsoil has less clay. In places the soil has been radically altered. Some of the low areas have been filled or leveled during construction, and some small areas have been cut, built up, or smoothed.

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

Included in mapping are small areas of the deep, moderately well drained Canfield, Ellsworth, and Rittman soils. These soils make up about 15 percent of most areas.

Permeability is moderate in the Loudonville soil. Surface runoff is rapid. The root zone is moderately deep over sandstone bedrock. Available water capacity is low.

The Loudonville soil is used for parks, lawns, or gardens. It is moderately well suited to grasses, flowers, vegetables, trees, and shrubs. Erosion is a hazard, especially in areas where the surface is disturbed and exposed for a considerable period and in watercourses. Tilth is very poor in exposed subsoil and substratum material. Areas that have been cut and filled are poorly suited to lawns and gardens.

The Loudonville soil is moderately well suited to building site development. It is better suited to dwellings without basements than to dwellings with basements. Building foundations or basements generally require costly excavation of the bedrock. Buildings should be designed so that they conform to the natural slope of the land. Erosion is a hazard during construction. This hazard can be reduced by maintaining a plant cover wherever possible. Backfilling around foundations with material that has a low shrink-swell potential helps to prevent the structural damage caused by shrinking and swelling. Local roads can be improved by suitable base material, which minimizes the damage caused by low strength.

The Loudonville soil is poorly suited to septic tank absorption fields. All sanitary facilities should be connected to community sewers and sewage treatment facilities. Where these treatment facilities are not available, the effectiveness of a septic tank absorption field is greatly reduced because the layer of suitable soil material is too thin to filter the effluent adequately. Installing the distribution lines in suitable fill material reduces the hazard of seepage, which can result in water pollution.

No land capability classification or woodland ordination symbol is assigned.

MgA—Mahoning silt loam, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil is in broad areas on flats and in small areas at the head of drainageways on till plains. Most areas are irregularly shaped and range from 10 to 150 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 32 inches of dark yellowish brown and yellowish brown, mottled, firm silty clay loam and clay. The substratum to a depth of about 60 inches is yellowish brown, firm silty clay loam and clay loam glacial till.

Included with this soil in mapping are small areas of the moderately well drained Ellsworth soils on slight rises. Also included are small areas of the poorly drained Condit and Trumbull soils in depressions. Included soils make up about 15 percent of most areas.

The Mahoning soil has a perched seasonal high water table at a depth of 6 to 18 inches during extended wet periods. Permeability is slow or very slow. Runoff is slow. The root zone is restricted mainly to the 30 to 42 inches above compact glacial till. Available water capacity is moderate.

Most areas are used for row crops, hay, or pasture. Some areas are reverting to natural vegetation.

The major limitations in the areas of this soil used for row crops are the wetness and the slow or very slow permeability. Drained areas are well suited to corn and to grasses and legumes for hay and pasture. Undrained areas, where planting commonly is delayed, are poorly suited to row crops, hay, and pasture. Both surface and subsurface drains can improve drainage. Closely spacing the subsurface drains results in uniform drainage. Hard clods form if the soil is cultivated when wet. The surface layer crusts after heavy rainfall, especially in tilled areas. Shallow cultivation of intertilled crops breaks up the crust. Because of compaction, grazing should be controlled. Returning crop residue to the soil and growing cover crops can increase the rate of water infiltration and the content of organic matter and improve tilth.

This soil is moderately well suited to woodland. Planting techniques that spread the roots of the seedlings and improve the soil-root contact reduce the seedling mortality rate. Harvesting procedures that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard.

This soil is poorly suited to building site development. Because of the seasonal wetness, it is better suited to dwellings without basements than to dwellings with basements. Ditches and subsurface drains can improve drainage. Properly landscaping building sites helps to keep surface water away from foundations. Properly designing foundations and footings helps to prevent the structural damage caused by shrinking and swelling. Drains at the base of footings and exterior basement wall coatings help to keep basements dry. Local roads can be improved by a drainage system and suitable base material, which minimize the damage caused by frost action and low strength.

This soil is poorly suited to septic tank absorption fields. The efficiency of the septic tank system can be improved by increasing the number and length of laterals. In areas where suitable outlets are available, curtain or perimeter drains can help to lower the seasonal high water table. Alternative disposal systems, such as two separate absorption fields, aerobic digesting systems, and mound systems, should be considered. A community sewer system is the most efficient, trouble-free method of sewage disposal.

Play areas and walkways require special surfacing material.

The land capability classification is IIIw. The woodland ordination symbol is 5C.

MgB—Mahoning silt loam, 2 to 6 percent slopes. This deep, gently sloping, somewhat poorly drained soil is on knolls and on gently undulating slopes in broad transitional areas between knolls and depressions on till plains. Areas range from 20 to 250 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The subsoil is yellowish brown and dark yellowish brown, mottled, firm silty clay loam about 33 inches thick. The substratum to a depth of about 70 inches is dark yellowish brown and yellowish brown, firm silty clay loam glacial till.

Included with this soil in mapping are small areas of the moderately well drained Ellsworth soils on slight rises. Also included are small areas of the poorly drained Condit and Trumbull soils in depressions. Included soils make up about 15 percent of most areas.

The Mahoning soil has a perched seasonal high water table at a depth of 6 to 18 inches during extended wet periods. Permeability is slow or very slow. Runoff is medium. The root zone is restricted mainly to the 30 to 42 inches above compact glacial till. Available water capacity is moderate.

Most areas are used for cultivated crops, hay, or pasture. Some areas are wooded or are reverting to natural vegetation.

Drained areas of this soil are well suited to cultivated crops, hay, and pasture, and undrained areas are moderately well suited. The wetness and the slow or very slow permeability limit the suitability of this soil for the crops that are planted early in spring. Maintaining good tilth and controlling erosion are difficult in intensively cultivated areas. Tilling and harvesting at the proper moisture content, growing cover crops, and incorporating crop residue into the soil improve tilth, increase the content of organic matter, and help to control erosion. Minimizing soil compaction and maintaining desirable forage stands are difficult in undrained areas. Both surface and subsurface drains can improve drainage. Closely spacing the subsurface drains results in uniform drainage. Hard clods form if the soil is cultivated when it is too wet (fig. 5). The surface layer crusts after heavy rainfall, especially in tilled areas. Shallow cultivation of intertilled crops breaks up the crust.

This soil is moderately well suited to trees. Planting techniques that spread the roots of the seedlings and improve the soil-root contact reduce the seedling mortality rate. Harvesting procedures that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard.

This soil is poorly suited to building site development. Because of the seasonal wetness, it is better suited to dwellings without basements than to dwellings with basements. Ditches and subsurface drains can improve drainage. Properly landscaping building sites helps to keep surface water away from foundations. Properly designing foundations and footings helps to prevent the structural damage caused by shrinking and swelling. Drains at the base of footings and exterior basement wall coatings help to keep basements dry. Excavation is limited by the wetness in winter and spring. A drainage system and suitable base material can minimize the damage to local roads caused by frost action and low strength.

This soil is poorly suited to septic tank absorption fields. The efficiency of the septic tank system can be improved by increasing the number and length of laterals. In areas where suitable outlets are available, curtain or perimeter drains can help to lower the seasonal high water table. Alternative disposal systems, such as two separate absorption fields, aerobic digesting systems, and mound systems, should be considered. A community sewer system is the most efficient, trouble-free method of sewage disposal.

Play areas and walkways require special surfacing material.

The land capability classification is IIIe. The woodland ordination symbol is 5C.

MhA—Mahoning silt loam, shale substratum, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil is on flats on till plains. Areas are irregularly shaped and range from 2 to 90 acres in size.

Figure 5.—An area of Mahoning silt loam, 2 to 6 percent slopes, where clods have formed because the soil was tilled when wet.

Typically, the surface layer is dark grayish brown, friable silt loam about 9 inches thick. The subsoil is about 30 inches thick. It is mottled. The upper part is yellowish brown, firm silty clay loam, and the lower part is dark yellowish brown and brown, firm silty clay loam and silty clay. The substratum is yellowish brown, mottled, firm silty clay loam glacial till. Weathered shale bedrock is at a depth of about 58 inches. In a few areas the depth to shale bedrock is more than 60 inches.

Included with this soil in mapping are some small areas of the poorly drained Condit soils in depressions. These soils make up about 15 percent of most areas.

The Mahoning soil has a perched seasonal high water table at a depth of 6 to 18 inches during extended wet periods. Permeability is slow or very slow. Runoff is slow. The root zone is restricted mainly to the 30 to 42 inches above compact glacial till. Available water capacity is moderate.

This soil is used mainly for row crops, hay, pasture, or woodland. Drained areas are well suited to corn, hay, and pasture, but undrained areas are poorly suited. The seasonal wetness and the slow or very slow permeability limit the use of this soil for farming. Planting is delayed and the choice of crops is limited in undrained areas. These areas can be used for hay or pasture, but maintaining desirable forage stands and tilth is difficult. Both surface and subsurface drains can improve drainage in most areas. Hard clods form if the soil is cultivated when wet. The surface layer crusts after heavy rainfall, especially in tilled areas. Shallow cultivation of intertilled crops breaks up the crust. Controlled grazing helps to prevent excessive compaction. Returning crop residue to the soil, growing cover crops, and tilling and harvesting at the proper moisture content increase the rate of water infiltration and maintain the content of organic matter and tilth.

This soil is moderately well suited to woodland. Planting techniques that spread the roots of the seedlings and improve the soil-root contact reduce the seedling mortality rate. Harvesting procedures that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard.

This soil is poorly suited to building site development. Because of the seasonal wetness, it is better suited to dwellings without basements than to dwellings with basements. Properly landscaping building sites helps to keep surface water away from foundations. Ditches and subsurface drains also can improve drainage. Properly designing foundations and footings helps to prevent the structural damage caused by shrinking and swelling. Drains at the base of footings and exterior basement wall coatings help to keep basements dry. The shale bedrock at a depth of 40 to 60 inches can be ripped with heavy excavation equipment. A drainage system and suitable base material can minimize the damage to local roads and streets caused by frost action and low strength.

This soil is poorly suited to septic tank absorption fields. The efficiency of the septic tank system can be improved by increasing the number and length of laterals. In areas where suitable outlets are available, curtain or perimeter drains can help to lower the seasonal high water table. Alternative disposal systems, such as two separate absorption fields, aerobic digesting systems, and mound systems, should be considered. A community sewer system is the most efficient, trouble-free method of sewage disposal.

Play areas and walkways require special surfacing material.

The land capability classification is IIIw. The woodland ordination symbol is 5C.

MhB—Mahoning silt loam, shale substratum, 2 to 6 percent slopes. This deep, gently sloping, somewhat poorly drained soil is in slightly convex areas between and along drainageways on till plains. Most areas are irregularly shaped and range from 3 to 50 acres in size.

Typically, the surface layer is grayish brown, friable silt loam about 7 inches thick. The subsoil is about 33 inches thick. It is mottled. The upper part is yellowish brown, firm silty clay loam, and the lower part is dark yellowish brown and brown, firm silty clay loam and silty clay. The substratum is yellowish brown, mottled, firm silty clay loam glacial till. Weathered shale bedrock is at a depth of about 58 inches. In a few areas the depth to shale bedrock is more than 60 inches. In places it is less than 40 inches.

Included with this soil in mapping are small areas of the poorly drained Condit soils in depressions. These soils make up about 10 percent of most areas.

The Mahoning soil has a perched seasonal high water table at a depth of 6 to 18 inches during extended wet periods. Permeability is slow or very slow. Runoff is medium. The root zone is restricted mainly to the 20 to 42 inches above compact glacial till. Available water capacity is moderate.

This soil is used mainly for row crops, hay, pasture, or woodland. Some areas are used for specialty crops.

The hazard of erosion, the seasonal wetness, and the slow or very slow permeability limit farming. Returning crop residue to the soil, growing cover crops, and tilling and harvesting at the proper moisture content reduce the hazard of erosion, increase the rate of water infiltration, and maintain the content of organic matter and tilth. Planting is delayed and the choice of crops is limited in undrained areas. These areas can be used for hay or pasture, but maintaining desirable forage stands and tilth is difficult. Drained areas are well suited and undrained areas moderately well suited to corn, hay, and pasture. Drained areas are moderately well suited to specialty crops (fig. 6). Both surface and subsurface drains can improve drainage in most areas. Hard clods form if the soil is cultivated when wet. The surface layer crusts after heavy rainfall, especially in tilled areas. Shallow cultivation of intertilled crops breaks up the crust. Controlled grazing helps to prevent excessive compaction.

This soil is moderately well suited to woodland. Planting techniques that spread the roots of the seedlings and improve the soil-root contact reduce the seedling mortality rate. Harvesting procedures that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard.

This soil is poorly suited to building site development. Because of the seasonal wetness, it is better suited to dwellings without basements than to dwellings with basements. Properly designing foundations and footings helps to prevent the structural damage caused by shrinking and swelling. Drains at the base of footings and exterior basement wall coatings help to keep basements dry. The shale bedrock at a depth of 40 to 60 inches can be ripped with heavy excavation equipment. A drainage system and suitable base material can minimize the damage to local roads caused by frost action and low strength.

This soil is poorly suited to septic tank absorption fields. The efficiency of the septic tank system can be improved by increasing the number and length of laterals. In areas where suitable outlets are available, curtain or perimeter drains can help to lower the seasonal high water table. Alternative disposal systems, such as two separate absorption fields, aerobic digesting systems, and mound systems, should be considered. A community sewer system is the most efficient, trouble-free method of sewage disposal.

Play areas and walkways require special surfacing material.

Figure 6.—A drained area of Mahoning silt loam, shale substratum, 2 to 6 percent slopes, used for strawberries.

The land capability classification is IIIe. The woodland ordination symbol is 5C.

MhC—Mahoning silt loam, shale substratum, 6 to 12 percent slopes. This deep, sloping, somewhat poorly drained soil is on ridgetops, uneven shoulder slopes, and side slopes along well defined drainageways on till plains. Most areas are irregularly shaped and range from 3 to 35 acres in size.

Typically, the surface layer is grayish brown, friable silt loam about 7 inches thick. The subsoil is about 33 inches thick. It is mottled. The upper part is yellowish brown, firm silty clay loam, and the lower part is dark yellowish brown and brown, firm silty clay loam and silty clay. The substratum is yellowish brown, mottled, firm silty clay loam glacial till. Weathered shale bedrock is at a depth of about 50 inches. In a few areas the depth to shale bedrock is more than 60 inches. In places it is less than 40 inches.

Included with this soil in mapping are small areas of the poorly drained Condit soils in drainageways and small areas of moderately well drained soils on convex slopes. Included soils make up about 15 percent of most areas.

The Mahoning soil has a perched seasonal high water table at a depth of 6 to 18 inches during extended wet periods. Permeability is slow or very slow. Runoff is medium. The root zone is restricted mainly to the 30 to

42 inches above compact glacial till. Available water capacity is moderate.

This soil is used mainly for hay, pasture, or woodland. It is poorly suited to row crops and moderately well suited to hay and pasture. The hazard of erosion, the seasonal wetness, and the slow or very slow permeability limit farming. Returning crop residue to the soil, growing cover crops, and tilling and harvesting at the proper moisture content reduce the hazard of erosion, increase the rate of water infiltration, and maintain the content of organic matter and tilth. Planting is delayed and the choice of crops is limited in undrained areas. These areas can be used for hay or pasture, but maintaining desirable forage stands and tilth is difficult. Subsurface drains can improve drainage in some areas. Hard clods form if the soil is cultivated when wet. The surface layer crusts after heavy rainfall, especially in tilled areas. Shallow cultivation of intertilled crops breaks up the crust. Controlled grazing helps to prevent excessive compaction.

This soil is moderately well suited to woodland. Planting techniques that spread the roots of the seedlings and improve the soil-root contact reduce the seedling mortality rate. Harvesting procedures that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard.

This soil is poorly suited to building site development. Because of the seasonal wetness, it is better suited to dwellings without basements than to dwellings with basements. Buildings should be designed so that they conform to the natural slope of the land. Land shaping is needed in some areas. Properly designing foundations and footings helps to prevent the structural damage caused by shrinking and swelling. Drains at the base of footings and exterior basement wall coatings help to keep basements dry. The shale bedrock at a depth of 40 to 60 inches can be ripped with heavy excavation equipment. Increased runoff and erosion occur during construction. They can be controlled by maintaining a plant cover wherever possible. A drainage system and suitable base material can minimize the damage to local roads caused by frost action and low strength.

This soil is poorly suited to septic tank absorption fields. The efficiency of the septic tank system can be improved by increasing the number and length of laterals. Installing interceptor drains upslope from the absorption field reduces the seasonal wetness. Alternative disposal systems, such as two separate absorption fields, aerobic digesting systems, and mound systems, should be considered. A community sewer system is the most efficient, trouble-free method of sewage disposal.

The land capability classification is IVe. The woodland ordination symbol is 5C.

MkB—Mahoning-Urban land complex, 2 to 6 percent slopes. This map unit consists of a deep, gently sloping, somewhat poorly drained Mahoning soil intermingled with Urban land. The unit is on till plains. Most areas range from 10 to 250 acres in size. They are about 55 percent Mahoning silt loam and 35 percent Urban land. The Mahoning soil and Urban land occur as areas so intricately mixed or so small that separating them at the scale used in mapping is not practical.

Typically, the Mahoning soil has a surface layer of dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 32 inches of yellowish brown and dark yellowish brown, mottled, firm silty clay loam and clay. The substratum to a depth of about 60 inches is yellowish brown, mottled, firm silty clay loam and clay loam glacial till. In places the soil has been radically altered. Some of the low areas have been filled or leveled during construction, and other areas have been cut, built up, or smoothed.

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

Included in mapping are small areas of Ellsworth and Condit soils. The moderately well drained Ellsworth soils are in the more sloping, convex areas. The poorly drained Condit soils are in depressions on the till plains. Included soils make up about 10 percent of most areas.

Most areas of this map unit are drained by sewer systems, gutters, subsurface drains, and surface ditches. Areas of the Mahoning soil that are not drained have a perched seasonal high water table at a depth of 6 to 18 inches during extended wet periods. Permeability is slow or very slow in this soil. Surface runoff is medium. The root zone is restricted mainly to the 30 to 42 inches above compact glacial till. Available water capacity is moderate.

The Mahoning soil is used for parks, lawns, or gardens. It is well suited to grasses, flowers, vegetables, trees, and shrubs where excess water is removed. Undrained areas are only moderately well suited to these uses. The wetness can be reduced primarily by a subsurface drainage system but also by surface drainage ditches. The perennial plants that are selected for planting should be those that are fairly tolerant of wetness. Erosion is a major problem only in areas where the surface is disturbed and exposed for a considerable period and in watercourses. Areas that have been cut and filled are poorly suited to lawns and gardens because of very poor tilth.

The Mahoning soil is poorly suited to building site development. It is better suited to dwellings without basements than to dwellings with basements because of the seasonal wetness. If dwellings with basements are constructed, drains around footings and other subsurface drains, adequate waterproofing of basement walls, and a sump pump are needed because of the seasonal high water table. Properly designing foundations and footings and providing suitable backfill material help to prevent the structural damage caused by shrinking and swelling. Local roads can be improved by a drainage system and suitable base material, which minimize the damage caused by frost action and low strength.

The Mahoning soil is poorly suited to septic tank absorption fields because of the slow permeability and the wetness. Community sewage treatment plants should be used wherever they are available. In areas where they are not available, increasing the size of the absorption field and installing perimeter drains can improve the sewage disposal system.

No land capability classification or woodland ordination symbol is assigned.

MtA—Mitiwanga silt loam, 0 to 2 percent slopes. This moderately deep, nearly level, somewhat poorly drained soil is on flats on bedrock-controlled till plains. Most areas are irregularly shaped and range from 5 to 60 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 4 inches thick. The subsurface layer is pale brown, mottled, friable silt loam about 5 inches thick. The subsoil is about 22 inches thick. The upper part is yellowish brown, mottled, friable silt loam and firm clay loam, and the lower part is grayish brown, mottled, firm clay loam. Sandstone bedrock is at a depth of about 31 inches. In some areas the surface layer is loam.

Included with this soil in mapping are areas of the deep, poorly drained Condit and Sebring soils in small depressions. These soils make up about 15 percent of most areas.

The Mitiwanga soil has a perched seasonal high water table at a depth of 12 to 30 inches during extended wet periods. Permeability is moderate. Runoff is slow. The root zone is moderately deep over sandstone bedrock. Available water capacity is low.

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

The seasonal wetness and the moderate depth to bedrock limit the use of this soil for farming. Unless drained, the soil is poorly suited to row crops. The wetness delays planting and limits the choice of crops. Drained areas are well suited to row crops, hay, and pasture. Undrained areas can be used for hay or pasture, but maintaining tilth and desirable forage stands is difficult. Surface and subsurface drains can be used. The hard sandstone bedrock commonly hinders the installation of drains, however, and outlets are not available in many areas. The soil is subject to compaction and hard clodding if tillage or harvesting activities are performed during excessively wet periods. The surface layer crusts after heavy rainfall, especially in tilled areas. Shallow cultivation of intertilled crops breaks up the crust. Tillage and harvesting activities should be performed at the optimum moisture content with equipment that minimizes soil compaction. Properly managing crop residue and growing cover crops increase the content of organic matter and improve tilth.

This soil is moderately well suited to woodland. Frequent, light thinning and harvesting can increase the vigor of the stand and reduce the windthrow hazard.

This soil is poorly suited to building site development because of the seasonal wetness and the hard bedrock at a depth of 20 to 40 inches. It is better suited to dwellings without basements than to dwellings with basements. Surface drains and storm sewers can remove surface water. Properly landscaping building sites helps to keep surface water away from foundations and footings. Local roads can be improved by a drainage system and suitable base material, which minimize the damage caused by frost action.

This soil is poorly suited to septic tank absorption fields because of the seasonal wetness and the bedrock at a depth of 20 to 40 inches. In areas where suitable outlets are available, curtain or perimeter drains can help to lower the seasonal high water table. The layer of suitable soil material is not thick enough to filter the effluent adequately. Installing the distribution lines in suitable fill material reduces the hazard of seepage, which can result in water pollution. Alternative disposal systems, such as two separate absorption fields, aerobic digesting systems, and mound systems, should be considered. A community sewer system is the most efficient, trouble-free method of sewage disposal.

The land capability classification is IIw. The woodland ordination symbol is 4D.

MtB—Mitiwanga silt loam, 2 to 6 percent slopes. This moderately deep, gently sloping, somewhat poorly drained soil is on knolls and side slopes on bedrock-controlled till plains. Most areas are irregular in shape and range from 5 to 35 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The subsoil is about 23 inches thick. It is mottled. The upper part is yellowish brown and grayish brown, friable silt loam and firm clay loam, and the lower part is dark yellowish brown and grayish brown, firm silty clay loam and clay loam. Sandstone bedrock is at a depth of about 30 inches. In some areas the surface layer is loam. In a few areas the bedrock is at a depth of 40 to 60 inches.

Included with this soil in mapping are small areas of the deep, poorly drained Condit and Sebring soils in depressions. These soils make up about 15 percent of most areas.

The Mitiwanga soil has a perched seasonal high water table at a depth of 12 to 30 inches during extended wet periods. Permeability is moderate. Runoff is medium. The root zone is moderately deep over sandstone bedrock. Available water capacity is low.

This soil is used mainly for pasture or woodland. Some areas have been cleared and are used for corn or small grain or for mixtures of grasses and legumes for hay.

Drained areas of this soil are well suited to hay, pasture, and row crops, and undrained areas are moderately well suited. Erosion and the seasonal wetness are the most serious problems affecting cropland and pasture. Erosion can be kept to a minimum by increasing the rate of water infiltration and reducing the runoff rate. Growing winter cover crops and including grasses and legumes in the crop rotation help to maintain maximum ground cover throughout the year. Minimum tillage and incorporation of crop residue into the plow layer improve tilth and increase the rate of water infiltration. The wetness can be reduced mainly by a subsurface drainage system but also by ditches and grassed waterways. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is moderately well suited to woodland. Frequent, light thinning and harvesting can increase the vigor of the stand and reduce the windthrow hazard.

Because of the seasonal high water table and the moderate depth to sandstone bedrock, this soil is poorly suited to building site development. It is better suited to dwellings without basements than to dwellings with basements. Drains around footings and other subsurface drains, adequate waterproofing of basement walls, and a sump pump are needed because of the high water table. Local roads can be improved by a drainage system and suitable base material, which minimize the damage caused by frost action.

Because of the moderate depth to bedrock, this soil is poorly suited to septic tank absorption fields. The layer of suitable soil material is not thick enough to filter the effluent adequately. Installing the distribution lines in suitable fill material reduces the hazard of seepage, which can result in water pollution. In areas where suitable outlets are available, curtain or perimeter drains can help to lower the seasonal high water table. If possible, community disposal systems should be used.

The land capability classification is IIe. The woodland ordination symbol is 4D.

Or—Orrville silt loam, frequently flooded. This deep, nearly level, somewhat poorly drained soil is on flood plains. It is subject to flooding. Slopes are 0 to 2 percent. Most areas are long and narrow and range from 5 to 120 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 10 inches thick. The subsoil is brown and grayish brown, mottled, friable silt loam about 26 inches thick. It has thin strata of loam in the lower part. The substratum to a depth of about 60 inches is gray, dark gray, and dark olive gray, friable and loose, stratified fine sandy loam, silt loam, sandy loam, and loamy sand. It is mottled in the upper part.

Included with this soil in mapping are narrow strips of the well drained Tioga soils. These soils are on slight rises and in positions on the landscape similar to those of the Orrville soil. Also included are small areas of the poorly drained Holly soils in slight depressions and old meander channels. Included soils make up about 15 percent of most areas.

The Orrville soil has a seasonal high water table at a depth of 12 to 30 inches during extended wet periods. Permeability is moderate. Runoff is slow. The root zone is deep. Available water capacity is high.

Most of the acreage is used as pasture or woodland. The flooding and the seasonal wetness limit the use of this soil for farming. The wetness delays planting and limits the choice of crops. Drained areas are well suited to row crops, such as corn. Undrained areas are poorly suited to row crops, hay, and pasture. Maintaining tilth and desirable forage stands is difficult in undrained areas. Surface drains can remove excess surface water. A subsurface drainage system also is needed, but establishing suitable outlets is difficult in many areas. Growing cover crops helps to maintain the content of organic matter and protects the surface during periods of flooding.

This soil is moderately well suited to woodland. The species selected for planting should be those that can withstand floodwater and are tolerant of some wetness.

This soil is generally unsuited to building site development and septic tank absorption fields because of the hazard of flooding and the seasonal wetness. Diking to control flooding is difficult. Local roads can be improved by installing a drainage system, which can mimimize the damage caused by frost action, and by providing suitable base and fill material, which can raise the road above the level of flooding. Sloughing is a hazard in excavations.

This soil is suited to such recreational areas as hiking trails, which can be used during the drier part of the year.

The land capability classification is IIw. The woodland ordination symbol is 5A.

OsB—Oshtemo sandy loam, 2 to 6 percent slopes. This deep, gently sloping, well drained soil is on stream terraces and outwash plains. Most areas are irregularly shaped and range from 3 to 25 acres in size.

Typically, the surface layer is brown, friable sandy loam about 8 inches thick. The subsoil is about 50 inches thick. The upper part is yellowish brown and brown, friable sandy loam, and the lower part is brown and dark yellowish brown, very friable loamy sand. The substratum to a depth of about 80 inches is yellowish brown, loose gravelly loamy sand.

Included with this soil in mapping are scattered small areas of Chili soils. These soils have more clay in the upper part of the subsoil than the Oshtemo soil. They make up about 10 percent of most areas.

Permeability is moderately rapid in the subsoil of the Oshtemo soil and very rapid in the substratum. Runoff is slow. The root zone is deep. Available water capacity is moderate.

Most areas are used for row crops. This soil is well suited to small grain and hay and to grazing early in spring. If irrigated, it is well suited to row crops and specialty crops. It is suited to no-till farming and other kinds of minimum tillage. Pasture grasses grow slowly in summer because the soil is droughty. Deep-rooted plants, such as alfalfa, grow better than other plants during dry periods. Returning crop residue to the soil and growing cover crops conserve moisture, improve tilth, help to control erosion, and maintain the content of organic matter. Because nutrients are leached at a moderately rapid rate, crops generally respond better to smaller, more frequent or more timely applications of fertilizer than to one large application.

This soil is well suited to woodland. No major hazards or limitations affect planting or harvesting. The species that are adapted to dry sites should be selected for planting.

This soil is well suited to building site development and septic tank absorption fields. Sloughing is a hazard in excavations. The effluent in septic tank absorption fields can pollute ground water if the distribution lines are installed too deep in the soil. The soil is a probable source of sand and gravel.

The land capability classification is IIIs. The woodland ordination symbol is 4A.

OsC—Oshtemo sandy loam, 6 to 12 percent slopes. This deep, sloping, well drained soil is on outwash plains, stream terraces, and kames. Most areas are irregularly shaped and range from 5 to 25 acres in size.

Typically, the surface layer is dark grayish brown, friable sandy loam about 6 inches thick. The subsoil is about 34 inches thick. The upper part is dark brown, friable sandy loam, and the lower part is dark brown and brown, friable sandy loam and loose loamy sand. The substratum to a depth of about 60 inches is yellowish brown, loose loamy sand and gravelly loamy sand. In some areas the substratum has thin lenses of gravelly loam.

Included with this soil in mapping are scattered small areas of Chili soils. These soils have more clay in the upper part of the subsoil than the Oshtemo soil. They make up about 10 percent of most areas.

Permeability is moderately rapid in the subsoil of the Oshtemo soil and very rapid in the substratum. Runoff is medium. The root zone is deep. Available water capacity is moderate.

Most areas are used as cropland. This soil is moderately well suited to row crops. It can be cropped successfully, but the cropping system should include a high proportion of long-term hay or pasture. The hazard of erosion is severe if cultivated crops are grown. Conservation of moisture is very important because of droughtiness. The soil is better suited to early maturing crops than to late maturing crops. During dry periods deep-rooted plants, such as alfalfa, grow better than other plants. Minimizing tillage, returning crop residue to the soil, and growing cover crops help to control erosion, conserve moisture, and maintain the content of organic matter. Because nutrients are leached at a moderately rapid rate, crops generally respond better to smaller, more frequent or more timely applications of fertilizer than to one large application.

This soil is well suited to woodland. No major hazards or limitations affect planting or harvesting. The species that are adapted to dry sites should be selected for planting.

This soil is well suited to building site development and moderately well suited to septic tank absorption fields. Buildings should be designed so that they conform to the natural slope of the land. Land shaping is needed in some areas. Sloughing is a hazard in excavations. Maintaining as much vegetation on the site as possible during construction reduces the hazard of erosion. Installing the distribution lines in absorption fields across the slope helps to prevent seepage of the effluent to the surface. The effluent can pollute ground water if the distribution lines are installed too deep in the soil. The soil is a probable source of sand and gravel.

The land capability classification is IIIe. The woodland ordination symbol is 4A.

Pg—Pits, gravel. This map unit consists of surface-mined areas from which aggregate material has been removed for use in construction. The pits are on kames and outwash terraces. Typically, they are adjacent to Chili, Oshtemo, and other soils that are underlain by gravel and sand outwash. Most range from 2 to 50 acres in size. Actively mined pits are continually being enlarged. Most of the pits have a high wall on one or more sides.

The material that is mined consists of stratified layers of gravel and sand of varying thickness and orientation. The kind and grain size of the aggregates are relatively uniform within any one layer but commonly differ from layer to layer. Some layers contain a significant amount of silt and sand. Selectivity in mining commonly is feasible.

The material that remains after mining is poorly suited to plants. Available water capacity is low. Many of the abandoned pits have been developed as habitat for wildlife or as recreational areas.

No land capability classification or woodland ordination symbol is assigned.

Pr—Pits, quarry. This map unit consists of surface-mined areas from which sandstone bedrock has been removed for use in construction. The quarries generally are in areas where sandstone bedrock is close to the surface. Typically, they are adjacent to Lordstown, Loudonville, and Mitiwanga soils. Most range from 3 to 80 acres in size. They generally have a high wall on one or more sides.

The sandstone that is mined is of varying thickness and orientation. Selectivity in mining commonly is feasible. The material remaining after mining varies within short lateral distances. It varies in available water capacity. It is poorly suited to plants. It is subject to erosion and is a source of siltation.

Establishing vegetation in areas that are no longer mined reduces the hazard of erosion. Grasses and trees that can tolerate a fairly low available water capacity and unfavorable soil properties should be selected for planting. Blanketing the area with favorable soil material can help to establish a good vegetative cover. Ponded areas generally are suitable for the development of habitat for wildlife and for some recreational uses.

No land capability classification or woodland ordination symbol is assigned.

PsA—Platea silt loam, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil is on broad flats on till plains. Most areas are irregularly shaped and range from 5 to 120 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 38 inches thick. It is mottled. The upper part is yellowish brown, friable silt loam; the next part is a dense, brittle fragipan of yellowish brown, very firm silty clay loam; and the lower part is yellowish brown, firm silty clay loam. The substratum to a depth of about 65 inches is yellowish brown, firm silty clay loam.

Included with this soil in mapping are small areas of the poorly drained Sebring soils in depressions. These soils make up about 15 percent of most areas.

The Platea soil has a perched seasonal high water table at a depth of 6 to 24 inches during extended wet periods. Permeability is moderately slow above the fragipan and very slow in the fragipan. This soil dries out slowly in spring. Runoff is slow. The root zone is restricted mainly to the part of the profile above the fragipan. This zone has a low available water capacity.

Most areas are used for row crops. Some areas are used as woodland or pasture.

The wetness limits the suitability of this soil for planting crops or grazing early in spring. Drained areas are moderately well suited to row crops, hay, and pasture, but undrained areas are poorly suited. Minimizing soil compaction and maintaining desirable forage stands are difficult in undrained areas. Surface drains can remove excess surface water. Subsurface drains can remove excess water from the root zone. These drains should be closely spaced for uniform drainage. Hard clods form if the soil is cultivated when wet. The surface layer crusts after heavy rainfall, especially in tilled areas. Shallow cultivation of intertilled crops breaks up the crust. Properly managing crop residue and growing cover crops increase the content of organic matter, improve tilth, and increase the rate of water infiltration.

This soil is moderately well suited to woodland. The species selected for planting should be those that are tolerant of some wetness and a root-restricting layer in the lower part of the subsoil. Planting seedlings that have been transplanted once can reduce the seedling mortality rate. Harvesting procedures that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard.

Because of the seasonal wetness, this soil is poorly suited to building site development. It is better suited to dwellings without basements than to dwellings with basements. Ditches and subsurface drains can improve drainage. Properly landscaping building sites helps to keep surface water away from foundations. Drains at the base of footings and exterior basement wall coatings help to keep basements dry. Local roads can be improved by a drainage system and suitable base material, which minimize the damage caused by frost action, wetness, and low strength.

This soil is poorly suited to septic tank absorption fields because of the seasonal wetness and the very slowly permeable fragipan. The efficiency of the septic tank system can be improved by increasing the number and length of laterals. In areas where suitable outlets are available, curtain or perimeter drains can help to lower the seasonal high water table. Alternative disposal systems, such as two separate absorption fields, aerobic digesting systems, and mound systems, should be considered. A community sewer system is the most efficient, trouble-free method of sewage disposal.

The land capability classification is IIIw. The woodland ordination symbol is 4D.

PsB—Platea silt loam, 2 to 6 percent slopes. This deep, gently sloping, somewhat poorly drained soil is on low knolls and side slopes on till plains. Most areas are irregularly shaped and range from 20 to 80 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 27 inches thick. It is mottled. The upper part is brown and yellowish brown, friable silt loam and firm silty clay loam, and the lower part is a dense, brittle fragipan of dark yellowish brown, very firm silt loam. The substratum to a depth of about 65 inches is yellowish brown, mottled, firm silty clay loam.

Included with this soil in mapping are small areas of the poorly drained Sebring soils in depressions. These soils make up about 15 percent of most areas.

The Platea soil has a perched seasonal high water table at a depth of 6 to 24 inches during extended wet periods. Permeability is moderately slow above the fragipan and very slow in the fragipan. This soil dries out slowly in spring. Runoff is medium. The root zone is restricted mainly to the part of the profile above the fragipan. This zone has a low available water capacity.

Most areas are used for row crops or hay. This soil is moderately well suited to row crops, hay, and pasture. Maintaining good tilth is important because it minimizes surface crusting and erosion. Growing cover crops and properly managing crop residue increase the content of organic matter, improve tilth, reduce the hazard of erosion, and increase the rate of water infiltration. Minimizing soil compaction and maintaining desirable forage stands are difficult. The wetness delays planting and limits the choice of crops. It also delays grazing in spring. Subsurface drains can remove excess water from the subsoil. They should be closely spaced for uniform drainage.

This soil is moderately well suited to woodland. Planting seedlings that have been transplanted once can reduce the seedling mortality rate. Harvesting procedures that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard.

Because of the seasonal wetness, this soil is poorly suited to building site development. It is better suited to dwellings without basements than to dwellings with basements. Properly landscaping building sites helps to keep surface water away from foundations. Drains at the base of footings and exterior basement wall coatings help to keep basements dry. Local roads can be improved by a drainage system and suitable base material, which minimize the damage caused by frost action, wetness, and low strength.

This soil is poorly suited to septic tank absorption fields because of the seasonal high water table and the very slowly permeable fragipan. The efficiency of the septic tank system can be improved by increasing the number and length of laterals. In areas where suitable outlets are available, curtain or perimeter drains can help to lower the seasonal high water table. Alternative disposal systems, such as two separate absorption fields, aerobic digesting systems, and mound systems, should be considered. A community sewer system is the most efficient, trouble-free method of sewage disposal.

The land capability classification is IIIe. The woodland ordination symbol is 4D.

PsC—Platea silt loam, 6 to 12 percent slopes. This deep, sloping, somewhat poorly drained soil is on side slopes along well defined drainageways on till plains. Most areas are long and narrow or irregularly shaped and range from 5 to 35 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The subsurface layer is pale brown, mottled, friable silt loam about 3 inches thick. The subsoil is about 29 inches thick. It is mottled. The upper part is yellowish brown, firm silt loam, and the lower part is a dense, brittle fragipan of dark yellowish brown, very firm silty clay loam. The substratum to a depth of about 65 inches is yellowish brown, mottled, firm silt loam and silty clay loam. In some areas the soil is eroded and has a brown surface layer containing more clay.

Included with this soil in mapping are small areas of the poorly drained Sebring soils on foot slopes and in narrow strips along drainageways. Also included are moderately well drained soils in small convex areas. Included soils make up about 15 percent of most areas.

The Platea soil has a perched seasonal high water table at a depth of 6 to 24 inches during extended wet periods. Permeability is moderately slow above the fragipan and very slow in the fragipan. Runoff is medium. The root zone is restricted mainly to the part of the profile above the fragipan. This zone has a low available water capacity.

This soil is used mainly for row crops, pasture, or woodland. Drained areas are well suited to hay and pasture and moderately well suited to row crops. Undrained areas are poorly suited to row crops. The soil can be cropped successfully, but the cropping system should include long-term hay or pasture. Erosion is a management concern, especially if slopes are long. Applying a system of minimum tillage and growing cover crops increase the content of organic matter, improve tilth, reduce the hazard of erosion, and increase the rate of water infiltration. Grassed waterways are needed. The surface layer crusts, especially after heavy rainfall. Shallow cultivation of intertilled crops breaks up the crust. Subsurface drains can remove excess water from the subsoil.

This soil is moderately well suited to woodland. Planting seedlings that have been transplanted once can reduce the seedling mortality rate. Harvesting procedures that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. The species that are tolerant of a root-restricting layer in the lower part of the subsoil should be selected for planting.

This soil is poorly suited to building site development. Because of the seasonal wetness, it is better suited to dwellings without basements than to dwellings with basements. Buildings should be designed so that they conform to the natural slope of the land. Land shaping is needed in some areas. Drains at the base of footings and exterior basement wall coatings help to keep basements dry. Increased runoff and erosion occur during construction. They can be controlled by maintaining a plant cover wherever possible. Local roads can be improved by strengthening or replacing the base material and by installing a drainage system, which minimizes the damage caused by frost action.

This soil is poorly suited to septic tank absorption fields. The efficiency of the septic tank system can be improved by increasing the number and length of laterals. In areas where suitable outlets are available, curtain or perimeter drains can help to lower the seasonal high water table. Installing the distribution lines across the slope helps to prevent seepage of the effluent to the surface. Alternative disposal systems, such as two separate absorption fields, aerobic digesting systems, and mound systems, should be considered. A community sewer system is the most efficient, trouble-free method of sewage disposal.

The land capability classification is IIIe. The woodland ordination symbol is 4D.

RaA—Ravenna silt loam, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil is on broad flats on till plains. Most areas are broad or irregularly shaped and range from 15 to 75 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 10 inches thick. The subsoil is about 45 inches thick. It is mottled. The upper part is yellowish brown and brown, friable and firm loam and clay loam; the next part is a dense, brittle fragipan of brown and yellowish brown, very firm loam; and the lower part is brown and yellowish brown, firm loam. The substratum to a depth of about 60 inches is brown and yellowish brown, firm loam.

Included with this soil in mapping are small areas of the moderately well drained Canfield soils on slight rises. Also included are small areas of the poorly drained Sebring soils in depressions. Included soils make up about 10 percent of most areas.

The Ravenna soil has a perched seasonal high water table at a depth of 6 to 18 inches during extended wet periods. Permeability is moderate above the fragipan and slow in the fragipan. This soil dries out slowly in the spring. Runoff is slow. The root zone is restricted mainly to the part of the profile above the fragipan. The zone has a low available water capacity.

Most areas are used for row crops or hay (fig. 7). The wetness limits the suitability of this soil for planting crops or grazing early in spring. Drained areas are well suited to row crops, hay, and pasture, but undrained areas are poorly suited. Minimizing soil compaction and maintaining desirable forage stands are difficult in undrained areas. Surface and subsurface drains can remove excess water. Because of the slowly permeable fragipan, subsurface drains should be closely spaced for uniform drainage. The surface layer crusts after heavy rainfall, especially in tilled areas. Shallow cultivation of intertilled crops breaks up the crust. Returning crop residue to the soil and growing cover crops increase the content of organic matter and the rate of water infiltration and improve tilth. The perennial plants that are tolerant of wetness should be selected for planting. Grazing should be controlled because of the hazard of excessive compaction.

This soil is moderately well suited to woodland. Planting seedlings that have been transplanted once can reduce the seedling mortality rate. Harvesting procedures that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard.

Because of the seasonal wetness, this soil is poorly suited to building site development. It is better suited to dwellings without basements than to dwellings with basements. Ditches and subsurface drains can improve drainage. Drains at the base of footings and exterior

Figure 7.—A drained area of Ravenna silt loam, 0 to 2 percent slopes, used for row crops and hay.

basement wall coatings help to keep basements dry. Properly landscaping building sites helps to keep surface water away from foundations. Local roads can be improved by a drainage system and suitable base material, which minimize the damage caused by frost action and wetness.

This soil is poorly suited to septic tank absorption fields because of the seasonal wetness and the slowly permeable fragipan. The efficiency of the septic tank system can be improved by increasing the number and length of laterals. In areas where suitable outlets are available, curtain or perimeter drains can help to lower the seasonal high water table. Alternative disposal systems, such as two separate absorption fields, aerobic digesting systems, and mound systems, should be considered. A community sewer system is the most efficient, trouble-free method of sewage disposal.

The land capability classification is IIw. The woodland ordination symbol is 5D.

RaB—Ravenna silt loam, 2 to 6 percent slopes. This deep, gently sloping, somewhat poorly drained soil is on low knolls and side slopes on till plains. Most areas are broad or irregularly shaped and range from 15 to 100 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 9 inches thick. The subsoil is about 45 inches thick. It is mottled. The upper part is yellowish brown, friable and firm silt loam; the next part is a dense, brittle fragipan of yellowish brown, very firm and firm loam; and the lower part is yellowish brown, firm loam. The substratum to a depth of about 74 inches is yellowish brown, firm loam.

Included with this soil in mapping are small areas of the poorly drained Sebring soils in depressions and drainageways. Also included are small areas of the moderately well drained Canfield soils on some of the higher knolls. Included soils make up about 10 percent of most areas.

The Ravenna soil has a perched seasonal high water table at a depth of 6 to 18 inches during extended wet periods. Permeability is moderate above the fragipan and slow in the fragipan. This soil dries out slowly in spring. Runoff is medium. The root zone is restricted mainly to the part of the profile above the fragipan. This zone has a low available water capacity.

Most areas are used for row crops or hay. Drained areas are well suited to row crops, hay, and pasture, and undrained areas are moderately well suited. Erosion is a moderate hazard if the soil is cultivated. The wetness delays planting and limits the choice of crops. Minimizing soil compaction and maintaining desirable forage stands are difficult in undrained areas. Maintaining good tilth is important because it minimizes surface crusting and erosion. Growing cover crops and properly managing crop residue increase the content of organic matter, improve tilth, reduce the hazard of erosion, and increase the rate of water infiltration. Because of the slowly permeable fragipan, subsurface drains should be closely spaced for uniform drainage. Grazing should be controlled because of the hazard of excessive compaction.

This soil is moderately well suited to woodland. Planting seedlings that have been transplanted once can reduce the seedling mortality rate. Harvesting procedures that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard.

Because of the seasonal wetness, this soil is poorly suited to building site development. It is better suited to dwellings without basements than to dwellings with basements. Ditches and subsurface drains can improve drainage. Properly landscaping building sites helps to keep surface water away from foundations. Drains at the base of footings and exterior basement wall coatings help to keep basements dry. Local roads can be improved by a drainage system and suitable base material, which minimize damage caused by the wetness and frost action.

This soil is poorly suited to septic tank absorption fields because of the seasonal high water table and the slowly permeable fragipan. The efficiency of the septic tank system can be improved by increasing the number and length of laterals. In areas where suitable outlets are available, curtain or perimeter drains can help to lower the seasonal high water table. Alternative disposal systems, such as two separate absorption fields, aerobic digesting systems, and mound systems, should be considered. A community sewer system is the most efficient, trouble-free method of sewage disposal.

The land capability classification is IIe. The woodland ordination symbol is 5D.

RdB—Rawson silt loam, 2 to 6 percent slopes. This deep, gently sloping, moderately well drained soil is on terraces and till plains. Most areas are long and narrow or irregularly shaped and range from 5 to 100 acres in size.

Typically, the surface layer is brown, friable silt loam about 8 inches thick. The subsoil is about 36 inches thick. It is mottled below a depth of about 17 inches. The upper part is yellowish brown, friable silt loam and firm clay loam; the next part is yellowish brown and brown, firm loam and gravelly sandy clay loam; and the lower part is brown, firm clay loam. The substratum to a depth of about 60 inches is yellowish brown, mottled, firm clay glacial till. In some areas the surface layer is loam, sandy loam, or gravelly loam.

Included with this soil in mapping are small areas of the somewhat poorly drained Haskins soils. These soils are in nearly level areas. Also included are scattered small areas of soils that have less clay and more sand and gravel in the substratum than the Rawson soil. Included soils make up about 15 percent of most areas.

The Rawson soil has a perched seasonal high water table at a depth of 24 to 42 inches during extended wet periods. Permeability is moderate in the upper part of the subsoil and slow or very slow in the lower part and in the substratum. Runoff is medium. The root zone is restricted mainly to the 24 to 48 inches above compact glacial till or lacustrine material. Available water capacity is moderate.

Most areas are used as cropland. A few areas support native hardwoods.

This soil is well suited to corn, soybeans, small grain, hay, and pasture. It is especially well suited to crops that mature early in the growing season. Erosion is the main hazard. Returning crop residue to the soil, minimizing tillage, and including meadow crops in the cropping sequence commonly help to control erosion, improve tilth, and increase the rate of water infiltration. Randomly spaced subsurface drains are used in the wetter included soils and seep spots. The soil is moderately well suited to grazing early in spring. Surface compaction, reduced growth rates, and poor tilth result from overgrazing or grazing when the soil is soft and sticky.

This soil is well suited to trees. No major hazards or limitations affect planting or harvesting.

This soil is moderately well suited to building site development and septic tank absorption fields. The seasonal wetness affects both of these uses, and the slow or very slow permeability in the lower part of the soil is a limitation on sites for septic tank absorption fields. The soil is better suited to dwellings without basements than to dwellings with basements. Properly landscaping building sites helps to keep surface water away from foundations. Drains at the base of footings and exterior basement wall coatings help to keep basements dry. Backfilling around basement walls with material from the upper part of the subsoil helps to prevent the structural damage caused by shrinking and swelling in the lower part of the subsoil and in the substratum. Increased runoff and erosion occur during construction. They can be reduced by maintaining a plant cover wherever possible. Septic tank absorption fields can be improved by increasing the size of the absorption area and installing curtain drains where outlets are available. Local roads can be improved by suitable base material, which minimizes the damage caused by frost action.

The land capability classification is IIe. The woodland ordination symbol is 4A.

RmA—Remsen silt loam, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil is on slight rises and at the head of small drainageways on till plains. Areas are generally rather broad and range from 10 to 150 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 35 inches thick. It is mottled. The upper part is yellowish brown and olive brown, firm and very firm silty clay loam and silty clay, and the lower part is grayish brown, very firm silty clay. The substratum to a depth of about 64 inches is grayish brown silty clay and clay glacial till. In places the subsoil is dominantly silty clay loam.

Included with this soil in mapping are small areas of the moderately well drained Geeburg soils on small knolls and the poorly drained Trumbull soils in depressions. Included soils make up about 15 percent of most areas.

The Remsen soil has a perched seasonal high water table at a depth of 6 to 18 inches during extended wet periods. Permeability is very slow. Runoff is slow. The root zone is restricted mainly to the 24 to 48 inches above compact glacial till. Available water capacity is moderate.

This soil is used mainly as cropland. Drained areas are moderately well suited to row crops, hay, and pasture, but undrained areas are poorly suited. The major management concern is the seasonal high water table. Some of the excess water can be drained off by surface drainage ditches. Subsurface drainage systems do not function well because of the high content of clay in the subsoil. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

This soil is moderately well suited to woodland. The species selected for planting should be those that are tolerant of the high content of clay in the subsoil and of some wetness. Harvesting procedures that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Planting techniques that spread the roots of the seedlings and improve the soil-root contact reduce the seedling mortality rate.

This soil is poorly suited to building site development. Because of the seasonal wetness and a moderate shrink-swell potential, it is better suited to dwellings without basements than to dwellings with basements. Ditches, storm sewers, and subsurface drains can improve drainage. Properly landscaping building sites helps to keep surface water away from foundations. Properly designing foundations and footings helps to prevent the structural damage caused by shrinking and swelling. Local roads can be improved by a drainage system and by suitable base material, which minimizes the damage caused by low strength.

This soil is poorly suited to septic tank absorption fields. The efficiency of the septic tank system can be improved by increasing the number and length of laterals. In areas where suitable outlets are available, curtain or perimeter drains can help to lower the seasonal high water table. Alternative disposal systems, such as two separate absorption fields, aerobic digesting systems, and mound systems, should be considered. A community sewer system is the most efficient, trouble-free method of sewage disposal.

Play areas and walkways require special surfacing material.

The land capability classification is IIIw. The woodland ordination symbol is 3C.

RmB—Remsen silt loam, 2 to 6 percent slopes. This deep, gently sloping, somewhat poorly drained soil generally is in broad transitional areas between knolls and depressions on till plains. It also is on some knolls and on the broad tops of ridges between steep valleys. Most areas are irregularly shaped and range from 5 to 200 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The subsoil is about 39 inches thick. It is mottled. The upper part is yellowish brown and brown, firm silty clay loam and silty clay, and the lower part is olive brown and grayish brown, very firm clay. The substratum to a depth of about 64 inches is grayish brown, mottled, very firm silty clay glacial till. In places the subsoil is dominantly silty clay loam.

Included with this soil in mapping are small areas of the moderately well drained Geeburg soils on the steeper slopes and the poorly drained Trumbull soils in depressions. Included soils make up about 15 percent of most areas.

The Remsen soil has a perched seasonal high water table at a depth of 6 to 18 inches during extended wet periods. Permeability is very slow. Runoff is medium. The root zone is restricted mainly to the 24 to 48 inches above compact glacial till. Available water capacity is moderate.

This soil is used mainly as cropland. Many areas that formerly were used for cultivated crops are reverting to woodland.

Drained areas of this soil are moderately well suited to crops, such as corn, small grain, and hay, but undrained areas are poorly suited. Some of the excess water can be drained off by surface drainage ditches. Subsurface tiling systems do not function well in this soil because of the high content of clay. Erosion is a moderate hazard if cultivated crops are grown. Minimum tillage, winter cover crops, and grassed waterways help to prevent excessive soil loss. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration.

This soil is moderately well suited to woodland. The species selected for planting should be those that are tolerant of the high content of clay in the subsoil and of some wetness. Harvesting procedures that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Planting techniques that spread the roots of the seedlings and improve the soil-root contact reduce the seedling mortality rate.

This soil is poorly suited to building site development. Because of the seasonal wetness, it is better suited to dwellings without basements than to dwellings with basements. Ditches, storm sewers, and subsurface drains can improve drainage. Properly landscaping building sites helps to keep surface water away from foundations. Properly designing foundations and footings helps to prevent the structural damage caused by shrinking and swelling. Drains at the base of footings and exterior basement wall coatings help to keep basements dry. Local roads can be improved by a drainage system and by suitable base material, which minimizes the damage caused by low strength.

This soil is poorly suited to septic tank absorption fields because of the seasonal high water table and the very slow permeability. The efficiency of the septic tank system can be improved by increasing the number and length of laterals. In areas where suitable outlets are available, curtain or perimeter drains can help to lower the seasonal high water table. Alternative disposal systems, such as two separate absorption fields, aerobic digesting systems, and mound systems, should be considered. A community sewer system is the most efficient, trouble-free method of sewage disposal.

Play areas and walkways require special surfacing material.

The land capability classification is IIIw. The woodland ordination symbol is 3C.

RoB—Remsen-Urban land complex, 2 to 6 percent slopes. This map unit consists of a deep, gently sloping, somewhat poorly drained Remsen soil intermingled with Urban land. The unit is on till plains. Most areas range from 25 to 200 acres in size. They are about 55 percent Remsen silt loam and 35 percent Urban land. The Remsen soil and Urban land occur as areas so intricately mixed or so small that separating them at the scale used in mapping is not practical.

Typically, the Remsen soil has a surface layer of dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 35 inches thick. It is mottled. The upper part is yellowish brown and olive brown, firm and very firm silty clay and clay, and the lower part is grayish brown, very firm clay. The substratum to a depth of about 60 inches is grayish brown, mottled, firm silty clay and clay glacial till. In places the soil has been radically altered. Some of the low areas have been filled or leveled during construction, and some small areas have been cut, built up, or smoothed.

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

Included in mapping are small areas of the moderately well drained Geeburg soils on the higher, convex parts of the landscape and the poorly drained Trumbull soils in depressions and along drainageways. Included soils make up about 10 percent of most areas.

Most areas of this map unit are drained by sewer systems, gutters, subsurface drains, and surface ditches. Areas of the Remsen soil that are not drained have a perched water table at a depth of 6 to 18 inches during extended wet periods. Permeability is very slow in this soil. Runoff is medium. The root zone is restricted mainly to the 24 to 48 inches above compact glacial till. Available water capacity is moderate.

The Remsen soil is used for parks, lawns, or gardens. It is well suited to grasses, flowers, vegetables, trees, and shrubs where excess water is removed by a drainage system. Undrained areas are only moderately well suited to these uses. Surface drainage ditches can remove some of the excess moisture. Subsurface tiling systems are not very effective because of the high content of clay in the soil. The perennial plants that are selected for planting should be those that are fairly tolerant of wetness. Erosion is a major hazard only in areas where the surface is disturbed and exposed for a considerable period and in watercourses. Areas that have been cut and filled are poorly suited to lawns and gardens. Tilth is very poor in exposed subsoil and substratum material. This material is sticky when wet and hard when dry.

The Remsen soil is poorly suited to building site development. Because of the seasonal wetness and a moderate shrink-swell potential, it is better suited to dwellings without basements than to dwellings with basements. Ditches, storm sewers, and subsurface drains can improve drainage. Properly designing the foundations and footings of dwellings and small commercial buildings helps to prevent the structural damage caused by shrinking and swelling. Local roads can be improved by a drainage system and by suitable base material, which minimizes the damage caused by low strength.

The Remsen soil is poorly suited to septic tank absorption fields. All sanitary facilities should be connected to community sewers and sewage treatment facilities. In areas where sewers are not available, the efficiency of the septic tank system can be improved by increasing the number and length of laterals. In areas where suitable outlets are available, curtain or perimeter drains can help to lower the seasonal high water table.

No land capability classification or woodland ordination symbol is assigned.

RsB—Rittman silt loam, 2 to 6 percent slopes. This deep, gently sloping, moderately well drained soil is on knolls and side slopes on till plains. Most areas are irregularly shaped and range from 3 to 100 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 9 inches thick. The subsoil is about 47 inches thick. It is mottled below a depth of about 22 inches. The upper part is yellowish brown and brown, friable silt loam and firm clay loam; the next part is a dense, brittle fragipan of dark yellowish brown, very firm clay loam; and the lower part is dark yellowish brown, firm silty clay loam. The substratum to a depth of about 72 inches is yellowish brown, firm silty clay loam.

Included with this soil in mapping are small areas of the somewhat poorly drained Wadsworth soils on foot slopes and in slight depressions. These soils make up about 15 percent of most areas.

The Rittman soil has a perched seasonal high water table at a depth of 18 to 36 inches during extended wet periods. Permeability is moderate above the fragipan and slow in the fragipan. Runoff is medium. The root zone is restricted mainly to the part of the profile above the fragipan. This zone has a low available water capacity.

Most areas are used as cropland or pasture. A few areas are wooded.

This soil is well suited to corn, soybeans, hay, and pasture. Row crops can be grown frequently if management is intensive. Grasses and legumes that withstand some wetness are suitable for hay or pasture. The soil tends to erode easily. Properly managing crop residue and growing cover crops increase the content of organic matter, improve tilth, help to control erosion, and increase the rate of water infiltration. The soil is subject to compaction if tillage and harvesting activities are performed during excessively wet periods. The surface layer crusts after heavy rainfall, especially in tilled areas. Shallow cultivation of intertilled crops breaks up the crust. Tillage and harvesting activities should be performed at the optimum moisture content. Slight seasonal wetness delays planting in some areas. Random subsurface drains may be needed in the wetter included soils, but water moves slowly into the drains.

This soil is well suited to woodland. Machine planting of tree seedlings is practical on this soil.

This soil is moderately well suited to building site development. It is better suited to dwellings without basements than to dwellings with basements. Drains at the base of footings and exterior wall coatings help to keep basements dry. Local roads and streets can be improved by a drainage system and suitable base material, which minimize the damage caused by frost action.

This soil is poorly suited to septic tank absorption fields because of the slow permeability and the seasonal wetness. The efficiency of the septic tank system can be improved by increasing the number and length of laterals. In areas where suitable outlets are available, curtain or perimeter drains can help to lower the seasonal high water table. Alternative disposal systems, such as two separate absorption fields, aerobic digesting systems, and mound systems, should be considered. A community sewer system is the most efficient, trouble-free method of sewage disposal.

The land capability classification is IIe. The woodland ordination symbol is 5A.

RsC—Rittman silt loam, 6 to 12 percent slopes. This deep, sloping, moderately well drained soil is on ridgetops and on side slopes along well defined drainageways on till plains. Most areas are long and narrow and range from 3 to 50 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 6 inches thick. The subsoil is about 45 inches thick. It is mottled below a depth of about 18 inches. The upper part is yellowish brown, friable silt loam and firm clay loam, and the lower part is a dense, brittle fragipan of dark yellowish brown, very firm clay loam. The substratum to a depth of about 60 inches is yellowish brown and dark yellowish brown, mottled, firm clay loam and silty clay loam.

Included with this soil in mapping are small areas of the somewhat poorly drained Wadsworth soils on foot slopes and along drainageways. These soils make up about 10 percent of most areas.

The Rittman soil has a perched seasonal high water table at a depth of 18 to 36 inches during extended wet periods. Permeability is moderate above the fragipan and slow in the fragipan. Runoff is rapid. The root zone is restricted mainly to the part of the profile above the dense fragipan. This zone has a low available water capacity.

Most areas are used as cropland or pasture. A few are used as woodland.

This soil is well suited to hay and pasture and moderately well suited to row crops. It can be cropped successfully, but the cropping system should include long-term hay or pasture. Erosion is a management concern, especially if slopes are long. Hard clods form if the soil is cultivated when it is too wet. The surface layer crusts after heavy rainfall, especially in tilled areas. Shallow cultivation of intertilled crops breaks up the crust. Minimum tillage, grassed waterways, and cover crops increase the content of organic matter, improve tilth, reduce the hazard of erosion, and increase the rate of water infiltration. Random subsurface drains may be needed in the wetter included soils.

This soil is well suited to woodland. Plant competition can be controlled by mowing, spraying, or disking. Mechanical tree planting is feasible on this soil.

This soil is moderately well suited to building site development. It is better suited to dwellings without basements than to dwellings with basements because of the seasonal wetness. Buildings should be designed so that they conform to the natural slope of the land. Land shaping is needed in some areas. Drains at the base of footings and exterior basement wall coatings help to keep basements dry. Increased runoff and erosion occur during construction. They can be controlled by maintaining a plant cover wherever possible. Local roads can be improved by strengthening or replacing the base material and by installing a drainage system, which minimizes the damage caused by frost action.

This soil is poorly suited to septic tank absorption fields. The efficiency of the sewage disposal system can be improved by increasing the number and length of laterals. In areas where suitable outlets are available, curtain or perimeter drains can help to lower the seasonal high water table. Installing the distribution lines across the slope helps to prevent seepage of the effluent to the surface. Alternative disposal systems, such as two separate absorption fields, aerobic digesting systems, and mound systems, should be considered. Community sewer systems provide the most efficient, trouble-free method of sewage disposal.

The land capability classification is IIIe. The woodland ordination symbol is 5A.

RtB—Rittman-Urban land complex, 4 to 10 percent slopes. This map unit consists of a deep, gently sloping and sloping, moderately well drained Rittman soil intermingled with Urban land. The unit is on till plains. Most areas range from 25 to 80 acres in size. They are about 55 percent Rittman silt loam and 35 percent Urban land. The Rittman soil and Urban land occur as areas so intricately mixed or so small that separating them at the scale used in mapping is not practical.

Typically, the Rittman soil has a surface layer of dark grayish brown, friable silt loam about 7 inches thick. The subsoil is about 50 inches thick. It is mottled below a depth of about 20 inches. The upper part is yellowish brown, firm silty clay loam; the next part is a dense, brittle fragipan of dark yellowish brown, very firm clay loam; and the lower part is dark yellowish brown, firm silty clay loam. The substratum to a depth of about 60 inches is brown and yellowish brown, firm clay loam and silty clay loam. In places the soil has been radically altered. Some of the low areas have been filled or leveled during construction, and some small areas have been cut, built up, or smoothed.

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

Included in mapping are small areas of the somewhat poorly drained Wadsworth soils. These soils generally are in depressions and nearly level areas. They make up about 10 percent of most areas.

Most areas of this map unit are drained by sewer systems, gutters, subsurface drains, and surface ditches. Areas of the Rittman soil that are not drained have a perched water table at a depth of 18 to 36 inches during extended wet periods. Permeability is moderate above the fragipan in this soil and slow in the fragipan. Runoff is medium. The root zone is restricted mainly to the part of the profile above the fragipan. This zone has a low available water capacity.

The Rittman soil is used for parks, lawns, or gardens. It is well suited to grasses, flowers, vegetables, trees, and shrubs. Erosion is a hazard, particularly in areas where the surface is disturbed and exposed for a considerable period and in watercourses. Tilth is very poor in exposed subsoil and substratum material. Areas that have been cut and filled are poorly suited to lawns and gardens.

The Rittman soil is moderately well suited to building site development. Drains around footings and other subsurface drains and a surface drainage system are needed. Basement walls should be waterproofed. Local roads can be improved by a drainage system and suitable base material, which minimize the damage caused by frost action.

The Rittman soil is poorly suited to septic tank absorption fields because of the slow permeability and the seasonal wetness. The effectiveness of the septic tank system can be improved by enlarging the absorption area and by installing curtain drains. Installing the distribution lines across the slope helps to prevent seepage of the effluent to the surface. Community sewer systems provide a better alternative.

No land capability classification or woodland ordination symbol is assigned.

Sb—Sebring silt loam. This deep, nearly level, poorly drained soil is on flats and in slightly concave areas in the basins of former glacial lakes on slack-water terraces and lake plains. It receives runoff from the higher adjacent soils and is subject to ponding. Most areas are irregularly shaped and range from 5 to 20 acres in size. Slopes are 0 to 2 percent.

Typically, the surface layer is dark gray, friable silt loam about 6 inches thick. The subsurface layer is gray and light brownish gray, mottled, friable silt loam about 9 inches thick. The subsoil is mottled, firm silt loam about 38 inches thick. The upper part is light brownish gray, and the lower part is yellowish brown. The substratum to a depth of about 69 inches is yellowish brown, friable and very friable silt loam.

Included with this soil in mapping are small areas of the somewhat poorly drained Fitchville soils on slight rises. These soils make up about 15 percent of most areas.

The Sebring soil has a high water table near or above the surface during extended wet periods. Permeability is moderately slow. Runoff is very slow or ponded. The root zone is deep. Available water capacity is high.

Most undrained areas support trees and brush. Drained areas are used for general farm crops.

The seasonal wetness severely limits the use of this soil for row crops. Drained areas are well suited to row crops, such as corn and soybeans, and to water-tolerant grasses and legumes for hay or pasture, but undrained areas are poorly suited. Surface drains can remove excess surface water. Subsurface drains can lower the seasonal high water table, but establishing this type of drainage system is difficult because of the low position on the landscape and the lack of suitable outlets. Tilling or grazing when the soil is wet causes compaction. Properly managing crop residue, growing cover crops, and tilling and harvesting at the proper moisture content are important management practices.

This soil is moderately well suited to woodland. The trees can be logged when the soil is frozen or during the drier parts of the year. The species selected for planting should be those that are tolerant of wetness. Planting seedlings that have been transplanted once can reduce the seedling mortality rate. Harvesting procedures that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Plant competition can be controlled by removing vines and the less desirable trees and shrubs.

This soil is poorly suited to building site development because of the ponding and is generally unsuited to septic tank absorption fields because of the moderately slow permeability and the ponding. Drains are somewhat effective in reducing the wetness. Properly landscaping building sites helps to keep surface water away from foundations. Local roads can be improved by a drainage system and suitable base material, which minimize the damage caused by frost action and low strength.

Most play areas and walkways require special surfacing material.

The land capability classification is IIIw. The woodland ordination symbol is 5W.

Sc—Sebring silt loam, till substratum. This deep, nearly level, poorly drained soil is on flats and in slightly concave areas and depressions on till plains. It receives runoff from the higher adjacent soils and is subject to ponding. Most areas are irregularly shaped and range from 3 to 100 acres in size. Slopes are 0 to 2 percent.

Typically, the surface layer is gray, friable silt loam about 9 inches thick. The subsoil is about 40 inches thick. It is mottled. The upper part is gray and light olive gray, friable silt loam, and the lower part is brown and yellowish brown, firm silt loam and silty clay loam. The substratum to a depth of about 60 inches is brown and yellowish brown, mottled, firm clay loam. In a few areas the substratum does not include glacial till within 60 inches of the surface.

Included with this soil in mapping are small areas of the very poorly drained Lorain soils in depressions and the somewhat poorly drained Ravenna and Wadsworth soils on slight rises. Included soils make up about 15 percent of most areas.

The Sebring soil has a perched seasonal high water table near or above the surface during extended wet periods. Permeability is slow or moderately slow. Runoff is very slow or ponded. The root zone is deep. Available water capacity is high.

Most undrained areas support trees and brush. Drained areas are used for general crops.

The seasonal wetness severely limits the use of this soil for row crops. Drained areas are well suited to row crops, such as corn, to small grain, and to grasses and legumes for hay or pasture, but undrained areas are poorly suited. Surface drains can remove excess surface water. Subsurface drains can lower the seasonal high water table, but establishing this type of drainage system is difficult because of the low position on the landscape and the lack of suitable outlets. Tilling or grazing when the soil is wet causes compaction. Properly managing crop residue, growing cover crops, and tilling and harvesting at the proper moisture content are important management practices.

This soil is moderately well suited to trees that are tolerant of wetness. The trees can be logged when the soil is frozen or during the drier parts of the year. Planting seedlings that have been transplanted once can reduce the seedling mortality rate. Harvesting procedures that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Plant competition can be controlled by removing vines and the less desirable trees and shrubs.

This soil is poorly suited to building site development because of the ponding and is generally unsuited to septic tank absorption fields because of the ponding and the slow or moderately slow permeability. Drains are somewhat effective in reducing the wetness. Properly landscaping building sites helps to keep surface water away from foundations. Local roads can be improved by a drainage system and suitable base material, which minimize the damage caused by frost action and low strength.

Most play areas and walkways require special surfacing material.

The land capability classification is IIIw. The woodland ordination symbol is 5W.

SeB—Seward loamy fine sand, 2 to 6 percent slopes. This deep, gently sloping, moderately well drained soil is on side slopes and knolls on terraces and till plains. Most areas are long and narrow or irregularly shaped and range from 5 to 75 acres in size.

Typically, the surface layer is dark grayish brown, very friable loamy fine sand about 10 inches thick. The subsurface layer is yellowish brown, very friable loamy fine sand about 15 inches thick. The subsoil is about 17 inches thick. It is mottled below a depth of about 30 inches. The upper part is brown, friable fine sandy loam, and the lower part is yellowish brown and brown, firm silty clay loam. The substratum to a depth of about 70 inches is yellowish brown and light olive brown, mottled, firm silty clay loam and silty clay. In places the combined thickness of the sandy surface layer and subsurface layer is less than 20 inches.

Included with this soil in mapping are small areas of the somewhat poorly drained Jimtown soils in small depressions and in narrow strips along drainageways and small areas of Lakin soils on ridge crests. The substratum and the entire subsoil in Lakin soils are sandy. Included soils make up about 15 percent of most areas.

The Seward soil has a perched seasonal high water table at a depth of 30 to 48 inches. Permeability is moderately rapid or rapid in the upper part of the profile and slow or very slow in the lower part of the subsoil and in the substratum. Runoff is slow. The root zone is restricted mainly to the 25 to 48 inches above lacustrine material or compact glacial till. Available water capacity is low. The shrink-swell potential is high in the substratum and in the lower part of the subsoil.

Most areas are used as cropland. This soil is moderately well suited to row crops and pasture. Erosion is a moderate hazard if cultivated crops are grown. Minimum tillage, winter cover crops, and grassed waterways help to prevent excessive soil loss. Returning crop residue to the soil or regularly adding other organic material improves fertility, minimizes crusting, and increases the rate of water infiltration. Early season crops, such as oats and winter wheat, and vegetable crops that can be planted early grow well. Plant nutrients should be added as needed but not in excess as leaching losses are high. Droughtiness is a problem during long dry periods in the summer.

This soil is moderately well suited to woodland. Establishing seedlings is difficult during the drier part of the year. Mulching around seedlings can reduce the seedling mortality rate.

This soil is moderately well suited to building site development. It is better suited to dwellings without basements than to dwellings with basements because of the seasonal wetness and the high shrink-swell potential in the substratum and in the lower part of the subsoil. Properly landscaping building sites helps to keep surface water away from foundations. Drains at the base of footings and exterior basement wall coatings help to keep basements dry. Backfilling around basement walls with material from the upper part of the soil helps to prevent the structural damage caused by shrinking and swelling in the substratum and in the lower part of the subsoil. Local roads can be improved by a drainage system and suitable base material, which minimize the damage caused by frost action.

This soil is poorly suited to septic tank absorption fields because of the seasonal wetness, a poor filtering capacity in the upper part of the profile, and the slow or very slow permeability in the substratum and the lower part of the subsoil. Installing the distribution lines in suitable fill material increases the filtering capacity. The efficiency of the septic tank system can be improved by increasing the number and length of laterals. In areas where suitable outlets are available, curtain or perimeter drains can help to lower the seasonal high water table. Alternative disposal systems, such as two separate absorption fields, aerobic digesting systems, and mound systems, should be considered. A community sewer system is the most efficient, trouble-free method of sewage disposal.

The land capability classification is IIe. The woodland ordination symbol is 4S.

Tg—Tioga loam, occasionally flooded. This deep, nearly level, well drained soil is in the highest positions on flood plains. It is subject to flooding. Slopes are 0 to 2 percent. Most areas are long and narrow or moderately wide and range from 15 to 85 acres in size.

Typically, the surface layer is dark grayish brown, friable loam about 10 inches thick. The subsoil is brown and yellowish brown, friable loam and sandy loam about 22 inches thick. The substratum to a depth of about 62 inches is yellowish brown and dark yellowish brown. It is friable and very friable sandy loam and loamy sand in the upper part, and loose loamy sand and gravelly loamy sand in the lower part. In some areas the surface layer is sandy loam or fine sandy loam.

Included with this soil in mapping are narrow strips of the somewhat poorly drained Orrville and poorly drained Holly soils in the slightly lower positions on the flood plains. Also included are small areas of gently sloping soils along old meander channels. Included soils make up about 15 percent of most areas.

The Tioga soil has a seasonal high water table at a depth of 36 to 72 inches during extended wet periods. Permeability is moderate or moderately rapid. Runoff is slow. The root zone is deep. Available water capacity is moderate.

This soil is used mainly as woodland or pasture. It is well suited to grasses and legumes for hay or pasture and to woodland. It also is well suited to corn and to some specialty crops, such as sweet corn, melons, potatoes, and other vegetables. The major hazard in the areas used for cultivated crops is the occasional flooding. Small grain crops, such as winter wheat and oats, may be severely damaged by flooding in winter and early spring. Growing cover crops helps to maintain the content of organic matter and protects the surface during periods when tree seedlings, such as black walnut and eastern white pine, are becoming established. No major hazards or limitations affect planting or harvesting in wooded areas.

This soil is generally unsuited to building site development and septic tank absorption fields because of the hazard of flooding. The seasonal high water table and a poor filtering capacity also are limitations on sites for septic tank absorption fields. Diking and other flood-control measures are difficult and costly. Filling can elevate roads above normal flood levels. Sloughing is a hazard in excavations.

The land capability classification is IIw. The woodland ordination symbol is 4A.

Th—Tioga loam, frequently flooded. This deep, nearly level, well drained soil is on flood plains. It is subject to flooding. Slopes are 0 to 2 percent. Most areas are long and narrow or moderately wide and range from 15 to 200 acres in size.

Typically, the surface layer is dark grayish brown, very friable loam about 10 inches thick. The subsoil is strong brown and yellowish brown, friable loam and sandy loam about 22 inches thick. The substratum to a depth of about 62 inches is yellowish brown and dark yellowish brown, very friable or loose loamy sand and gravelly loamy sand. In some areas the surface layer is sandy loam or fine sandy loam.

Included with this soil in mapping are narrow strips of the somewhat poorly drained Orrville and poorly drained Holly soils on the slightly lower parts of the flood plains. Also included are small areas of gently sloping soils along old meander channels. Included soils make up about 15 percent of most areas.

The Tioga soil has a seasonal high water table at a depth of 36 to 72 inches during extended wet periods. Permeability is moderate or moderately rapid. Runoff is slow. The root zone is deep. Available water capacity is moderate.

This soil is used mainly as woodland or pasture. It is well suited to grasses and legumes for hay or pasture and to woodland. It is moderately well suited to corn and soybeans and to some specialty crops, such as sweet corn, melons, potatoes, and other vegetables. The major hazard in the areas used for row crops is the frequent flooding. Small grain crops, such as winter wheat and oats, may be severely damaged by flooding in winter and early spring. Growing cover crops helps to maintain the content of organic matter and protects the surface during periods when tree seedlings, such as black walnut and eastern white pine, are becoming established. No major hazards or limitations affect planting or harvesting in wooded areas.

This soil is generally unsuited to building site development and septic tank absorption fields because of the hazard of flooding. The seasonal high water table and a poor filtering capacity also are limitations on sites for septic tank absorption fields. Diking and other flood-control measures are difficult and costly. Filling can elevate roads above normal flood levels. Sloughing is a hazard in excavations.

The land capability classification is IIw. The woodland ordination symbol is 4A.

Tr—Trumbull silty clay loam. This deep, nearly level, poorly drained soil is in depressions and on flats on till plains. It receives runoff from the higher adjacent soils and is subject to ponding. Most areas are irregularly shaped and range from 5 to 200 acres in size. Slopes are 0 to 2 percent.

Typically, the surface layer is very dark grayish brown, friable silty clay loam about 2 inches thick. The subsurface layer is dark gray, mottled, firm silty clay loam about 3 inches thick. The subsoil is about 46 inches thick. It is mottled. The upper part is dark gray and gray, very firm clay, and the lower part is yellowish brown and brown, very firm and firm silty clay. The substratum to a depth of about 62 inches is dark gray, mottled, firm silty clay.

Included with this soil in mapping are small areas of the somewhat poorly drained Remsen soils on slight rises and the very poorly drained Lorain soils in the lowest parts of some depressions. Also included are scattered small areas of Condit soils, which have less clay in the subsoil than the Trumbull soil. Included soils make up about 15 percent of most areas.

The Trumbull soil has a perched seasonal high water table near or above the surface during extended wet periods. Permeability is slow or very slow. Runoff is very slow or ponded. The root zone is deep. Available water capacity is moderate.

Most areas are wooded or pastured. A few have been cleared and are used as cropland.

The excessive wetness and the slow permeability are the major limitations that affect farming. They commonly delay tillage. Drained areas are moderately well suited to row crops, hay, and pasture, but undrained areas are poorly suited. Maintaining tilth and desirable forage stands is difficult in undrained areas. The slow internal water movement reduces the effectiveness of subsurface drains. Outlets for these drains are not available in many areas. Surface drains can remove surface water. The soil is subject to compaction and hard clodding if tillage or harvesting activities are performed during wet periods. Properly managing crop residue and growing cover crops increase the rate of water infiltration and the content of organic matter and improve tilth.

This soil is moderately well suited to woodland. The trees can be logged when the soil is frozen or during the drier parts of the year. Planting techniques that spread the roots of the seedlings and improve the soil-root contact reduce the seedling mortality rate. Harvesting procedures that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Plant competition can be controlled by removing vines and the less desirable trees and shrubs.

This soil is poorly suited to building site development because of the ponding and is generally unsuited to septic tank absorption fields because of the ponding and the slow or very slow permeability. Drainage can be improved by surface drains, storm sewers, and open ditches. Properly landscaping building sites helps to keep surface water away from foundations. Backfilling around foundations with material that has a low shrink-swell potential helps to prevent the structural damage caused by shrinking and swelling. Local roads can be improved by a drainage system and by suitable base material, which improves soil strength.

Play areas and walkways require special surfacing material.

The land capability classification is IVw. The woodland ordination symbol is 5W.

Ud—Udorthents, loamy. These soils are in areas that have been cut or filled. In areas that have been cut, the remaining soil material typically is similar to the subsoil or substratum of the adjacent soils. In fill or disposal areas, the characteristics of the soil material are more varied; this soil material generally is the subsoil and substratum of nearby soils. Slopes are dominantly 2 to 6 percent but range from 0 to 10 percent.

Typically, the upper 60 inches is silty clay loam, clay loam, or silt loam. In some areas on terraces and flood plains, the material is sandy and gravelly. The surface layer is commonly covered with shale fragments and is firm and dense. Internal water movement and runoff vary. In some areas the soils have a seasonal high water table. Available water capacity varies but is dominantly low or very low in the root zone. Hard rains tend to seal the surface in poorly vegetated areas, thus reducing the infiltration rate and restricting the emergence and growth of plants.

Most areas have been used as construction sites. About half of the areas have no vegetation. A few areas are used for hay or pasture. In areas where the surface is bare, the hazard of erosion is severe. A suitable plant cover is needed to control erosion.

The suitability of these soils for building site development and septic tank absorption fields varies. Onsite investigation is needed to determine the suitability for and limitations affecting any proposed use.

No land capability classification or woodland ordination symbol is assigned.

Ur—Urban land. This map unit is in nearly level or gently sloping areas where more than about 80 percent of the surface is covered by asphalt, concrete, buildings, or other structures. Examples are parking lots and shopping and business centers. Areas are 5 or more acres in size.

Only a limited acreage of this unit is natural soil. The asphalt or concrete surface increases the volume and rate of runoff. Onsite investigation is needed to determine the limitations affecting any proposed use.

No land capability classification or woodland ordination symbol is assigned.

VeA—Venango silt loam, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil is on broad flats on till plains. Most areas are irregular in shape and range from 5 to 30 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 48 inches thick. The upper part is pale brown and yellowish brown, mottled, friable and firm silt loam and loam; the next part is a dense, brittle fragipan of dark yellowish brown, mottled, very firm loam and silt loam; and the lower part is yellowish brown, firm loam. The substratum to a depth of about 66 inches also is yellowish brown, firm loam. In some areas the soil is underlain by sandstone or shale bedrock at a depth of 40 to 60 inches. In some small areas part of the subsoil is dense but is not a fragipan. In places the surface layer and the upper part of the subsoil do not have any pebbles.

Included with this soil in mapping are small areas of the moderately well drained Cambridge soils on knolls and crests and the poorly drained Sebring soils in depressions and along minor drainageways. Included soils make up 15 percent of most areas.

The Venango soil has a perched seasonal high water table at a depth of 6 to 18 inches during extended wet periods. Permeability is moderate above the fragipan and slow or very slow in the fragipan. This soil dries out slowly in spring. Runoff is slow. The root zone is restricted mainly to the part of the profile above the fragipan. This zone has a low available water capacity.

Most areas are used for row crops. Some areas are wooded or pastured.

Drained areas of this soil are well suited to row crops, hay, and pasture, but undrained areas are poorly suited. Minimizing soil compaction and maintaining desirable forage stands are difficult in undrained areas. Surface drains can remove excess surface water. Subsurface drains can remove excess water from the root zone. These drains should be closely spaced for uniform drainage. Hard clods form if the soil is cultivated when wet. The surface layer crusts after heavy rainfall, especially in tilled areas. Shallow cultivation of intertilled crops breaks up the crust. Properly managing crop residue and growing cover crops increase the content of organic matter, improve tilth, and increase the rate of water infiltration.

This soil is moderately well suited to woodland. The trees can be logged when the soil is frozen or during the drier parts of the year. Harvesting procedures that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Plant competition can be controlled by removing vines and the less desirable trees and shrubs.

This soil is poorly suited to building site development because of the seasonal wetness. Surface drains, drains around footings and other subsurface drains, adequate waterproofing of basement walls, and a sump pump are needed because of the high water table. Local roads can be improved by a drainage system and suitable base material, which minimize the damage caused by frost action and wetness.

This soil is poorly suited to septic tank absorption fields because of the seasonal wetness and the slowly permeable or very slowly permeable fragipan. The efficiency of the septic tank system can be improved by increasing the number and length of laterals. In areas where suitable outlets are available, curtain or perimeter drains can help to lower the seasonal high water table. Alternative disposal systems, such as two separate absorption fields, aerobic digesting systems, and mound systems, should be considered. A community sewer system is the most efficient, trouble-free method of sewage disposal.

The land capability classification is IIIw. The woodland ordination symbol is 4D.

VeB—Venango silt loam, 2 to 6 percent slopes. This deep, gently sloping, somewhat poorly drained soil is on low knolls and side slopes on till plains. Most areas are irregular in shape and range from 10 to 50 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The subsoil is about 40 inches thick. It is mottled. The upper part is yellowish brown, firm silt loam and loam, and the lower part is a dense, brittle fragipan of brown, yellowish brown, and dark yellowish brown, very firm loam. The substratum to a depth of about 60 inches is yellowish brown, firm loam and silt loam. In some areas the soil is underlain by sandstone bedrock at a depth of 40 to 60 inches. In other areas part of the subsoil is dense but is not a fragipan. In places the surface layer and the upper part of the subsoil do not have any pebbles.

Included with this soil in mapping are small areas of the moderately well drained Cambridge soils on knolls and crests and the poorly drained Sebring soils in depressions. Included soils make up about 15 percent of most areas.

The Venango soil has a perched seasonal high water table at a depth of 6 to 18 inches during extended wet periods. Permeability is moderate above the fragipan and slow or very slow in the fragipan. This soil dries out slowly in spring. Runoff is medium. The root zone is restricted mainly to the part of the profile above the fragipan. This zone has a low available water capacity.

Most areas are used for row crops, such as corn, for small grain, or for grasses and legumes for hay or pasture. A substantial acreage is used as woodland or is reverting to woodland.

The wetness delays planting and limits the choice of crops. It also delays grazing in spring. Drained areas are well suited to row crops, hay, and pasture, and undrained areas are moderately well suited. Minimizing soil compaction and maintaining desirable forage stands are difficult, especially in undrained areas. Subsurface drains can remove excess water from the subsoil. They should be closely spaced for uniform drainage. Maintaining good tilth is important because it minimizes surface crusting and erosion. Growing cover crops and properly managing crop residue increase the content of organic matter, improve tilth, reduce the hazard of erosion, and increase the rate of water infiltration.

This soil is moderately well suited to woodland. The trees can be logged when the soil is frozen or during the drier parts of the year. Harvesting procedures that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Plant competition can be controlled by removing vines and the less desirable trees and shrubs.

Because of the seasonal wetness, this soil is poorly suited to building site development. It is better suited to dwellings without basements than to dwellings with basements. Properly landscaping building sites helps to keep surface water away from foundations. Drains at the base of footings and exterior basement wall coatings help to keep basements dry. Local roads can be improved by a drainage system and suitable base material, which minimize the damage caused by frost action and wetness.

This soil is poorly suited to septic tank absorption fields because of the seasonal high water table and the very slowly permeable fragipan. The efficiency of the septic tank system can be improved by increasing the number and length of laterals. In areas where suitable outlets are available, curtain or perimeter drains can help to lower the seasonal high water table. Alternative disposal systems, such as two separate absorption fields, aerobic digesting systems, and mound systems, should be considered. A community sewer system is the most efficient, trouble-free method of sewage disposal.

The land capability classification is IIIw. The woodland ordination symbol is 4D.

WbA—Wadsworth silt loam, 0 to 2 percent slopes. This deep, nearly level, somewhat poorly drained soil is on moderately broad flats on till plains. Most areas are broad or irregularly shaped and range from 3 to 200 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 50 inches thick. It is mottled. The upper part is yellowish brown and strong brown, friable silt loam and firm silty clay loam; the next part is a dense, brittle fragipan of yellowish brown and dark yellowish brown, very firm clay loam; and the lower part is yellowish brown, firm clay loam. The substratum to a depth of about 80 inches is yellowish brown, mottled, firm clay loam.

Included with this soil in mapping are small areas of the poorly drained Sebring soils in depressions. Also included are small areas of the moderately well drained Rittman soils on slight rises. Included soils make up about 15 percent of most areas.

The Wadsworth soil has a perched seasonal high water table at a depth of 12 to 24 inches during extended wet periods. Permeability is moderate or moderately slow above the fragipan and slow or very slow in the fragipan. Runoff is slow. The root zone is restricted mainly to the part of the profile above the fragipan. This zone has a low available water capacity.

Most of the acreage is used for general farm crops, pasture, or trees. The wetness limits the suitability of this soil for planting crops or grazing early in spring. Drained areas are well suited to corn, soybeans, wheat, hay, and pasture, but undrained areas are poorly suited. Minimizing soil compaction and maintaining desirable forage stands are difficult in undrained areas. Surface and subsurface drains can remove excess water. Closely spacing the subsurface drains results in uniform drainage. Hard clods form if the soil is cultivated when wet. The surface layer crusts after heavy rainfall, especially in tilled areas. Shallow cultivation of intertilled crops breaks up the crust. Properly managing crop residue and growing cover crops increase the content of organic matter and the rate of water infiltration and improve tilth.

This soil is moderately well suited to woodland. Harvesting procedures that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Planting seedlings that have been transplanted once can reduce the seedling mortality rate.

Because of the seasonal wetness, this soil is poorly suited to building site development. It is better suited to dwellings without basements than to dwellings with basements. Ditches and subsurface drains can improve drainage. Properly landscaping building sites helps to keep surface water away from foundations. Drains at the base of footings and exterior basement wall coatings help to keep basements dry. Local roads can be improved by a drainage system and suitable base material, which minimize the damage caused by frost action.

This soil is poorly suited to septic tank absorption fields because of the seasonal wetness and the slowly permeable or very slowly permeable fragipan. The efficiency of the septic tank system can be improved by increasing the number and length of laterals. In areas where suitable outlets are available, curtain or perimeter drains can help to lower the seasonal high water table. Alternative disposal systems, such as two separate absorption fields, aerobic digesting systems, and mound systems, should be considered. A community sewer system is the most efficient, trouble-free method of sewage disposal.

The land capability classification is IIIw. The woodland ordination symbol is 5D.

WbB—Wadsworth silt loam, 2 to 6 percent slopes. This deep, gently sloping, somewhat poorly drained soil is on low knolls and side slopes on till plains. Most areas are broad or irregularly shaped and range from 2 to 300 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 9 inches thick. The subsoil is about 49 inches thick. It is mottled. The upper part is yellowish brown, firm silty clay loam; the next part is a dense, brittle fragipan of dark yellowish brown and yellowish brown, firm and very firm clay loam; and the lower part is yellowish brown, firm clay loam. The substratum to a depth of about 60 inches is yellowish brown, firm silt loam.

Included with this soil in mapping are small areas of the poorly drained Sebring soils in depressions. Also included are small areas of the moderately well drained Rittman soils on some of the higher knolls. Included soils make up about 15 percent of most areas.

The Wadsworth soil has a perched seasonal high water table at a depth of 12 to 24 inches during extended wet periods. Permeability is moderate or moderately slow above the fragipan and slow or very slow in the fragipan. Runoff is medium. The root zone is restricted mainly to the part of the profile above the fragipan. This zone has a low available water capacity.

Most of the acreage is used for general farm crops, pasture, or trees. Drained areas are well suited to corn, soybeans, wheat, hay, and pasture, and undrained areas are moderately well suited. Erosion is a moderate hazard if the soil is cultivated. The wetness delays planting and limits the choice of crops. Minimizing soil compaction and maintaining desirable forage stands are difficult in undrained areas. Maintaining good tilth is important because it minimizes surface crusting and erosion. Growing cover crops and properly managing crop residue increase the content of organic matter, improve tilth, reduce the hazard of erosion, and increase the rate of water infiltration. Subsurface drains can remove excess water from the subsoil. They should be closely spaced for uniform drainage.

This soil is moderately well suited to woodland. Planting seedlings that have been transplanted once can reduce the seedling mortality rate. Harvesting procedures that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard.

Because of the seasonal wetness, this soil is poorly suited to building site development. It is better suited to dwellings without basements than to dwellings with basements. Ditches and subsurface drains can improve drainage. Properly landscaping building sites helps to keep surface water away from foundations. Drains at the base of footings and exterior basement wall coatings help to keep basements dry. Local roads can be improved by a drainage system and suitable base material, which minimize the damage caused by frost action.

This soil is poorly suited to septic tank absorption fields because of the seasonal wetness and the slowly permeable or very slowly permeable fragipan. The efficiency of the septic tank system can be improved by increasing the number and length of laterals. In areas where suitable outlets are available, curtain or perimeter drains can help to lower the seasonal high water table. Alternative disposal systems, such as two separate absorption fields, aerobic digesting systems, and mound systems, should be considered. A community sewer system is the most efficient, trouble-free method of sewage disposal.

The land capability classification is IIIe. The woodland ordination symbol is 5D.

WeA—Wadsworth-Urban land complex, 0 to 2 percent slopes. This map unit consists of a deep, nearly level, somewhat poorly drained Wadsworth soil intermingled with Urban land. The unit is on till plains. Most areas range from 25 to 50 acres in size. They are about 55 percent Wadsworth silt loam and 35 percent Urban land. The Wadsworth soil and Urban land occur as areas so intricately mixed or so small that separating them at the scale used in mapping is not practical.

Typically, the Wadsworth soil has a surface layer of dark grayish brown, friable silt loam about 10 inches thick. The subsoil is about 50 inches thick. It is mottled. The upper part is yellowish brown, firm silty clay loam; the next part is a dense, brittle fragipan of dark yellowish brown, very firm silty clay loam and clay loam; and the lower part is yellowish brown, firm silty clay loam. The substratum to a depth of about 65 inches is brown and yellowish brown, firm silty clay loam and clay loam. In places the soil has been radically altered. Some of the low areas have been filled or leveled during construction, and some small areas have been cut, built up, or smoothed.

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

Included in mapping are small areas of Sebring and Rittman soils. The poorly drained Sebring soils are in depressions. The moderately well drained Rittman soils are in the higher, convex areas. Included soils make up about 10 percent of most areas.

Most areas of this map unit are drained by sewer systems, gutters, subsurface drains, and surface ditches. Areas of the Wadsworth soil that are not drained have a perched water table at a depth of 12 to 24 inches during extended wet periods. Permeability is moderate or moderately slow above the fragipan in this soil and slow or very slow in the fragipan. Runoff is slow. The root zone is restricted mainly to the part of the profile above the fragipan. This zone has a low available water capacity.

The Wadsworth soil is used for parks, lawns, or gardens. It is well suited to grasses, flowers, vegetables, trees, and shrubs where excess water is removed by a drainage system. Undrained areas are only moderately well suited to these uses. A combination of surface and subsurface drains works best. The perennial plants that are selected for planting should be those that are fairly tolerant of wetness. Erosion generally is a major problem only in areas where the surface is disturbed and exposed for a considerable period and in watercourses. Tilth is very poor in exposed subsoil and substratum material. Areas that have been cut and filled are poorly suited to lawns and gardens.

The Wadsworth soil is poorly suited to building site development because of the seasonal wetness. Drains around footings and other subsurface drains and a surface drainage system are needed. Basement walls should be waterproofed. Local roads can be improved by a drainage system and suitable base material, which minimize the damage caused by frost action.

The Wadsworth soil is poorly suited to septic tank absorption fields because of the seasonal wetness and the slow or very slow permeability. All sanitary facilities should be connected to community sewers and sewage treatment facilities. Where these treatment facilities are not available, the effectiveness of a septic tank absorption field can be improved by enlarging the absorption area and by installing curtain drains around the field.

No land capability classification or woodland ordination symbol is assigned.

WeB—Wadsworth-Urban land complex, 2 to 6 percent slopes. This map unit consists of a deep, gently sloping, somewhat poorly drained Wadsworth soil intermingled with Urban land. The unit is on till plains. Most areas range from 25 to 50 acres in size. They are about 55 percent Wadsworth silt loam and 35 percent Urban land. The Wadsworth soil and Urban land occur as areas so intricately mixed or so small that separating them at the scale used in mapping is not practical.

Typically, the Wadsworth soil has a surface layer of grayish brown, friable silt loam about 10 inches thick. The subsoil is about 50 inches thick. It is mottled. The upper part is yellowish brown, firm silty clay loam; the next part is a dense, brittle fragipan of dark yellowish brown, very firm silty clay loam and clay loam; and the lower part is yellowish brown, firm silty clay loam. The substratum to a depth of about 65 inches is brown and yellowish brown, firm silty clay loam and clay loam. In places the soil has been radically altered. Some of the low areas have been filled or leveled during construction, and some small areas have been cut, built up, or smoothed.

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

Included in mapping are small areas of Sebring and Rittman soils. The poorly drained Sebring soils are in depressions. The moderately well drained Rittman soils are in the higher, convex areas. Included soils make up about 10 percent of most areas.

Most areas of this map unit are drained by sewer systems, gutters, subsurface drains, and surface ditches. Areas of the Wadsworth soil that are not drained have a perched water table at a depth of 12 to 24 inches during extended wet periods. Permeability is moderate or moderately slow above the fragipan in this soil and slow or very slow in the fragipan. Runoff is medium. The root zone is restricted mainly to the part of the profile above the fragipan. This zone has a low available water capacity.

The Wadsworth soil is used for parks, lawns, or gardens. It is well suited to grasses, flowers, vegetables, trees, and shrubs where excess water is removed by a drainage system. Undrained areas are only moderately well suited to these uses. A combination of surface and subsurface drains works best. The perennial plants that are selected for planting should be those that are fairly tolerant of wetness. Erosion generally is a major problem only in areas where the surface is disturbed and exposed for a considerable period and in watercourses. Tilth is very poor in exposed subsoil and substratum material. Areas that have been cut and filled are poorly suited to lawns and gardens.

The Wadsworth soil is poorly suited to building site development because of the seasonal wetness. Drains around footings and other subsurface drains and a surface drainage system are needed. Basement walls should be waterproofed. Local roads can be improved by a drainage system and suitable base material, which minimize the damage caused by frost action.

The Wadsworth soil is poorly suited to septic tank absorption fields because of the seasonal wetness and the slow or very slow permeability. All sanitary facilities should be connected to community sewers and sewage treatment facilities. Where these treatment facilities are not available, the effectiveness of a septic tank absorption field can be improved by enlarging the absorption area and by installing curtain drains around the field.

No land capability classification or woodland ordination symbol is assigned.

WuF—Wooster silt loam, 25 to 50 percent slopes. This deep, very steep, well drained soil is on dissected hillsides along drainageways on till plains. Most areas are long and generally less than 500 feet wide and range from 5 to 50 acres in size. The dominant size is less than 30 acres.

Typically, the surface layer is very dark grayish brown silt loam about 3 inches thick. The subsurface layer is brown, friable silt loam about 3 inches thick. The subsoil is about 52 inches thick. The upper part is yellowish brown, friable and firm silt loam, and the lower part is a dense, brittle fragipan of brown, very firm loam. The substratum to a depth of about 66 inches is brown, mottled, firm gravelly loam. In some areas that have been cleared, the soil is moderately eroded or severely eroded in spots and has a surface layer of loam or gravelly loam.

Included with this soil in mapping are small areas of the moderately deep Loudonville, Lordstown, and Brecksville soils on the lower parts of the hillsides and small areas of Chili soils on the lower parts of the hillsides and on small terraces along narrow drainageways. Also included are areas of the poorly drained Holly and somewhat poorly drained Orrville soils on narrow flood plains. The included soils do not have a fragipan. They make up about 15 percent of most areas.

The Wooster soil has a perched seasonal high water table at a depth of 30 to 48 inches during extended wet periods. Permeability is moderately slow in the fragipan. Runoff is very rapid. The root zone is restricted mainly to the part of the profile above the fragipan. This zone has a low available water capacity.

In most areas this soil is used as woodland. Because of the very steep slopes, it is generally unsuited to crops and pasture. Erosion is a very severe hazard unless a good plant cover is maintained.

This soil is moderately well suited to woodland and well suited to habitat for woodland wildlife. Building logging roads and skid trails on the contour facilitates the use of equipment and helps to control erosion. Water bars and a vegetative cover also help to control erosion. Harvesting procedures that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Plant competition can be controlled by removing vines and the less desirable trees and shrubs.

This soil is generally unsuited to building site development and septic tank absorption fields. Construction for recreation and urban development is very difficult, and the hazard of erosion is very severe if vegetation is removed. Slope stability should be considered prior to cutting or filling.

Trails or paths in recreational areas should be protected against erosion and established across the slope if possible.

The land capability classification is VIIe. The woodland ordination symbol is 5R.

Prime Farmland

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

Prime farmland, as defined by the U.S. Department of Agriculture, is the land that is best suited to food, feed, forage, fiber, and oilseed crops. It may be cultivated land, pasture, woodland, or other land, but it is not urban or built-up land or water areas. It either is used for food or fiber crops or is available for those crops. The soil qualities, growing season, and moisture supply are those needed for a well managed soil to produce a sustained high yield of crops in an economic manner. Prime farmland produces the highest yields with minimal expenditure of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The level of acidity or alkalinity is acceptable. Prime farmland has few or no rocks and is permeable to water and air. It is not excessively erodible or saturated with water for long periods and is not frequently flooded during the growing season. The slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Soil Conservation Service.

About 284,275 acres in the survey area, or nearly 75 percent of the total acreage, meets the soil requirements for prime farmland. This land is throughout the county. The crops grown on this land are mainly corn, soybeans, small grain, and grass-legume hay. Some areas of many map units that qualify as prime farmland are urban or built-up areas. These areas are not included in the total acreage of prime farmland.

A recent trend in land use in some parts of the county has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

The map units in the survey area that are considered prime farmland are listed in table 5. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Some soils that have a seasonal high water table and all soils that are frequently flooded during the growing season qualify for prime farmland only in areas where these limitations have been overcome by drainage measures or flood control. The need for these measures is indicated after the map unit name in table 5. Onsite evaluation is needed to determine whether or not these limitations have been overcome by corrective measures. On about 80 percent of the acreage of prime farmland, a drainage system is needed, and about 18,355 acres is frequently flooded.

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 behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other 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.

The soils in the survey area are assigned to interpretive groups at the end of each map unit description and in table 8. The groups for each map unit also are shown in the section "Interpretive Groups," which follows the tables at the back of this survey.

Crops and Pasture

Dan Ross, district conservationist, Soil Conservation Service, and Dr. Paul Hartley, county agent, Cooperative Extension 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.

In 1984, about 122,000 acres in Trumbull County, or 31 percent of the total acreage, was farmland. Approximately 63,000 acres of the farmland was used for crops *(6)*. About 17,000 acres was used for corn; 12,900 acres for soybeans; 5,100 acres for oats; 4,000 acres for wheat; and 24,000 acres for hay. A relatively small acreage was used for orchards or nursery crops.

The potential of the soils in Trumbull County for increased food production is good. About 90,100 acres of prime farmland is used as woodland and about 14,700 acres as pasture *(20)*. Food production could be increased by growing crops on all of the prime farmland and by applying the latest crop production technology.

The acreage of farmland has remained fairly constant since l976. The acreage of cropland increased from 46,100 acres in 1974 *(5)* to 63,000 acres in 1984 *(6)*. The acreage of corn increased from 15,000 to 17,000 acres, that of soybeans from about 2,600 to 12,900 acres, and that of hay from 17,400 to 24,000 acres. The acreage of small grain increased by about 2,000 acres from 1974 to 1984 *(5, 6)*.

Cropping patterns have changed over the years. Crop rotations were fairly standard on most of the cropland at one time. The acreage used year after year for row crops has steadily increased. As a result, erosion is excessive in some areas, especially where the cover of crop residue is not adequate and where fields are plowed in the fall.

The paragraphs that follow describe the management needed on the cropland in the county. The main management concerns are water erosion, fertility, soil moisture, drainage, and tilth.

Water erosion is a major hazard on the cropland in the county, especially where the terrain is rolling terrain and where slopes are long. On more than 25,000 acres of the cropland, erosion exceeds tolerable limits *(20)*. It is damaging for two reasons. First, productivity is reduced as the surface layer is lost and part of the subsoil is incorporated into the plow layer. Loss of the surface layer is especially damaging on soils that have a fine textured or moderately fine textured subsoil, such as Remsen, Geeburg, Ellsworth, and Mahoning soils, and on soils that have a restricted root zone or are droughty, such as Loudonville, Mitiwanga, Lakin, and Canfield soils. Second, erosion results in the sedimentation of lakes and streams. Control of erosion improves the quality of water for municipal and recreational uses and for fish and wildlife.

Erosion-control measures protect the surface, help to control runoff, and increase the rate of water infiltration. A cropping system that keeps a vegetative cover on the surface for extended periods can hold soil losses to an amount that will not reduce the productive capacity of the soils. A system of conservation tillage that leaves crop residue on the surface increases the rate of water infiltration and reduces the hazards of runoff and erosion. No-tillage is the most effective of the conservation tillage methods applied in row cropped areas. It is suited to most of the soils in the county, but it is less successful on soils that have a high content of clay in the subsoil, such as Geeburg, Ellsworth, Mahoning, and Remsen soils.

Including grasses and legumes in the crop rotation not only helps to control erosion but also increases the content of organic matter and the level of fertility. Cover crops also help to control erosion. They are especially needed in areas where the amount of residue from a row crop, such as soybeans, is not sufficient to protect the surface. Contour tillage helps to control erosion on gently sloping and sloping soils, but it is generally not practical on short, irregular slopes.

Grassed waterways are natural or constructed outlets that dispose of surface water at a nonerosive velocity. Natural drainageways are the best sites for grassed waterways because a good grassed channel commonly can be established in the drainageway with a minimum of shaping. The waterway should be designed so that it can be crossed by farm machinery. Water-control structures can be constructed in low areas where excess surface water from grassed waterways collects (fig. 8).

Soil fertility is affected by reaction and the content of plant nutrients. Almost all of the soils in the county are naturally acid in the surface layer. If these soils have never been limed, applications of agricultural limestone are needed to raise the pH level sufficiently for the production of alfalfa and other crops that grow well on neutral soils. Available phosphorus levels are naturally low in most of these soils. 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.

Insufficient soil moisture is a limitation in soils that have a coarse textured or moderately coarse textured subsoil, such as Elnora, Oshtemo, and Lakin soils, and in soils that have a moderately deep root zone, such as Mitiwanga, Loudonville, Canfield, and Ravenna soils. Yields of row crops and forage can be increased by measures that help to control runoff and evaporation. Examples of these measures are a system of conservation tillage that leaves crop residue on the surface, cover crops, and a cropping system that includes legumes and grasses.

Soil drainage is a major management concern on some of the soils in the county. Trumbull County is on a watershed divide between Lake Erie and the Ohio River. Some soils, such as Holly, Canadice, Lorain, and Sebring soils, are naturally so wet that crop production generally is not possible unless a drainage system is installed. Unless drained, somewhat poorly drained soils, such as Wadsworth, Ravenna, and Fitchville soils, are so wet that the crops are damaged during most years and planting or harvesting is delayed.

Subsurface drainage of Holly, Canadice, Sebring, and Caneadea soils is difficult because natural outlets are commonly not available. The effectiveness of surface drainage channels is limited because of the scarcity of outlets. These soils are mainly on the watersheds of the Grand River and Pymatuning Creek. Pump drainage has been limited in the county because it is costly.

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

Most of the soils used for crops in the county have a surface layer of silt loam that is low or moderate in content of organic matter. Generally, the structure of such soils is weak. During periods of intensive rainfall, a crust forms on the surface. When dry, the crust is hard and becomes nearly impervious to water. It reduces the rate of water infiltration and increases the runoff rate.

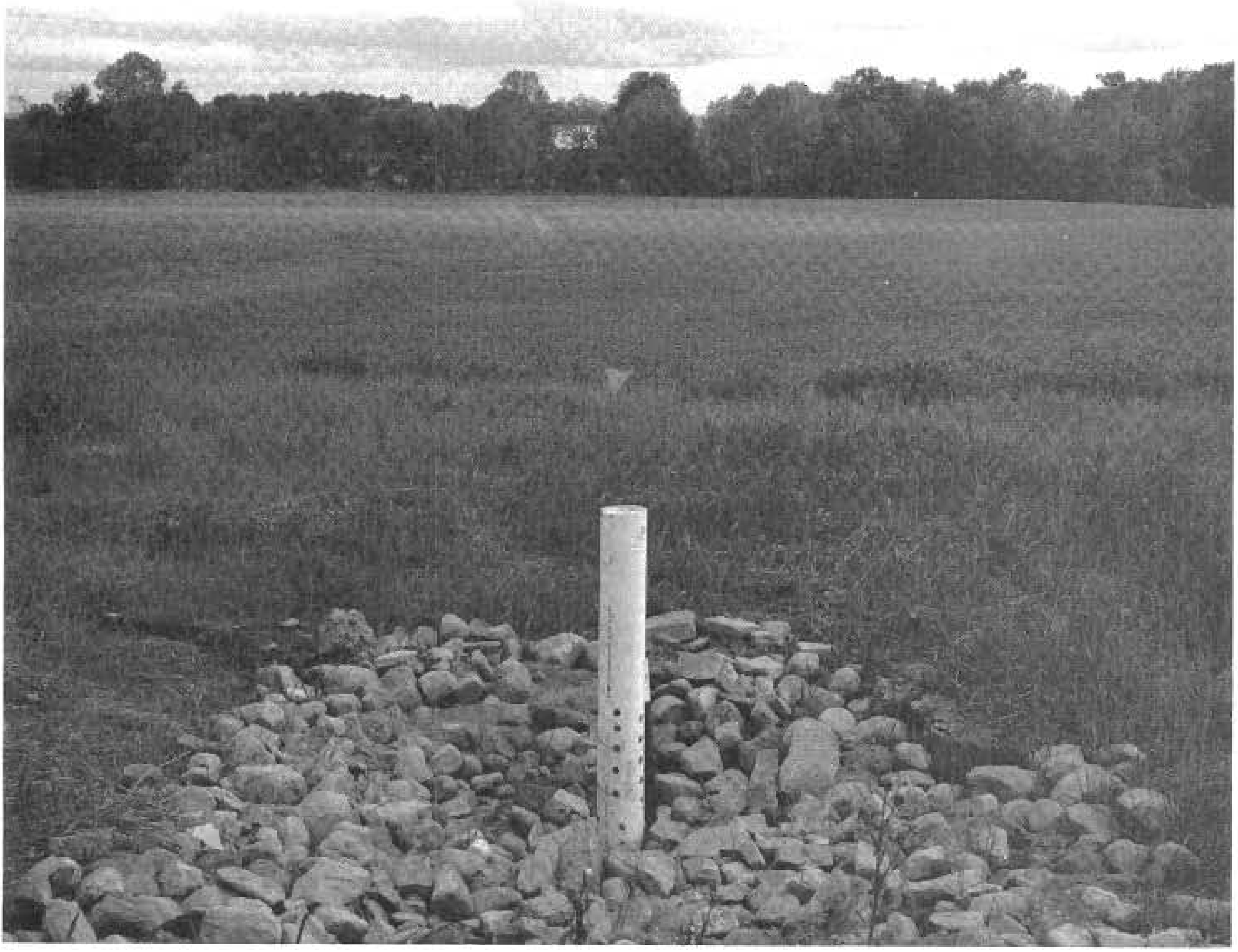

Figure 8.—A water-control structure that removes surface water from a grassed waterway.

Measures that add organic matter to the soil can improve soil structure. These include crop rotations, conservation tillage, crop residue management, and cover crops.

Fall plowing is not a good practice on soils that have a surface layer of silt loam because it increases the extent of crusting and the hazard of erosion. After fall plowing, many of these soils are nearly as dense and hard at planting time as they were before they were plowed.

The specialty crops grown in Trumbull County include nursery plants and orchards. Soils that are characterized by good natural drainage and that warm up early in the spring, such as Chili, Oshtemo, and Tioga soils, are well suited to nursery crops and orchards. On some soils an irrigation system is needed if nursery crops are grown. Ellsworth, Canfield, and Rittman soils also are suitable for orchards.

About 20,400 acres in Trumbull County is used as pasture *(20)*. In 1982, an estimated 10,300 acres required treatment to bring forage production to a high level *(20)*. A drainage system is needed on somewhat poorly drained to very poorly drained soils, such as Wadsworth, Canadice, and Sebring soils. Reestablishment of good forage vegetation and brush control are needed in many pastured areas.

Pasture treatment can be achieved through a good fertility and reseeding program. Soil tests should be used to determine the proper kind and amount of lime and fertilizer to be applied. Successful establishment of forage crops requires the selection of quality species and varieties that are adapted to the climate and the soils. Reseeding requires proper seedbed preparation, proper seeding methods and seeding times, and recommended applications of lime and fertilizer. Renovation requires that the existing grasses and weeds be killed or suppressed before the desirable species are seeded. The object is to kill the existing vegetation and leave it on or near the surface as a dead mulch to control erosion. Nearly level pastures can be plowed. Vegetation on gently sloping and strongly sloping soils should be killed or suppressed. The pasture should be tilled and seeded on the contour. A herbicide can be used along with a trash-mulch method to reduce the amount of tillage needed to kill the existing vegetation.

The no-till seeding method can be effective on most of the soils in Trumbull County, except for those in which drainage is restricted. Where this method is used, vegetation should be suppressed or killed by grazing and by applying herbicide.

April or August generally is the best time for seeding. The forage species can be seeded along with small grain. Forage production frequently is reduced, however, because of competition for light, moisture, and nutrients.

Seeding mixtures should be selected on the basis of soil type and the desired management system. Legumes increase the nutrient value of the forage and provide nitrogen for the growth of grasses. Alfalfa and red clover should be seeded on well drained soils. The wetter soils are better suited to ladino clover, alsike clover, and trefoil.

Pastures can support only a certain number of animals. If the pastures are overgrazed, erosion is a major hazard. This hazard can be reduced by rotation grazing, applications of fertilizer, and pasture renovation. Further information about managing forage species is available at the local office of 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 also are considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

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

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit *(18)*. Only class and subclass are used in this survey.

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

Class I soils have few limitations that restrict their use. There are no class I soils in Trumbull County.

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

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

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

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

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

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

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production. There are no class VIII soils in Trumbull County.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e*, *w*, or *s*, to the class numeral, for example, IIe. The letter *e* shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); and *s* shows that the soil is limited mainly because it is shallow, droughty, or stony.

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

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

Dan Ross, district conservationist, Soil Conservation Service, and Mark Popichak, service forester, Ohio Department of Natural Resources, helped prepare this section.

During the period of settlement in the 1800's, most of Trumbull County was covered by hardwoods. Currently, about 133,600 acres, or more than 34 percent of the acreage, is wooded *(20)*. This acreage consists mainly of privately owned stands of timber and farm woodlots. Several thousand acres of woodland near Grand River, Pymatuning Creek, and Mosquito Creek Lake are owned by the Ohio Division of Wildlife. The largest concentration of woodland is along the major rivers and their tributaries, including the Mahoning and Grand Rivers. The most important wood products are sawtimber, veneer, Christmas trees, and maple syrup *(24)*.

Variation in soils and topography have resulted in a diversity of tree species. The major vegetative types, both at the time of the earliest land surveys and presently, are mixed mesophytic forests, beech forests, mixed oak forests, elm-ash swamp forests, and oak-sugar maple forests *(9)*.

The mixed mesophytic forests make up the largest part of the woodland in the county. They consist mainly of white oak, red oak, hickory, beech, sugar maple, and some hemlock. These trees grow on gently sloping to very steep, somewhat poorly drained to well drained soils on the more highly dissected parts of till plains. They also grow on the moderately deep soils along the major streams and rivers, except for the Grand River.

The second largest area of trees is the beech forests, which consist mainly of beech, sugar maple, and oak. These trees grow on nearly level to moderately steep, somewhat poorly drained to well drained soils on till plains and outwash terraces. The next most extensive group of trees are the mixed oak forests, which consist of white oak, black oak, red oak, scarlet oak, and hickory. These trees grow on somewhat poorly drained to well drained soils that formed in glacial till in bedrock-controlled areas on till plains and on outwash terraces.

The elm-ash swamp forests consist of swamp white oak, white oak, pin oak, silver maple, red maple, and elm. These trees grow on somewhat poorly drained to very poorly drained soils that formed in glacial till, outwash, lacustrine material, and alluvium in nearly level and depressional areas of wetland. Most of the large elm trees have been destroyed by the Dutch elm disease. Therefore, they make up a smaller part of the trees than they did a few years ago. One of the smallest groups of trees in Trumbull County is the oak-sugar maple forests, which consist of white oak, red oak, black maple, sugar maple, white ash, slippery elm, basswood, black walnut, hickory, and black cherry. These trees grow on poorly drained to well drained soils on terraces and till plains.

The natural beauty of Trumbull County is attributed mostly to its woodland. Native dogwood and redbud blooming in spring present a panorama of natural beauty. Rolling areas especially in the eastern and southeastern parts of the county, winding streams, and narrow roads abound with color in autumn, when maple, oak, dogwood, sassafras, and sumac display red, yellow, and brown hues.

Areas where the trees have been cleared for farming extend for varying distances from the roads, resulting in a unique pattern of narrow to broad strips of woodland between the roads. Some of these wooded strips extend for several miles and are hundreds of acres in size. Since the 1930's, many abandoned areas have been planted to pine, mainly Austrian pine, eastern white pine, red pine, and Scotch pine, for wood production. These trees have now attained a merchantable size. Other abandoned areas could be planted to pine, but hardwoods are another excellent option.

In places the woodland shows the result of abuse and neglect. High grading has continually removed the best trees and left diseased or damaged trees, which take up valuable growing space on excellent woodland sites. Many acres of valuable timber have been destroyed in areas where grapevines have not been controlled. To some extent, grazing cattle have damaged some woodland by destroying leaf litter and desirable seedings, by damaging roots, and by compacting the soil. Good management, in time, can restore this woodland to a high level of production. Additional information about woodland management can be obtained from local offices of the Soil Conservation Service and the Ohio Department of Natural Resources, Division of Forestry.

Soils differ greatly in their productivity as woodland. The factors influencing tree growth are almost the same as those influencing annual crops and pasture. The major difference is that tree roots utilize more of the soil depth, especially around rock fragments in the lower part of the profiles. Aspect and the position of the soil on the landscape also are important.

Aspect is the direction a slope faces. Trees grow best on north and east aspects because of less exposure to the prevailing wind and the sun and because of more abundant soil moisture. Some of the factors that make south and west aspects less well suited to woodland are a higher soil temperature caused by more direct sunrays, a high evaporation rate caused by the prevailing wind, earlier melting of snow, and a greater degree of freezing and thawing.

The position of the soil on the landscape is important in determining the supply of moisture available for tree growth. The moisture supply increases as elevation decreases partly because of downslope seepage. The soils on the lower part of the slopes generally are deeper than the soils on the upper part. Also, less moisture is lost through evaporation, and the soil temperature is somewhat lower.

Slope is an important factor affecting woodland management. Steep and very steep slopes seriously limit the use of equipment. As the percent of slope increases, the rate of water infiltration decreases and the runoff rate and hazard of erosion increase.

Erosion reduces the volume of soil available for water storage. Severe erosion exposes the subsoil, which is commonly less porous, than the surface layer. As a result, the runoff rate is increased and the rate of water intake is decreased. Both tree growth and natural reseeding are adversely affected.

Soil depth, the available water capacity, and drainage influence the growth and suitability of different kinds of trees. For example, black walnut grows better on Ellsworth, Tioga, and other soils that are deep, have a moderate available water capacity, and are well drained or moderately well drained than on other soils. Black walnut seedlings planted on soils that have a low available water capacity, such as Lakin soils, or on poorly drained soils, such as Sebring soils, grow slowly or die. These soils are better suited to other species.

Table 8 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for an indicator tree species. The number indicates the volume, in cubic meters per hectare per year, which the indicator species can produce. The number 1 indicates low potential productivity; 2 and 3, moderate; 4 and 5, moderately high; 6 to 8, high; 9 to 11, very high; and 12 to 39, extremely high. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *R* indicates steep slopes; *X*, stoniness or rockiness; *W*, excess water in or on the soil; *T*, toxic substances in the soil; *D*, restricted rooting depth; *C*, clay in the upper part of the soil; *S*, sandy texture; *F*, a high content of rock fragments in the soil; and *L*, low strength. The letter *A* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: R, X, W, T, D, C, S, F, and L.

In table 8, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Erosion hazard is the probability that damage will occur as a result of site preparation and cutting where the soil is exposed along roads, skid trails, fire lanes, and log-handling areas. Forests that have been burned or overgrazed also are subject to erosion. Ratings of the erosion hazard are based on the percent of the slope. A rating of *slight* indicates that no particular prevention measures are needed under ordinary conditions. A rating of *moderate* indicates that erosion-control measures are needed in certain silvicultural activities. A rating of *severe* indicates that special precautions are needed to control erosion in most silvicultural activities.

Equipment limitation reflects the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. The chief characteristics and conditions considered in the ratings are slope, stones on the surface, rock outcrops, soil wetness, and texture of the surface layer. A rating of *slight* indicates that under normal conditions the kind of equipment or season of use is not significantly restricted by soil factors. Soil wetness can restrict equipment use, but the wet period does not exceed 1 month. A rating of *moderate* indicates that equipment use is moderately restricted because of one or more soil factors. If the soil is wet, the wetness restricts equipment use for a period of 1 to 3 months. A rating of *severe* indicates that equipment use is severely restricted either as to the kind of equipment that can be used or the season of use. If the soil is wet, the wetness restricts equipment use for more than 3 months.

Seedling mortality refers to the death of naturally occurring or planted tree seedlings, as influenced by the kinds of soil, soil wetness, or topographic conditions. The factors used in rating the soils for seedling mortality are texture of the surface layer, depth to a seasonal high water table and the length of the period when the water table is high, rock fragments in the surface layer, effective rooting depth, and slope aspect. A rating of *slight* indicates that seedling mortality is not likely to be a problem under normal conditions. Expected mortality is less than 25 percent. A rating of *moderate* indicates that some problems from seedling mortality can be expected. Extra precautions are advisable. Expected mortality is 25 to 50 percent. A rating of *severe* indicates that seedling mortality is a serious problem. Extra precautions are important. Replanting may be necessary. Expected mortality is more than 50 percent.

Windthrow hazard is the likelihood that trees will be uprooted by the wind because the soil is not deep enough for adequate root anchorage. The main restrictions that affect rooting are a seasonal high water table and the depth to bedrock, a fragipan, or other limiting layers. A rating of *slight* indicates that under normal conditions no trees are blown down by the wind. Strong winds may damage trees, but they do not uproot them. A rating of *moderate* indicates that some trees can be blown down during periods when the soil is wet and winds are moderate or strong. A rating of *severe* indicates that many trees can be blown down during these periods.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index* and as a *volume* number. The site index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

The *volume,* a number, is the yield likely to be produced by the most important trees. This number, expressed as cubic feet per acre per year, indicates the amount of fiber produced in a fully stocked, even-aged, unmanaged stand.

The first species listed under *common trees* for a soil is the indicator species for that soil. It is the dominant species on the soil and the one that determines the ordination class.

Trees to plant are those that are suitable for commercial wood production.

Windbreaks and Environmental Plantings

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

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

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

Table 9 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 9 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service, the Cooperative Extension Service, or the Ohio Department of Natural Resources, Division of Forestry, or from a commercial nursery.

Recreation

Many recreational areas are available throughout Trumbull County. The recreational areas near school buildings include tracks, softball and baseball fields, and playgrounds.

The largest recreational area in the county is Mosquito State Park, which is 11,811 acres in size. It is in the center of the county. It includes a 7,850-acre lake, which provides opportunities for boating, fishing, waterskiing, and swimming. The park has 234 camp sites available for trailers or tents. Several picnic areas also are open to the public. Winter activities include skating, cross-country skiing, and ice fishing.

The county has 19 private recreational areas. Six of these offer overnight camping facilities. There are 22 golf courses in the county. Five of these are open only to members *(16)*.

The Meander Lake Fish and Game Reserve, the Grand River Wildlife Area, and the Shenango Lake Wildlife Area provide opportunities for recreation in the county. Two canoe trails are available to the public. One extends along the Mahoning River from an area in southern Newton Township to Packard Park in Harren. The other is in Pymatuning Creek, which is in the Shenango Lake Wildlife Area.

Mesopotamia Township has a 3.4 mile bikeway. State Routes 7 and 534 have been designated as scenic highways. Twelve of the townships in the county have what are known as green township centers, which evolved from a concept in New England by early English settlers. These "greens" vary from historical centers with monuments to areas of green grass and flowers. Also throughout the county are 12 historic, natural, scenic, and cultural areas.

The soils of the survey area are rated in table 10 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for 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 and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes 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

Dan Ross, district conservationist, Soil Conservation Service, and Steve Ver, game protector, and Tom Henry, private lands biologist, Division of Wildlife, Ohio Department of Natural Resources, helped prepare this section.

Trumbull County has a wide variety of wildlife supported by a diversity of habitat types, including cropland, woodland, open areas, swamps, and ponds. Some of the birds that inhabit the county are pheasants, turkeys, mourning doves, ruffed grouse, Canada geese, red-tailed hawks, crows, pileated woodpeckers, and other song birds. Some of the mammals are rabbits, squirrels, beavers, woodchucks, deer, foxes, and racoons.

The county has large areas of types 1, 2, 3, 4, 5, 6, and 7 wetlands, especially in the northern part *(22)*. These are mainly along the tributaries of the Grand River, Mosquito Creek Lake, and Pymatuning Creek. Sebring, Holly, Caneadea, and Canadice are the dominant soils in these areas. There are three major state wildlife areas in the county. They are the Grand River Wildlife Area, the Mosquito Creek Wildlife Area, and the Shenango Wildlife Area. These areas make up about 19,000 acres.

Most of the soils on uplands in the county are well suited to the plants that provide food and cover for wildlife. Nesting areas are needed. They can be established by planting grass and maintaining areas of grass. Shrubs can be planted for hedgerows and fence rows. Woodlots can be managed for wildlife by providing nut-producing trees (mast) and hollow den trees. If properly managed, cropland is an invaluable source of food for wildlife. Ponds built on suitable soils can provide water for the wetland wildlife. Additional information about improving wildlife habitat can be obtained from the local office of the Soil Conservation Service and from the local game protector.

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 *(1)*. 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 also are considerations. Examples of grain and seed crops are corn, wheat, oats, and soybeans.

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 also are considerations. Examples of grasses and legumes are fescue, timothy, bromegrass, clover, and alfalfa.

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

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, beech, maple, hawthorn, dogwood, hickory, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are shrub honeysuckle, autumn olive, and crabapple.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine and spruce.

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 duckweed, wild millet, willow, reed canarygrass, rushes, sedges, and reeds.

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

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. Wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, raccoon, and deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 or 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 evaluate the potential of areas for residential, commercial, industrial, and recreation uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 12 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or stabilized soil material; and a flexible or rigid surface. Cuts and fills generally are limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic-supporting capacity.

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

Sanitary Facilities

Table 13 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 13 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

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

Excessive seepage resulting from rapid permeability in the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

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

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

The ratings in table 13 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 14 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table; the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help to determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by 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, a 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 a 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 depth to the water table is less than 1 foot. These soils may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 14, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

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

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

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

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 15 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated 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, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

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

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. 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 control erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of soil blowing or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of soil blowing, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

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

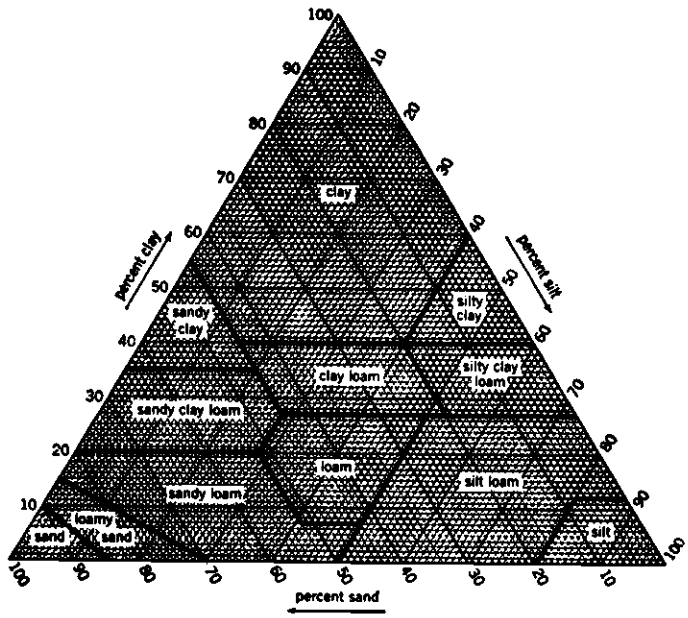

Figure 9.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

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 (fig. 9). "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system *(3)* and the system adopted by the American Association of State Highway and Transportation Officials *(2)*.

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments 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.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 17 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at ⅓ 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 soil blowing in cultivated areas. The groups indicate the susceptibility to soil blowing. Soils are grouped according to the following distinctions:

1. Coarse sands, sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, and sapric soil material. These soils are very highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

4L. Calcareous loams, silt loams, clay loams, and silty clay loams. These soils are erodible. Crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control soil blowing are used.

5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material. These soils are slightly erodible. Crops can be grown if measures to control soil blowing are used.

6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay. These soils are very slightly erodible. Crops can be grown if ordinary measures to control soil blowing are used.

7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material. These soils are very slightly erodible. Crops can be grown if ordinary measures to control soil blowing are used.

8. Soils that are not subject to soil blowing because of coarse fragments on the surface or because of surface wetness.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 17, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter in a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 18 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the infiltration of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to two hydrologic groups in table 18, the first letter is for drained areas and the second is for undrained areas.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 18 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *occasional* that it occurs, on the average, once or less 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.

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 or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 18.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations 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 the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors 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.

Physical and Chemical Analyses of Selected Soils

Many of the soils in Trumbull County were sampled by the Soil Characterization Laboratory, Department of Agronomy, Ohio State University, Columbus, Ohio. The physical and chemical data obtained from most of the samples include particle-size distribution, reaction, organic matter content, calcium carbonate equivalent, and extractable cations.

The data were used in classifying and correlating the soils in evaluating their behavior under various land cases. Five of the profiles were selected as representative of their respective series and are described in this survey. These series and their laboratory identification numbers are Canfield series (TR-18), Ravenna series (TR-19), Sebring series (TR-22), Glenford series (TR-23), and Venango series (TR-25).

In addition to the data from Trumbull County, laboratory data also are available from nearby counties that have many of the same soils. These data and the data from Trumbull County are on file in Columbus, Ohio, at the Department of Agronomy, Ohio State University; the Ohio Department of Natural Resources, Division of Soil and Water Conservation; and the State Office of the Soil Conservation Service. Some of the data have been published in special studies of the soils in nearby counties *(10, 13)*.

Engineering Index Test Data

Several of the soils in Trumbull County were analyzed for engineering properties by the Ohio Department of Transportation, Division of Highways, Bureau of Testing, Soils and Foundation Section. Two of the series in the county were tested. The series names and the laboratory identification numbers are Ravenna series (TR-19) and Sebring series (TR-22).

In addition to the data from Trumbull County, engineering test data also are available from nearby counties that have many of the same soils. All the data are on file in Columbus, Ohio, at the Department of Agronomy, Ohio State University; the Ohio Department of Natural Resources, Division of Soil and Water Conservation; and the State Office of the Soil Conservation Service.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories *(19)*. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 19 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Eleven soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is 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 Aqualf (*Aqu*, meaning water, 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 Ochraqualfs (*Ochr*, meaning light colored surface layer, plus *aqualf*, the suborder of the Alfisols that has an aquic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Ochraqualfs.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, mesic Typic Ochraqualfs.

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 (17)*. Many of the technical terms used in the descriptions are defined in *Soil Taxonomy (19)*. 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."

Brecksville Series

The Brecksville series consists of moderately deep, well drained, slowly permeable soils on side slopes in the uplands. These soils formed in shale residuum. Slopes range from 25 to 50 percent.

Brecksville soils are commonly adjacent to Ellsworth and Mahoning soils and are similar to Lordstown soils. Ellsworth soils are moderately well drained, and Mahoning soils are somewhat poorly drained. Both are on ridgetops. Lordstown soils contain less clay in the subsoil than the Brecksville soils.

Typical pedon of Brecksville silt loam, 25 to 50 percent slopes, about 2.5 miles north-northeast of Howland Corners; in Howland Township; 580 yards north of the intersection of King-Graves and Howland Wilson Roads along Howland Wilson Road, then 100 yards west:

Oi—4 to 3 inches; twigs and undecomposed leaves of beech and other deciduous trees.

Oa—3 inches to 0; black (10YR 2/1), decomposed leaf litter.

A—0 to 2 inches; black (10YR 2/1) silt loam, dark grayish brown (10YR 4/2) dry; moderate fine and medium granular structure; very friable; many roots; about 3 percent coarse fragments; very strongly acid; abrupt wavy boundary.

BA—2 to 10 inches; yellowish brown (10YR 5/4) silt loam; weak fine and medium subangular blocky structure; friable; many roots; common dark grayish brown (10YR 4/2) organic coatings along root channels and on faces of peds; few faint yellowish brown (10YR 5/6) silt coatings on faces of peds; about 5 percent coarse fragments; very strongly acid; clear wavy boundary.

Bw1—10 to 15 inches; light yellowish brown (2.5Y 6/4) silty clay loam; weak fine and medium subangular blocky structure; firm; common roots; common dark grayish brown (10YR 4/2) organic coatings along root channels and on faces of peds; about 10 percent coarse fragments; very strongly acid; clear wavy boundary.

Bw2—15 to 22 inches; light olive brown (2.5Y 5/4) shaly silty clay loam; moderate medium subangular blocky structure; firm; common roots; common faint light yellowish brown (2.5Y 6/4) silt coatings on faces of peds; about 20 percent coarse fragments; very strongly acid; clear wavy boundary.

BC—22 to 26 inches; light olive brown (2.5Y 5/4) shaly silty clay; weak medium and coarse subangular blocky structure; firm; few roots; common faint light yellowish brown (2.5Y 6/4) silt coatings on faces of peds; about 30 percent coarse fragments; very strongly acid; abrupt smooth boundary.

Cr—26 to 32 inches; very dark grayish brown (2.5Y 3/2) and olive brown (2.5Y 4/4), thinly bedded, weathered shale; can be cut with difficulty with a spade.

The thickness of the solum and the depth to shale bedrock range from 20 to 40 inches. The content of shale or siltstone fragments ranges from 0 to 5 percent in the A horizon and from 0 to 25 percent in individual subhorizons of the Bw horizon.

The A horizon has value of 2 to 4 and chroma of 1 or 2. The Bw horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma dominantly of 3 or 4. In some subhorizons, however, it has chroma of 1 or 2 in the lower part. It is dominantly silty clay loam or shaly silty clay loam. In some pedons, however, it is shaly silty clay or silty clay in the lower part. Some pedons have a C horizon.

Cambridge Series

The Cambridge series consists of deep, moderately well drained soils that formed in glacial till on uplands. These soils have a dense fragipan. Permeability is moderate above the fragipan and slow or very slow in the fragipan. Slopes range from 2 to 12 percent.

Cambridge soils are commonly adjacent to Venango and Sebring soils and are similar to Canfield and Rittman soils. Venango soils are somewhat poorly drained, and Sebring soils are poorly drained. Both are lower on the landscape than the Cambridge soils. Canfield and Rittman soils have an argillic horizon above the fragipan.

Typical pedon of Cambridge silt loam, 2 to 6 percent slopes, about 3 miles north of Kinsman; in Kinsman Township; 440 yards west of State Route 7 and 45 yards south of Stanhope McCormick Road:

Ap—0 to 8 inches; brown (10YR 4/3) silt loam, very pale brown (10YR 7/3) dry; moderate medium granular structure; friable; many roots; about 2 percent coarse fragments; strongly acid; abrupt smooth boundary.

Bw1—8 to 12 inches; yellowish brown (10YR 5/6) silt loam; weak medium subangular blocky structure; friable; common roots; dark brown (10YR 4/3) organic coatings in worm and root channels and on faces of peds; about 2 percent coarse fragments; strongly acid; clear smooth boundary.

Bw2—12 to 18 inches; yellowish brown (10YR 5/6) silt loam; few fine prominent strong brown (7.5YR 5/8) mottles; weak medium subangular blocky structure; firm; few roots; common faint light yellowish brown (10YR 6/4) silt coatings on faces of peds; about 2 percent coarse fragments; strongly acid; clear wavy boundary.

Btx1—18 to 28 inches; dark yellowish brown (10YR 4/4) loam; weak very coarse prismatic structure parting to moderate medium platy; very firm; brittle; many prominent grayish brown (10YR 5/2) clay films on faces of prisms; strong brown (7.5YR 5/6) rind between the clay films and the prism interior; common distinct light brownish gray (10YR 6/2) silt coatings on faces of prisms; few fine very dark grayish brown (10YR 3/2) stains and concretions of iron and manganese oxide; about 5 percent coarse fragments; very strongly acid; gradual wavy boundary.

Btx2—28 to 43 inches; dark yellowish brown (10YR 4/4) loam; weak very coarse prismatic structure parting to moderate medium platy; very firm; brittle; common prominent grayish brown (10YR 5/2) clay films on faces of prisms; strong brown (7.5YR 5/6) rind between the clay films and the prism interior; common distinct light brownish gray (10YR 6/2) silt coatings on faces of prisms; common fine dark brown (7.5YR 3/2) stains and concretions of iron and manganese oxide; about 5 percent coarse fragments; very strongly acid; clear wavy boundary.

BC—43 to 58 inches; yellowish brown (10YR 5/4) silt loam; weak very coarse prismatic structure parting to moderate thick platy; firm; few distinct gray (10YR 6/1) clay films and silty material along faces of prisms; strong brown (7.5YR 5/6) rind between the clay films and the prism interior; common fine dark brown (7.5YR 3/2) stains and concretions of iron and manganese oxide; about 10 percent coarse fragments; medium acid; clear wavy boundary.

C—58 to 70 inches; yellowish brown (10YR 5/4) silt loam; massive; firm; common fine dark brown (7.5YR 3/2) stains and concretions of iron and manganese oxide; about 10 percent coarse fragments; neutral.

The solum ranges from 45 to 65 inches in thickness. Free carbonates are at a depth of 48 inches or more. The content of coarse fragments ranges from 0 to 20 percent in the Ap horizon, from 2 to 25 percent in the Bw horizon, and from 5 to 35 percent in individual subhorizons of the Btx and C horizons.

The Ap horizon has chroma of 2 or 3. It is dominantly silt loam but is gravelly silt loam in some pedons. The Bw and Btx horizons are loam, silt loam, clay loam, or the gravelly analogs of those textures. The Bw horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. The Btx horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 6. The C horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 4 or 5, and chroma of 3 or 4. It is loam, silt loam, or the gravelly analogs of those textures.

Canadice Series

The Canadice series consists of deep, poorly drained, very slowly permeable soils in the basins of former glacial lakes. These soils formed in lacustrine material. Slopes are 0 to 2 percent.

Canadice soils are commonly adjacent to Caneadea and Lorain soils and are similar to Trumbull soils. Caneadea soils are somewhat poorly drained and are on the higher parts of the landscape. Lorain soils have a surface layer that is thicker and darker than that of the Canadice soils. Also, they are lower on the landscape. Trumbull soils generally have a higher content of coarse fragments in the subsoil and substratum than the Canadice soils.

Typical pedon of Canadice silty clay loam, in an area of Caneadea-Canadice complex, 0 to 2 percent slopes, about 3 miles northwest of North Bloomfield; in Bloomfield Township; 275 yards west of the intersection of Bloomfield Geneva Road and Mahan Parker Road on Mahan Parker Road, then 90 feet south:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silty clay loam, light brownish gray (10YR 6/2) dry; moderate fine and medium subangular blocky structure; friable; many roots; strongly acid; abrupt smooth boundary.

BEg—8 to 12 inches; dark gray (10YR 4/1) silty clay loam; common fine distinct dark yellowish brown (10YR 4/4) and common fine prominent strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; many roots; common distinct light brownish gray (10YR 6/2) silt coatings on faces of peds; strongly acid; clear wavy boundary.

Btg1—12 to 17 inches; dark gray (10YR 4/1) silty clay; common fine and medium prominent strong brown (7.5YR 5/6) mottles; moderate coarse prismatic structure parting to moderate medium subangular blocky; firm; common roots; many distinct gray (10YR 5/1) clay films on faces of peds; strongly acid; gradual wavy boundary.

Btg2—17 to 31 inches; dark gray (10YR 4/1) silty clay; many medium prominent strong brown (7.5YR 5/6) mottles; strong medium prismatic structure parting to strong medium subangular and angular blocky; firm; few roots; many distinct gray (10YR 5/1) clay films on faces of peds; strongly acid; clear wavy boundary.

Bt—31 to 45 inches; yellowish brown (10YR 5/4) silty clay; many medium prominent strong brown (7.5YR 5/8) and many medium distinct gray (10YR 5/1) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; many prominent dark gray (10YR 4/1) clay films on faces of peds; neutral; gradual wavy boundary.

C1—45 to 64 inches; olive brown (2.5Y 4/4) silty clay; common medium prominent gray (5Y 5/1) and common medium prominent strong brown (7.5YR 5/8) mottles; massive; firm; many prominent gray (5Y 5/1) surfaces on vertical partings; neutral; diffuse wavy boundary.

C2—64 to 80 inches; olive brown (2.5Y 4/4) silty clay; common medium prominent strong brown (7.5YR 5/8) mottles; massive; firm; common prominent gray (5Y 5/1) surfaces on vertical partings; slight effervescence; mildly alkaline.

The solum ranges from 30 to 60 inches in thickness. It is generally free of coarse fragments, but in some pedons the content of these fragments is as much as 5 percent in the Btg, Bt, and C horizons.

The Ap horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2. Some pedons have an A horizon and an Eg horizon. The Btg and Bt horizons have hue of 10YR to 5Y or are neutral in hue. They have value of 4 to 6. They have chroma of 0 to 2 within a depth of 30 inches and chroma of 1 to 4 below that depth. They are silty clay, clay, or silty clay loam. The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4. It is dominantly silty clay or clay, but in some pedons it has strata of silty clay loam.

Caneadea Series

The Caneadea series consists of deep, somewhat poorly drained, very slowly permeable soils in the basins of former glacial lakes. These soils formed in lacustrine material. Slopes range from 0 to 6 percent.

Caneadea soils are commonly adjacent to Canadice and Lorain soils and are similar to Mahoning and Remsen soils. Canadice soils are poorly drained, and Lorain soils are very poorly drained. Both are on the lower parts of the landscape. Mahoning and Remsen soils have a higher content of coarse fragments in the subsoil and substratum than the Caneadea soils.

Typical pedon of Caneadea silt loam, 0 to 2 percent slopes, about 1.5 mile south of Leavittsburg; in Warren Township; 750 yards south of the intersection of Kale Adams Road and Layer Road along Layer Road, then 70 yards west:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate fine and medium subangular blocky structure; friable; many roots; slightly acid; abrupt smooth boundary.

E—8 to 12 inches; light brownish gray (2.5Y 6/2) silty clay loam; common medium prominent strong brown (7.5YR 5/6) mottles; weak fine and medium subangular blocky structure; friable; common roots; dark grayish brown (10YR 4/2) organic coatings in root and worm channels; medium acid; clear wavy boundary.

Bt1—12 to 18 inches; yellowish brown (10YR 5/4) silty clay loam; many medium and coarse prominent strong brown (7.5YR 5/6) and few fine distinct grayish brown (10YR 5/2) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; common roots; many distinct and few distinct gray (10YR 5/1) clay films on vertical and horizontal faces of peds, respectively; few distinct light brownish gray (2.5Y 6/2) silt coatings on faces of peds; strongly acid; clear wavy boundary.

Bt2—18 to 25 inches; yellowish brown (10YR 5/4) silty clay; many medium prominent strong brown (7.5YR 5/6) and common fine distinct grayish brown (10YR 5/2) mottles; strong medium prismatic structure parting to moderate medium angular; firm; common roots; many distinct and common distinct gray (10YR 5/1) clay films on vertical and horizontal faces of peds, respectively; few distinct light brownish gray (2.5Y 6/2) silt coatings on faces of peds; strongly acid; clear wavy boundary.

Bt3—25 to 32 inches; dark yellowish brown (10YR 4/4) silty clay; common medium and coarse prominent strong brown (7.5YR 5/6) and common fine and medium distinct light brownish gray (10YR 6/2) mottles; strong medium prismatic structure parting to moderate medium subangular and angular blocky; firm; few roots; many distinct and common distinct gray (10YR 5/1) clay films on vertical and horizontal faces of peds, respectively; medium acid; gradual wavy boundary.

Bt4—32 to 37 inches; dark yellowish brown (10YR 4/4) silty clay; common medium distinct light olive brown (2.5Y 5/4) and common medium prominent light brownish gray (2.5Y 6/2) mottles; moderate coarse prismatic structure parting to moderate medium and coarse subangular and angular blocky; firm; few roots; gray (10YR 5/1) coatings on faces of peds; many distinct and few distinct gray (10YR 5/1) clay films on vertical and horizontal faces of peds, respectively; few fine very dark brown (10YR 2/2) stains of iron and manganese oxide; slightly acid; gradual wavy boundary.

BC—37 to 43 inches; light olive brown (2.5Y 5/4) silty clay; common medium distinct light olive brown (2.5Y 5/6) mottles; weak very coarse prismatic structure parting to weak coarse subangular and angular blocky; firm; many distinct gray (10YR 5/1) coatings on vertical faces of peds; common fine very dark brown (10YR 2/2) stains of iron and manganese oxide; neutral; clear wavy boundary.

C1—43 to 57 inches; olive brown (2.5Y 4/4) silty clay; firm; many prominent gray (N 5/0) surfaces along vertical and horizontal partings; laminated; common fine distinct very dark brown (10YR 2/2) stains of iron and manganese oxide; slight effervescence; mildly alkaline; clear wavy boundary.

C2—57 to 79 inches; olive brown (2.5Y 4/4) silty clay; common medium distinct light olive brown (2.5Y 5/6) mottles; firm; common prominent gray (N 5/0) surfaces along vertical and horizontal partings; laminated; common medium very dark brown (10YR 2/2) stains of iron and manganese oxide; slight effervescence; mildly alkaline.

The solum ranges from 40 to 56 inches in thickness. The soils are typically free of coarse fragments, but some pedons have a few pebbles.

The Ap horizon has value of 4 or 5 and chroma of 2 or 3. It is dominantly silt loam, but it is silty clay loam in some pedons. The Bt horizon has hue of 2.5Y or 10YR and chroma of 2 to 4. It is silty clay, clay, or silty clay loam. The C horizon has hue of 10YR to 5Y, value of 3 or 4, and chroma of 2 to 4. It is silty clay or silty clay loam.

Canfield Series

The Canfield series consists of deep, moderately well drained soils that formed in glacial till on uplands. These soils have a dense fragipan. Permeability is moderate above the fragipan and slow in the fragipan and substratum. Slopes range from 2 to 12 percent.

Canfield soils are commonly adjacent to Ravenna, Sebring, and Wooster soils and are similar to Cambridge and Rittman soils. Ravenna soils are somewhat poorly drained, and Sebring soils are poorly drained. Both are on the lower parts of the landscape. Wooster soils are well drained and are on hillsides along drainageways. Cambridge soils do not have an argillic horizon above the fragipan. Rittman soils contain more clay in the subsoil and substratum than the Canfield soils.

Typical pedon of Canfield silt loam, 2 to 6 percent slopes, about 2 miles north of Brookfield Center; in Brookfield Township; 190 yards west of State Route 7 and 105 yards south of Amy Boyle Road:

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (2.5Y 6/2) dry; moderate medium granular structure; friable; many roots; about 2 percent coarse fragments; medium acid; abrupt smooth boundary.

BE—7 to 15 inches; yellowish brown (10YR 5/6) silt loam; weak medium subangular blocky structure; friable; common roots; common faint yellowish brown (10YR 5/4) silt coatings on faces of peds; about 3 percent coarse fragments; strongly acid; clear smooth boundary.

Bt—15 to 20 inches; yellowish brown (10YR 5/6) silt loam; common fine distinct strong brown (7.5YR 5/6), few fine prominent light brownish gray (10YR 6/2), and few medium prominent yellowish red (5YR 5/8) mottles; weak coarse prismatic structure parting to weak medium subangular blocky; friable; few roots; common distinct and few faint gray (10YR 5/1) clay films on vertical and horizontal faces of peds, respectively; common faint pale brown (10YR 6/3) silt coatings on vertical faces of peds; about 5 percent coarse fragments; very strongly acid; clear wavy boundary.

Btx1—20 to 26 inches; dark yellowish brown (10YR 4/4) loam; weak very coarse prismatic structure parting to weak medium subangular blocky; very firm and brittle in about 50 percent of the horizon; few roots on faces of prisms; many prominent and common prominent gray (5Y 6/1) clay films on vertical and horizontal faces of peds, respectively; few distinct pale brown (10YR 6/3) silt coatings on vertical faces of peds; strong brown (7.5YR 5/6) rind ⅛ to ¼ inch wide between the clay films and the prism interior; common medium very dark brown (10YR 2/2) stains and concretions of iron and manganese oxide; about 10 percent coarse fragments; very strongly acid; clear wavy boundary.

Btx2—26 to 32 inches; dark yellowish brown (10YR 4/4) gravelly loam; weak very coarse prismatic structure parting to weak thick platy; very firm; brittle; few roots on vertical faces of prisms; many prominent and common distinct gray (5Y 6/1) clay films on vertical and horizontal faces of peds, respectively; few distinct pale brown (10YR 6/3) silt coatings on vertical faces of peds; strong brown (7.5YR 5/6) rind ⅛ to ¼ inch wide between the clay films and the prism interior; common medium very dark brown (10YR 2/2) stains and concretions of iron and manganese oxide; about 15 percent coarse fragments; very strongly acid; clear wavy boundary.

Btx3—32 to 44 inches; dark yellowish brown (10YR 4/4) gravelly loam; weak very coarse prismatic structure parting to weak thick platy; very firm; brittle; no roots; many prominent gray (5Y 6/1) clay films on vertical faces of peds; vertical clay seams 8 to 12 inches apart; strong brown (7.5YR 5/6) rind ⅛ to ¼ inch wide between the clay films and the prism interior; many medium very dark brown (10YR 2/2) stains and concretions of iron and manganese oxide; about 15 percent coarse fragments, including a few cobble-sized sandstone and igneous rocks in the lower part; strongly acid; clear wavy boundary.

BC—44 to 56 inches; light olive brown (2.5Y 5/4) silt loam; few fine prominent light brownish gray (10YR 6/2) and few fine prominent yellowish brown (10YR 5/6) mottles; massive; firm; many prominent gray (5Y 6/1) vertical clay seams 8 to 15 inches apart; strong brown (7.5YR 5/6) rind ⅛ to ¼ inch wide between the clay films and the prism interior; common medium very dark brown (10YR 2/2) stains and concretions of iron and manganese oxide; about 5 percent coarse fragments; slightly acid; clear wavy boundary.

C1—56 to 68 inches; light olive brown (2.5Y 5/4) silt loam; few fine prominent light brownish gray (10YR 6/2) and yellowish brown (10YR 5/6) mottles; massive; firm; prominent gray (5Y 6/1) vertical partings; about 3 percent coarse fragments; neutral; gradual wavy boundary.

C2—68 to 78 inches; light olive brown (2.5Y 5/4) silt loam; few fine distinct light brownish gray (10YR 6/2) and few fine prominent yellowish brown (10YR 5/6) mottles; massive; firm; prominent gray (5Y 6/1) vertical partings; about 3 percent coarse fragments; neutral.

The solum ranges from 45 to 60 inches in thickness. Carbonates are at a depth of 50 to 80 inches in some pedons. The content of coarse fragments ranges from 2 to 20 percent in the Ap horizon and from 2 to 35 percent below the Ap horizon.

The Ap horizon has value of 4 or 5 and chroma of 2 or 3. It is dominantly silt loam, but the range includes gravelly silt loam. The Bt horizon has value of 4 or 5 and chroma of 3 to 6. It is loam, silt loam, clay loam, or the gravelly analogs of those textures. Generally, the content of clay in this horizon is 18 to 27 percent. The Btx and C horizons are loam, silt loam, sandy loam, or the gravelly analogs of those textures. The Btx horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. The C horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 4 or 5, and chroma of 3 or 4.

Carlisle Series

The Carlisle series consists of deep, very poorly drained soils that formed in organic deposits in bogs and swales on till plains and terraces and in the basins of former glacial lakes. Permeability is moderately slow to moderately rapid. Slopes are 0 to 1 percent.

Carlisle soils are commonly adjacent to Sebring and Canadice soils. The adjacent soils formed in mineral material in the slightly higher areas in the basins of former glacial lakes.

Typical pedon of Carlisle muck, ponded, about 2.8 miles northwest of Kinsman; in Kinsman Township; 150 yards north of the intersection of State Street (Williamsfield Kinsman State Road) and Webber Cole Road along State Street, then 990 yards west:

Oa1—0 to 9 inches; sapric material, black (10YR 2/1) broken face and rubbed, very dark grayish brown (10YR 3/2) dry; about 15 percent fiber, less than 5 percent rubbed; weak fine granular structure; very friable; many roots; slightly acid; clear smooth boundary.

Oa2—9 to 18 inches; sapric material, black (10YR 2/1) broken face and rubbed; about 10 percent fiber, less than 2 percent rubbed; weak fine subangular blocky structure; very friable; about 5 percent woody fragments; common roots; slightly acid; clear smooth boundary.

Oa3—18 to 29 inches; sapric material, black (10YR 2/1) broken face and rubbed; about 10 percent fiber, less than 2 percent rubbed; weak fine and medium subangular blocky structure; very friable; few roots; about 10 percent woody fragments; slightly acid; gradual smooth boundary.

Oa4—29 to 53 inches; sapric material, black (10YR 2/1) broken face and rubbed; about 5 percent fiber, less than 1 percent rubbed; massive; very friable; about 5 percent woody fragments; slightly acid; gradual smooth boundary.

Oa5—53 to 65 inches; sapric material, very dark gray (10YR 3/1) broken face and rubbed; no fiber; massive; friable; about 20 percent mineral material; about 1 percent woody fragments; slightly acid.

The organic deposits are more than 60 inches thick. Woody fragments consisting of twigs, branches, and logs are throughout most pedons and make up as much as 10 to 25 percent of the volume in some pedons.

The surface tier has chroma of 1 or 2. The subsurface and bottom tiers have hue of 5YR to 10YR, value of 2 or 3, and chroma of 1 or 2. The bottom tier is dominantly sapric material, but some pedons have thin layers of hemic material.

Chili Series

The Chili series consists of deep, well drained, moderately rapidly permeable soils on stream terraces, outwash plains, and kames. These soils formed in glacial outwash. Slopes range from 0 to 50 percent.

Chili soils are commonly adjacent to Damascus, Jimtown, and Oshtemo soils. Damascus soils are poorly drained, and Jimtown soils are somewhat poorly drained. Both are in the lower positions on the landscape. Oshtemo soils have less clay in the upper part of the subsoil than the Chili soils.

Typical pedon of Chili loam, 2 to 6 percent slopes, about 3.3 miles southwest of Cortland; in Bazetta Township; 1,120 yards north of the intersection of State Route 46 and McCleary-Jacoby Road along McCleary-Jacoby Road, then 1,330 yards west:

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; many roots; about 5 percent coarse fragments; medium acid; abrupt smooth boundary.

BE—7 to 13 inches; yellowish brown (10YR 5/6) loam; weak medium subangular blocky structure; friable; common faint grainy light yellowish brown (10YR 6/4) silt coatings on faces of peds; common roots; about 10 percent coarse fragments; medium acid; clear smooth boundary.

Bt1—13 to 18 inches; strong brown (7.5YR 5/6) sandy clay loam; moderate fine and medium subangular blocky structure; firm; few roots; few faint brown (7.5YR 4/4) clay films on faces of peds; about 10 percent coarse fragments; strongly acid; gradual smooth boundary

Bt2—18 to 24 inches; strong brown (7.5YR 5/6) gravelly sandy clay loam; moderate fine and medium subangular blocky structure; firm; few roots; common faint brown (7.5YR 4/4) clay films on faces of peds; about 20 percent coarse fragments; strongly acid; clear smooth boundary.

Bt3—24 to 39 inches; strong brown (7.5YR 5/6) gravelly sandy clay loam; moderate fine and medium subangular blocky structure; firm; common faint brown (7.5YR 4/4) clay films on faces of peds; about 20 percent coarse fragments; strongly acid; clear smooth boundary.

Bt4—39 to 48 inches; brown (10YR 4/3) gravelly sandy loam; weak medium subangular blocky structure; friable; few faint brown (7.5YR 4/4) clay films bridging pebbles and sand grains; about 30 percent coarse fragments; strongly acid; clear smooth boundary.

Bt5—48 to 70 inches; dark yellowish brown (10YR 4/4) very gravelly sandy loam; weak medium subangular blocky structure; friable; pebbles and sand grains coated and bridged with clay; about 45 percent coarse fragments; strongly acid; clear smooth boundary.

BC—70 to 79 inches; brown (7.5YR 4/4) very gravelly sandy loam; massive; friable; about 55 percent coarse fragments; strongly acid; abrupt smooth boundary.

C—79 to 84 inches; yellowish brown (10YR 5/4) gravelly sand; single grained; loose; about 25 percent coarse fragments; medium acid.

The solum ranges from 40 to 80 inches in thickness. The content of coarse fragments ranges from 2 to 25 percent in the upper 20 inches, from 15 to 40 percent between depths of 20 and 40 inches, and from 25 to 60 percent below a depth of 40 inches.

The Ap horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 or 3. It is dominantly loam or gravelly loam, but the range includes silt loam, sandy loam, and gravelly sandy loam. Some pedons have an A horizon and an E horizon. The Bt horizon has hue of 5YR to 10YR and chroma of 3 to 6. It is loam, clay loam, sandy clay loam, or the gravelly analogs of those textures in the upper part and the gravelly or very gravelly analogs of sandy loam or loam in the lower part. The C horizon has value of 4 or 5 and chroma of 2 to 4. It is the gravelly or very gravelly analogs of loamy sand or sand.

Condit Series

The Condit series consists of deep, poorly drained, slowly permeable soils on till plains. These soils formed in glacial till. Slopes are 0 to 2 percent.

Condit soils are commonly adjacent to Ellsworth and Mahoning soils. The adjacent soils are better drained than the Condit soils and are higher on the landscape.

Typical pedon of Condit silt loam, about 2.5 miles east of Champion; in Bazetta Township; 1,250 yards north of the intersection of State Route 305 and Durst-Clagg Road along Durst-Clagg Road, then 450 yards east:

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate fine and medium granular structure; friable; many roots; about 2 percent coarse fragments; strongly acid; abrupt smooth boundary.

E—7 to 11 inches; light brownish gray (10YR 6/2) silty clay loam; common fine and medium prominent yellowish brown (10YR 5/8) mottles; weak fine and medium granular structure; friable; common roots; dark grayish brown (10YR 4/2) krotovina (crayfish channel); common fine and medium prominent yellowish red (5YR 5/6) stains of iron oxide; about 2 percent coarse fragments; very strongly acid; abrupt wavy boundary.

Btg1—11 to 18 inches; grayish brown (10YR 5/2) silty clay loam; many medium prominent yellowish brown (10YR 5/8) mottles; weak very coarse prismatic structure parting to weak medium subangular blocky; firm; few roots; few distinct dark gray (10YR 4/1) clay films on vertical faces of peds; dark grayish brown (10R 4/2) krotovina (crayfish channel); common fine yellowish red (5YR 5/6) and dark red (10R 3/6) stains and striations of iron oxide; about 3 percent coarse fragments; very strongly acid; clear wavy boundary.

Btg2—18 to 27 inches; grayish brown (10YR 5/2) silty clay loam; common fine and medium prominent yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to weak medium subangular and angular blocky; firm; few roots; common distinct dark gray (10YR 4/1) clay films on faces of peds; common fine yellowish red (5YR 5/6) and dark red (10R 3/6) stains and striations of iron oxide; about 3 percent coarse fragments; very strongly acid; gradual wavy boundary.

Btg3—27 to 36 inches; grayish brown (10YR 5/2) silty clay loam; many medium prominent yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular and angular blocky; very firm; many prominent and common prominent dark gray (10YR 4/1) clay films on vertical and horizontal faces of peds, respectively; about 5 percent coarse fragments; strongly acid; clear wavy boundary.

Bt—36 to 45 inches; dark yellowish brown (10YR 4/4) silty clay loam; common medium prominent yellowish brown (10YR 5/8) mottles; weak coarse prismatic structure parting to moderate coarse subangular blocky; very firm; many prominent and common distinct gray (5Y 5/1) clay films on vertical and horizontal faces of peds, respectively; about 5 percent coarse fragments; medium acid; gradual wavy boundary.

C1—45 to 58 inches; dark yellowish brown (10YR 4/4) silty clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; massive; very firm; few distinct gray (N 5/0) clay flows on vertical fracture planes; common medium light gray (10YR 7/2) and common medium white (10YR 8/1) splotches and streaks of calcium carbonate; about 5 percent coarse fragments; slight effervescence; mildly alkaline; gradual wavy boundary.

C2—58 to 80 inches; yellowish brown (10YR 5/4) silty clay loam; common medium prominent yellowish brown (10YR 5/8) and common medium prominent gray (N 6/0) mottles; very firm; massive; common medium light gray (10YR 7/2) and common medium white (10YR 8/1) splotches and streaks of calcium carbonate; about 10 percent coarse fragments; strong effervescence; moderately alkaline.

The thickness of the solum and the depth to carbonates range from 30 to 55 inches. The carbonates generally are below a depth of 40 inches. The content of coarse fragments ranges from 0 to 5 percent in the Ap horizon, from 2 to 10 percent in the Btg and Bt horizons, and from 5 to 15 percent in the C horizon.

The Ap horizon has hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 1 or 2. It is dominantly silt loam, but the range includes silty clay loam. Many pedons have an A horizon. Within a depth of 30 inches, the Btg and Bt horizons have hue of 10YR or 2.5Y and chroma of 1 or 2. Below a depth of 30 inches, they have hue of 10YR or 2.5Y and chroma of 1 to 6 or are neutral in hue and have chroma of 0. They are silty clay loam, clay loam, or silty clay. The content of clay in these horizons ranges from 35 to 40 percent. The C horizon has hue of 10YR to 5Y and chroma of 1 to 6. It is silty clay loam or clay loam.

Damascus Series

The Damascus series consists of deep, poorly drained soils that formed in stratified glacial outwash on stream terraces and outwash plains. Permeability is moderate in the subsoil and rapid or moderately rapid in the substratum. Slopes are 0 to 2 percent.

Damascus soils are commonly adjacent to Jimtown and Haskins soils. The adjacent soils are somewhat poorly drained and are higher on the landscape than the Damascus soils.

Typical pedon of Damascus loam, about 1.2 miles west of Bloomfield; in Bloomfield Township; 1,180 yards east of the township line along State Route 87, then 17 yards north:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) loam, light brownish gray (10YR 6/2) dry; moderate fine and medium granular structure; friable; many roots; about 2 percent coarse fragments; medium acid; clear smooth boundary.

BEg—8 to 14 inches; grayish brown (10YR 5/2) loam; few fine and medium prominent yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; many roots; few faint gray (10YR 6/1) silt coatings on faces of peds; few faint dark grayish brown (10YR 4/2) organic coatings in worm and root channels; few fine dark brown (7.5YR 3/2) stains of iron and manganese oxide; about 2 percent coarse fragments; medium acid; clear smooth boundary.

Btg1—14 to 22 inches; light brownish gray (10YR 6/2) loam; common fine and medium prominent strong brown (7.5YR 5/8) and yellowish brown (10YR 5/6) mottles; moderate fine and medium subangular blocky structure; firm; common roots; common faint gray (10YR 5/1) clay films on faces of peds; many faint light gray (10YR 6/1) silt coatings on vertical faces of peds; common fine and medium dark brown (7.5YR 3/2) stains and concretions of iron and manganese oxide; about 2 percent coarse fragments; medium acid; clear wavy boundary.

Btg2—22 to 31 inches; grayish brown (10YR 5/2) clay loam; common medium prominent strong brown (7.5YR 5/8) and yellowish brown (10YR 5/6) mottles; moderate fine and medium subangular blocky structure; firm; common roots; many faint gray (10YR 5/1) clay films on faces of peds; many medium and coarse black (N 2/0) and dark brown (7.5YR 3/2) stains and concretions of iron and manganese oxide; about 3 percent coarse fragments; medium acid; clear wavy boundary.

Btg3—31 to 35 inches; grayish brown (2.5Y 5/2) clay loam; common medium prominent strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; few roots; many faint gray (10YR 5/1) clay films on faces of peds; common fine and medium black (N 2/0) and dark brown (7.5YR 3/2) stains and concretions of iron and manganese oxide; about 2 percent coarse fragments; medium acid; clear wavy boundary.

Btg4—35 to 41 inches; grayish brown (2.5Y 5/2) clay loam; common medium distinct light olive brown (2.5Y 5/4) and common medium prominent strong brown (7.5YR 5/6) mottles; weak fine and medium subangular blocky structure; friable; common faint gray (N 5/0) clay films on faces of peds; about 5 percent coarse fragments; medium acid; clear wavy boundary.

BC—41 to 44 inches; light olive brown (2.5Y 5/4) gravelly loam; common medium prominent yellowish brown (10YR 5/6) and common medium prominent light brownish gray (10YR 6/2) mottles; moderate medium and coarse subangular blocky structure; firm; few faint gray (N 5/0) clay films on faces of peds; about 15 percent coarse fragments; medium acid; clear wavy boundary.

Cg—44 to 54 inches; grayish brown (10YR 5/2) sandy loam; many medium prominent yellowish brown (10YR 5/6), common medium faint brown (10YR 5/3), and common medium faint light brownish gray (10YR 6/2) mottles; massive; friable; about 10 percent coarse fragments; medium acid; clear wavy boundary.

C—54 to 65 inches; brown (10YR 5/3) gravelly sandy loam; common medium prominent strong brown (7.5YR 5/6), common medium faint light brownish gray (10YR 6/2), and many medium distinct yellowish brown (10YR 5/6) mottles; massive; friable; about 20 percent coarse fragments; slightly acid.

The solum ranges from 30 to 48 inches in thickness. The content of coarse fragments ranges from 0 to 15 percent in the Ap horizon, from 0 to 30 percent in the part of the Btg horizon within a depth of 20 inches, and from 2 to 30 percent between depths of 20 and 40 inches. It is as much as 35 percent in the Cg and C horizons.

The Ap horizon has value of 4 or 5 and chroma of 1 or 2. It is dominantly loam, but it is sandy loam in some pedons. Some pedons have an A horizon and an E horizon. The Btg horizon has hue of 10YR to 5Y or is neutral in hue. It has value of 4 to 6 and chroma of 0 to 2. It is dominantly loam, sandy clay loam, clay loam, or the gravelly analogs of those textures. In some pedons, however, it has thin subhorizons of silty clay loam. The Cg and C horizons have hue of 10YR to 5Y or are neutral in hue. They have value of 4 or 5 and chroma of 0 to 3. They are loam, sandy loam, loamy sand, or the gravelly analogs of those textures.

Darien Series

The Darien series consists of deep, somewhat poorly drained, moderately slowly permeable soils on till plains. These soils formed in glacial till. Slopes range from 0 to 6 percent.

Darien soils are commonly adjacent to Sebring soils and are similar to Mahoning soils. Sebring soils are poorly drained and are in depressions. Mahoning soils have more clay in the subsoil than the Darien soils.

Typical pedon of Darien silt loam, 0 to 2 percent slopes, about 1.5 miles southwest of Greene Center; in Greene Township; 540 yards south of Gardner-Barclay Road and 60 yards west of Hoagland-Blackstub Road:

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate fine and medium granular structure; friable; many roots, 2 percent coarse fragments; medium acid; abrupt smooth boundary.

E—9 to 13 inches; grayish brown (10YR 5/2) silt loam; common fine and medium prominent yellowish brown (10YR 5/6) mottles; weak fine and medium subangular blocky structure; friable; many roots; about 2 percent coarse fragments; medium acid; clear wavy boundary.

Bt1—13 to 18 inches; brown (10YR 5/3) silt loam; common fine and medium distinct brown (7.5YR 4/4) and gray (10YR 5/1) mottles and common medium prominent strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; firm; common roots; many distinct grayish brown (2.5Y 5/2) surfaces on peds; few faint grayish brown (2.5Y 5/2) clay films on faces of peds; about 5 percent coarse fragments; medium acid; clear wavy boundary.

Bt2—18 to 24 inches; yellowish brown (10YR 5/4) clay loam; few medium prominent strong brown (7.5YR 5/6) and common medium distinct gray (10YR 5/1) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; common roots; many distinct grayish brown (2.5Y 5/2) surfaces on peds; common distinct and many distinct grayish brown (2.5Y 5/2) clay films on vertical and horizontal faces of peds, respectively; about 10 percent coarse fragments; strongly acid; clear wavy boundary.

Bt3—24 to 32 inches; dark yellowish brown (10YR 4/4) clay loam; common medium distinct gray (10YR 5/1) and yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure parting to moderate medium platy; firm; few roots; many distinct gray (10YR 5/1) surfaces on peds; few distinct gray (10YR 5/1) clay films on vertical faces of peds; many medium black (10YR 2/1) stains and concretions of iron and manganese oxide; about 10 percent coarse fragments; strongly acid; gradual wavy boundary.

Bt4—32 to 41 inches; yellowish brown (10YR 5/4) clay loam; many medium distinct yellowish brown (10YR 5/6), common medium distinct dark brown (7.5YR 4/4), and common medium prominent strong brown (7.5YR 5/6) and grayish brown (2.5Y 5/2) mottles; weak very coarse prismatic structure parting to medium and coarse platy; firm; many distinct gray (10YR 5/1) surfaces on peds; few distinct gray (10YR 5/1) clay films on faces of peds; few fine black (10YR 2/1) stains and concretions of iron and manganese oxide; about 10 percent coarse fragments; medium acid; clear wavy boundary.

BC—41 to 47 inches; yellowish brown (10YR 5/4) silty clay loam; common fine and medium distinct yellowish brown (10YR 5/6) mottles; weak very thick platy structure parting to weak fine and medium subangular blocky; firm; many distinct gray (10YR 5/1) surfaces on peds; few distinct gray (10YR 5/1) and dark gray (10YR 4/1) clay films on faces of peds; few fine black (10YR 2/1) stains and concretions of iron and manganese oxide; about 10 percent coarse fragments; neutral; gradual wavy boundary.

C1—47 to 58 inches; yellowish brown (10YR 5/4) silty clay loam; many medium distinct yellowish brown (10YR 5/6) and many medium distinct gray (10YR 5/1) mottles; massive; firm; common fine black (10YR 2/1) stains and concretions of iron and manganese oxide; about 10 percent coarse fragments; strong effervescence; mildly alkaline; diffuse wavy boundary.

C2—58 to 70 inches; yellowish brown (10YR 5/4) silty clay loam; common fine and medium distinct yellowish brown (10YR 5/6) mottles; massive; firm; common fine and medium black (10YR 2/1) stains and concretions of iron and manganese oxide; common light gray (10YR 7/2) streaks and splotches of calcium carbonate; about 10 percent coarse fragments; strong effervescence; moderately alkaline.

The solum ranges from 30 to 55 inches in thickness. The content of coarse fragments, mostly sandstone and crystalline fragments and a few shale fragments, ranges from 2 to 5 percent in the Ap horizon, from 2 to 10 percent in the subsoil, and from 10 to 15 percent in the substratum.

The Ap horizon has hue of 10YR or 2.5Y and chroma of 2 or 3. The Bt horizon has hue of 10YR or 2.5Y and chroma of 2 to 4. It is dominantly clay loam or silty clay loam, but it is silt loam in the upper part in many pedons. The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4. It is silty clay loam, clay loam, or silt loam.

Ellsworth Series

The Ellsworth series consists of deep, moderately well drained, slowly permeable or very slowly permeable soils on till plains. These soils formed in glacial till. Slopes range from 2 to 50 percent.

Ellsworth soils are commonly adjacent to Condit and Mahoning soils and are similar to Geeburg soils. Condit soils are poorly drained and are in the less sloping areas. Mahoning soils are somewhat poorly drained and are in the less sloping or more concave areas. Geeburg soils have more clay in the subsoil and substratum than the Ellsworth soils.

Typical pedon of Ellsworth silt loam, 2 to 6 percent slopes, about 2.5 miles southwest of Cortland; in Bazetta Township; 1,670 yards east of the intersection of State Route 305 and Hoagland-Blackstub Road along State Route 305, then 150 yards north:

Oi—2 inches to 0; undecomposed leaf litter and twigs.

A—0 to 3 inches; very dark brown (10YR 2/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; many roots; about 2 percent coarse fragments; strongly acid; abrupt wavy boundary.

E—3 to 7 inches; brown (10YR 5/3) silt loam; few fine distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure parting to weak fine and medium granular; friable; many roots; common distinct pale brown (10YR 6/3) silt coatings on faces of peds; dark grayish brown (10YR 4/2) organic coatings in root channels; about 2 percent coarse fragments; strongly acid; clear wavy boundary.

BE—7 to 11 inches; yellowish brown (10YR 5/4) silty clay loam; moderate fine and medium subangular blocky structure; firm; common roots; many distinct and common distinct pale brown (10YR 6/3) silt coatings on vertical and horizontal faces of peds, respectively; dark grayish brown (10YR 4/2) organic coatings in root channels; about 5 percent coarse fragments; very strongly acid; clear wavy boundary.

Bt1—11 to 19 inches; yellowish brown (10YR 5/4) silty clay loam; few fine distinct strong brown (7.5YR 5/6) and few fine distinct grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; common roots; common distinct and few distinct brown (7.5YR 4/4) clay films on vertical and horizontal faces of peds, respectively; common distinct pale brown (10YR 6/3) and common distinct light brownish gray (10YR 6/2) silt coatings on faces of peds; common fine very dark brown (10YR 2/2) stains and concretions of iron and manganese oxide; about 5 percent coarse fragments; very strongly acid; clear wavy boundary.

Bt2—19 to 27 inches; brown (10YR 4/3) silty clay loam; common medium prominent strong brown (7.5YR 5/6) and common medium distinct grayish brown (10YR 5/2) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; common roots; many distinct and few distinct grayish brown (2.5YR 5/2) clay films on vertical and horizontal faces of peds, respectively; many distinct and common distinct pale brown (10YR 6/3) silt coatings on vertical and horizontal faces of peds, respectively; common fine distinct very dark brown (10YR 2/2) stains and concretions of iron and manganese oxide; about 10 percent coarse fragments; very strongly acid; clear wavy boundary.

Bt3—27 to 35 inches; yellowish brown (10YR 5/4) silty clay loam; moderate coarse prismatic structure parting to strong medium subangular blocky and angular blocky; firm; few roots; many distinct and few distinct grayish brown (2.5YR 5/2) clay films on vertical and horizontal faces of peds, respectively; many medium very dark brown (10YR 2/2) stains and concretions of iron and manganese oxide; about 10 percent coarse fragments; slightly acid; clear wavy boundary.

BC—35 to 39 inches; yellowish brown (10YR 5/4) silty clay loam; few fine distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; few roots; common distinct grayish brown (2.5Y 5/2) clay films on vertical faces of peds; many medium very dark brown (10YR 2/2) stains and concretions of iron and manganese oxide; about 10 percent coarse fragments; slight effervescence; mildly alkaline; clear wavy boundary.

C1—39 to 51 inches; yellowish brown (10YR 5/4) silty clay loam, massive; firm; few fine light brownish gray (10YR 6/2) splotches of soft calcium carbonate in vertical cracks; common medium very dark brown (10YR 2/2) stains and concretions of iron and manganese oxide; about 10 percent coarse fragments; strong effervescence; moderately alkaline; gradual wavy boundary.

C2—51 to 76 inches; yellowish brown (10YR 5/4) silty clay loam; massive; firm; common medium very dark brown (10YR 2/2) stains of iron and manganese oxide; about 10 percent coarse fragments; strong effervescence; moderately alkaline.

The solum ranges from 28 to 46 inches in thickness. The content of coarse fragments, mostly shale and sandstone fragments, ranges from 0 to 10 percent in the Bt and C horizons.

The A horizon has value of 2 or 3 and chroma of 1 or 2. Pedons in cultivated areas have an Ap horizon. The Bt horizon has hue of 10YR or 2.5Y and chroma of 3 to 6. It is silty clay, clay, silty clay loam, or clay loam. The content of clay in this horizon ranges from 35 to 45 percent. The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4. It is silty clay loam or clay loam.

Elnora Series

The Elnora series consists of deep, moderately well drained, rapidly permeable soils on outwash terraces. These soils formed in sandy glacial outwash. Slopes range from 2 to 6 percent.

Elnora soils are commonly adjacent to Lakin, Seward, and Jimtown soils. Lakin and Seward soils are in positions on terraces similar to those of the Elnora soils. Lakin soils are excessively drained. Seward soils are clayey or loamy in the substratum. Jimtown soils are somewhat poorly drained and are in the lower positions on stream terraces.

Typical pedon of Elnora loamy fine sand, 2 to 6 percent slopes, about 1.4 miles west of Leavittsburg; in Braceville Township; 620 yards north of the intersection of Diehl South Road and State Route 5 along Diehl South Road, then 110 yards west:

A—0 to 4 inches; very dark grayish brown (10YR 3/2) loamy fine sand, grayish brown (10YR 5/2) dry; weak fine granular structure; very friable; many roots; very strongly acid; clear wavy boundary.

BA—4 to 11 inches; brown (7.5YR 4/4) loamy fine sand; weak medium subangular blocky structure; very friable; many roots; common distinct dark yellowish brown (10YR 3/4) organic coatings; very strongly acid; abrupt smooth boundary.

Bw1—11 to 24 inches; strong brown (7.5YR 5/6) loamy fine sand; weak medium subangular blocky structure; very friable; many roots; very strongly acid; gradual wavy boundary.

Bw2—24 to 31 inches; yellowish brown (10YR 5/4) loamy fine sand; weak coarse subangular blocky structure; very friable; common roots; strongly acid; gradual wavy boundary.

C1—31 to 57 inches; light olive brown (2.5Y 5/4); fine sand; common medium prominent reddish yellow (7.5YR 6/8) and many medium distinct light brownish gray (2.5Y 6/2) mottles; single grained; very friable; common roots; strongly acid; clear wavy boundary.

C2—57 to 62 inches; dark yellowish brown (10YR 4/4) loamy fine sand; common medium distinct light brownish gray (10YR 6/2) mottles; single grained; very friable and loose; strongly acid.

The solum ranges from 24 to 40 inches in thickness. The soils generally have no coarse fragments. In some pedons, however, the content of gravel is as much as 15 percent in subhorizons of the Bw and C horizons.

The A horizon has hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 2 or 3. It is dominantly loamy fine sand, but the range includes fine sandy loam. The Bw horizon has hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 3 to 6. It is loamy fine sand or fine sand. The C horizon has hue of 7.5YR to 2.5Y, value of 3 to 5, and chroma of 1 to 4.

Fitchville Series

The Fitchville series consists of deep, somewhat poorly drained, moderately slowly permeable soils in the basins of former glacial lakes. These soils formed in lacustrine material. Slopes range from 0 to 6 percent.

Fitchville soils are commonly adjacent to Glenford and Sebring soils. Glenford soils are moderately well drained and are on the higher parts of the landscape. Sebring soils are poorly drained and are lower on the landscape than the Fitchville soils.

Typical pedon of Fitchville silt loam, 0 to 2 percent slopes, about 2 miles northwest of Bloomfield; in Bloomfield Township; 220 yards east of the intersection of Bloomfield-Geneva Road and Flagg East Road along Flagg East Road, then 32 yards south:

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate fine and medium granular structure; friable; many roots; slightly acid; abrupt smooth boundary.

BEg—7 to 12 inches; grayish brown (10YR 5/2) silt loam; common fine prominent yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; common roots; common faint dark grayish brown (10YR 4/2) organic coatings in root and worm channels and on faces of peds; medium acid; clear wavy boundary.

Bt1—12 to 17 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct grayish brown (10YR 5/2) and few medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; common roots; many distinct gray (10YR 5/1) surfaces on peds; common distinct gray (10YR 5/1) clay films on faces of peds; many prominent and few distinct light brownish gray (10YR 6/2) silt coatings on vertical and horizontal faces of peds, respectively; few fine black (N 2/0) stains and concretions of iron and manganese oxide; strongly acid; clear smooth boundary.

Bt2—17 to 22 inches; yellowish brown (10YR 5/4) silty clay loam; common fine and medium distinct yellowish brown (10YR 5/6) mottles; moderate medium and coarse prismatic structure parting to moderate medium subangular blocky; firm; few roots; many prominent and common prominent dark gray (10YR 4/1) clay films on vertical and horizontal faces of peds, respectively; common distinct and few distinct light brownish gray (10YR 6/2) silt coatings on vertical and horizontal faces of peds, respectively; common medium black (N 2/0) stains and concretions of iron and manganese oxide; medium acid; gradual smooth boundary.

Bt3—22 to 33 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) mottles; weak coarse prismatic structure parting to moderate medium and coarse subangular blocky; firm; few roots; many distinct gray (10YR 5/1) surfaces on peds; common distinct and few faint gray (10YR 5/1) clay films on vertical and horizontal faces of peds, respectively; few distinct light brownish gray (10YR 6/2) silt coatings on vertical and horizontal faces of peds; common medium black (N 2/0) stains and concretions of iron and manganese oxide; medium acid; clear smooth boundary.

Bt4—33 to 42 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct yellowish brown (10YR 5/6) and few fine distinct light brownish gray (10YR 6/2) mottles; weak very coarse prismatic structure parting to weak medium subangular blocky; firm; many distinct gray (10YR 5/1) surfaces on peds; few distinct gray (10YR 5/1) clay films on faces of peds; medium acid; clear wavy boundary.

BC—42 to 55 inches; yellowish brown (10YR 5/6) silt loam; common fine prominent light brownish gray (10YR 6/2) and common fine distinct dark yellowish brown (10YR 4/4) mottles; weak medium and coarse subangular blocky structure; firm; slightly acid; abrupt smooth boundary.

C—55 to 72 inches; yellowish brown (10YR 5/4) silt loam; many fine and medium prominent strong brown (7.5YR 5/6) and common medium distinct light brownish gray (10YR 6/2) mottles; massive with horizontal partings along bedding planes; friable; laminated; lenses of loamy fine sand and fine sand; few fine dark brown (7.5YR 3/2) stains of iron and manganese oxide; slightly acid.

The solum ranges from 30 to 60 inches in thickness. It has virtually no coarse fragments. The content of these fragments is 0 to 5 percent in the C horizon.

The Ap horizon has hue of 2.5Y or 10YR and value of 4 or 5. Some pedons have an A horizon and an E horizon. The Bt horizon has hue of 2.5Y to 7.5YR, value of 4 to 6, and chroma of 2 to 6. It is silt loam or silty clay loam. The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4. It is dominantly silt loam or silty clay loam, but it has thin lenses of loam, fine sandy loam, loamy fine sand, or fine sand in some pedons.

Geeburg Series

The Geeburg series consists of deep, moderately well drained, very slowly permeable soils on till plains. These soils formed in glacial till. Slopes range from 2 to 12 percent.

Geeburg soils are commonly adjacent to Remsen and Trumbull soils and are similar to Ellsworth soils. Remsen soils are somewhat poorly drained, and Trumbull soils are poorly drained. Both are on the lower parts of the landscape. Ellsworth soils have less clay in the subsoil and substratum than the Geeburg soils.

Typical pedon of Geeburg silt loam, 2 to 6 percent slopes, about 1.6 miles south of East Farmington; in Farmington Township; 850 yards north of Housel-Craft Road and 160 yards east of Hoffman-Norton Road:

Ap—0 to 7 inches; brown (10YR 4/3) silt loam, very pale brown (10YR 7/3) dry; moderate medium granular structure; friable; many roots; about 2 percent coarse fragments; slightly acid; abrupt smooth boundary.

Bt1—7 to 11 inches; yellowish brown (10YR 5/4) silty clay loam; common medium prominent strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; common roots; few faint brown (10YR 5/3) clay films on faces of peds; common faint light yellowish brown (10YR 6/4) silt coatings on faces of peds; about 2 percent coarse fragments; strongly acid; clear wavy boundary.

Bt2—11 to 21 inches; dark yellowish brown (10YR 4/4) silty clay; common medium distinct light brownish gray (10YR 6/2) and common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular and angular blocky; firm; common roots; many faint brown (10YR 5/3) clay films on vertical faces of prisms and common faint brown (10YR 5/3) clay films on horizontal faces of peds; many faint pale brown (10YR 6/3) silt coatings on vertical faces of prisms; few fine very dark brown (10YR 2/2) stains and concretions of iron and manganese oxide; about 3 percent coarse fragments; strongly acid; clear wavy boundary.

Bt3—21 to 32 inches; olive brown (2.5Y 4/4) clay; common medium prominent light brownish gray (10YR 6/2) and few fine faint light olive brown (2.5Y 5/6) mottles; moderate medium prismatic structure parting to moderate fine and medium subangular and angular blocky; very firm; few roots; many distinct grayish brown (2.5Y 5/2) clay films on vertical faces of prisms and common distinct grayish brown (2.5Y 5/2) clay films on horizontal faces of peds; few fine distinct very dark brown (10YR 2/2) stains of iron and manganese oxide; about 3 percent coarse fragments; slightly acid; gradual wavy boundary.

C1—32 to 48 inches; olive brown (2.5Y 4/4) clay; common medium prominent light brownish gray (10YR 6/2) and common medium distinct olive yellow (2.5Y 6/6) mottles; massive with vertical partings; very firm; many distinct grayish brown (2.5Y 5/2) surfaces on vertical fracture planes; few fine very dark brown (10YR 2/2) stains of iron and manganese oxide; few fine white (2.5Y 8/2) splotches of soft calcium carbonate; about 3 percent coarse fragments; strong effervescence; mildly alkaline; gradual wavy boundary.

C2—48 to 60 inches; light olive brown (2.5Y 5/4) silty clay; common medium distinct grayish brown (2.5Y 5/2) and common medium distinct olive yellow (2.5Y 6/6) mottles; massive with vertical partings; very firm; few fine very dark brown (10YR 2/2) stains and concretions of iron and manganese oxide; few fine white (2.5Y 8/2) splotches of soft calcium carbonate; about 3 percent coarse fragments; strong effervescence; moderately alkaline; gradual wavy boundary.

C3—60 to 72 inches; light olive brown (2.5Y 5/4) silty clay; common medium distinct grayish brown (2.5Y 5/2) and olive yellow (2.5Y 6/6) mottles; massive; very firm; dark brown (7.5YR 3/2) stains and concretions of iron and manganese oxide; common medium white (2.5Y 8/2) splotches of soft calcium carbonate; about 3 percent coarse fragments; strong effervescence; moderately alkaline.

The solum ranges from 20 to 40 inches in thickness. The content of coarse fragments, mostly shale and sandstone fragments, is less than 5 percent throughout the profile.

The Ap horizon has value of 4 or 5 and chroma of 2 or 3. Some pedons have an A horizon and an E horizon. The Bt horizon has chroma of 3 to 5. The content of clay in this horizon ranges from 45 to 60 percent. The C horizon has hue of 10YR or 2.5Y and chroma of 2 to 4.

Glenford Series

The Glenford series consists of deep, moderately well drained, moderately slowly permeable soils in the basins of former glacial lakes. These soils formed in lacustrine material. Slopes range from 2 to 12 percent.

Glenford soils are commonly adjacent to Fitchville and Sebring soils, which are on the lower parts of the landscape. Fitchville soils are somewhat poorly drained, and Sebring soils are poorly drained.

Typical pedon of Glenford silt loam, 2 to 6 percent slopes, 1.9 miles north of Newton Falls; in Braceville Township; 660 yards south of the intersection of Oviatt Windham Road and State Route 534 along State Route 534, then 180 yards east:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, very pale brown (10YR 7/3) dry; moderate fine and medium granular structure; friable; many roots; very strongly acid; abrupt smooth boundary.

BE—8 to 16 inches; yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure; friable; common faint pale brown (10YR 6/3) silt coatings on faces of peds; many roots; very strongly acid; clear smooth boundary.

Bt1—16 to 24 inches; yellowish brown (10YR 5/4) silty clay loam; common medium and coarse prominent yellowish brown (10YR 5/8) mottles; moderate fine and medium subangular blocky structure; firm; common roots, few faint brown (10YR 5/3) clay films on faces of peds; very strongly acid; clear wavy boundary.

Bt2—24 to 32 inches; dark yellowish brown (10YR 4/4) silty clay loam; common fine and medium prominent gray (10YR 6/1) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few roots; common distinct light olive gray (5Y 6/2) and few faint brown (10YR 5/3) clay films on vertical and horizontal faces of peds, respectively; very strongly acid; clear wavy boundary.

Bt3—32 to 38 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct gray (10YR 6/1) mottles; moderate thick platy structure parting to weak fine subangular blocky; friable; few faint brown (10YR 5/3) clay films on faces of peds; common fine and medium black (10YR 2/1) stains and concretions of iron and manganese oxide; strongly acid; gradual wavy boundary.

BC—38 to 48 inches; yellowish brown (10YR 5/4) silt loam; common medium and coarse distinct gray (10YR 6/1) mottles; weak thick and medium platy structure; friable; common fine black (10YR 2/1) stains and concretions of iron and manganese oxide; medium acid; abrupt smooth boundary.

C—48 to 64 inches; dark yellowish brown (10YR 4/4) stratified silt and silt loam; common fine and medium prominent gray (10YR 6/1) mottles with strong brown (7.5YR 5/6) rinds; massive; friable; lenses of silty clay loam, fine sandy loam and very fine sand; common fine black (N 2/0) and dark brown (7.5YR 3/2) stains and concretions of iron and manganese oxide; neutral.

The solum ranges from 30 to 60 inches in thickness. The Ap horizon has value of 4 or 5 and chroma of 2 or 3. Some pedons have an A horizon and an E horizon. The Bt horizon has hue of 7.5YR or 10YR and chroma of 3 to 6. The C horizon has value of 4 or 5 and chroma of 3 or 4. It is dominantly stratified silt, silt loam, or silty clay loam, but it has thin strata of loam, fine sandy loam, or silty clay or lenses of very fine sand in many pedons.

Haskins Series

The Haskins series consists of deep, somewhat poorly drained soils that formed in glacial outwash and in the underlying glacial till or lacustrine material. These soils are on terraces and till plains. Permeability is moderate in the loamy material and slow or very slow in the underlying material. Slopes range from 0 to 6 percent.

Haskins soils are commonly adjacent to Rawson soils and are similar to Jimtown soils. Rawson soils are moderately well drained and are on the higher parts of the landscape. Jimtown soils are coarse textured or moderately coarse textured in the substratum.

Typical pedon of Haskins loam, 0 to 2 percent slopes, about 1.4 miles east of Shihola; in Braceville Township; 260 yards west of the intersection of Barclay Messerly Road and Shihola-Garrard Road along Shihola-Garrard Road, then 200 yards north:

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) loam, light brownish gray (10YR 6/2) dry; moderate fine and medium granular structure; friable, many roots; about 2 percent coarse fragments; neutral; abrupt smooth boundary.

BE—10 to 16 inches; yellowish brown (10YR 5/4) loam; common medium distinct gray (10YR 6/1) and common medium prominent strong brown (7.5YR 5/8) mottles; weak fine and medium subangular blocky structure; firm; common roots; few faint grayish brown (10YR 5/2) clay films on vertical faces of peds; common faint brown (10YR 5/3) silt coatings on faces of peds; about 2 percent coarse fragments; strongly acid; clear wavy boundary.

Bt1—16 to 21 inches; dark yellowish brown (10YR 4/4) clay loam; common medium prominent strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; few roots; many distinct light brownish gray (10YR 6/2) surfaces on peds; many distinct and common distinct light brownish gray (10YR 6/2) clay films on vertical and horizontal faces of peds, respectively; about 3 percent coarse fragments; very strongly acid; clear wavy boundary.

Bt2—21 to 26 inches; dark yellowish brown (10YR 4/4) sandy clay loam; common medium prominent strong brown (7.5YR 5/6) and common medium distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; firm; few roots; many distinct gray (10YR 6/1) surfaces on peds; common distinct and few distinct gray (10YR 6/1) clay films on vertical and horizontal faces of peds, respectively; common fine and medium black (10YR 2/1) and very dark brown (10YR 2/2) stains and concretions of iron and manganese oxide; about 5 percent coarse fragments; strongly acid; clear smooth boundary.

Bt3—26 to 30 inches; dark yellowish brown (10YR 4/4) sandy loam; common medium distinct grayish brown (10YR 5/2) and common medium distinct light brownish gray (10YR 6/2) mottles; weak medium and coarse subangular blocky structure; friable; many distinct gray (10YR 6/1) surfaces on peds; common distinct gray (10YR 6/1) clay films on faces of peds; sand grains and pebbles coated and bridged with clay; common fine and medium black (10YR 2/1) and very dark brown (10YR 2/2) stains and concretions of iron and manganese oxide; about 10 percent coarse fragments; slightly acid; abrupt smooth boundary.

2BC—30 to 36 inches; light olive brown (2.5Y 5/4) silty clay; common medium distinct light olive brown (2.5Y 5/6) mottles; weak medium and coarse subangular blocky structure; firm; common distinct gray (10YR 6/1) clay films on vertical faces of peds; common medium very dark brown (10YR 2/2) stains and concretions of iron and manganese oxide; neutral; clear wavy boundary.

2C1—36 to 46 inches; light olive brown (2.5Y 5/4) silty clay; common medium distinct olive yellow (2.5Y 6/6) mottles; massive; firm; gray (10YR 5/1) surfaces on vertical and horizontal fracture planes; slight effervescence; mildly alkaline; gradual smooth boundary.

2C2—46 to 73 inches; yellowish brown (10YR 5/4) silty clay; common medium prominent yellowish brown (10YR 5/8) mottles; massive; firm; gray (10YR 5/1) surfaces on vertical and horizontal fracture planes; few patches of light gray (10YR 7/2) carbonates on vertical fracture planes; about 2 percent coarse fragments; strong effervescence; moderately alkaline.

The solum ranges from 32 to 48 inches in thickness. The content of coarse fragments ranges from 0 to 10 percent in the A horizon, from 2 to 20 percent in the Bt horizon, and from 0 to 10 percent in the 2C horizon.

The Ap horizon has value of 4 or 5 and chroma of 1 or 2. It is dominantly loam, but the range includes sandy loam and silt loam. The Bt horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 4. It is dominantly clay loam, sandy clay loam, loam, or the gravelly analogs of those textures. In some pedons, however, it has thin strata of sandy loam. The 2C horizon has hue of 10YR to 5Y or is neutral in hue. It has value of 4 or 5 and chroma of 0 to 4. It is clay, silty clay, silty clay loam, or clay loam.

Holly Series

The Holly series consists of deep, poorly drained soils on flood plains. The adjacent soils formed in alluvium. Permeability is moderate or moderately slow in the subsoil and moderate or moderately rapid in the substratum. Slopes are 0 to 2 percent.

Holly soils are commonly adjacent to Orrville and Tioga soils. The adjacent soils are better drained than the Holly soils and are on the higher parts of the flood plains.

Typical pedon of Holly silt loam, frequently flooded, about 1.8 miles east of Johnston; in Johnston Township; 660 yards east of the intersection of State

Route 88 and Sodom Hutchings Road along State Route 88, then 50 yards north:

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate fine and medium granular structure; friable; many roots; neutral; abrupt smooth boundary.

Bg1—7 to 12 inches; dark gray (10YR 4/1) silt loam; common fine distinct dark yellowish brown (10YR 4/4) and few medium prominent yellowish red (5YR 4/6) mottles; weak medium subangular blocky structure; friable; many roots; common faint dark grayish brown (10YR 4/2) organic coatings and stains in worm and root channels; few medium black (10YR 2/1) stains and concretions of iron and manganese oxide; neutral; clear smooth boundary.

Bg2—12 to 16 inches; grayish brown (2.5Y 5/2) silt loam; common fine prominent dark yellowish brown (10YR 4/4) and common medium prominent yellowish red (5YR 4/6) mottles; weak fine and medium subangular blocky structure; friable; common roots; common distinct dark grayish brown (10YR 4/2) organic coatings and stains in worm and root channels; few medium black (10YR 2/1) stains and concretions of iron and manganese oxide; neutral; clear wavy boundary.

Bg3—16 to 20 inches; grayish brown (2.5Y 5/2) silt loam; many medium prominent yellowish brown (10YR 5/6) and few fine prominent yellowish red (5YR 4/6) mottles; weak fine and medium subangular blocky structure; friable; few roots; common distinct dark grayish brown (10YR 4/2) organic coatings and stains in worm and root channels; common fine dark brown (7.5YR 3/2) stains and concretions of iron and manganese oxide; medium acid; clear wavy boundary.

Bg4—20 to 27 inches; gray (5Y 5/1) silt loam; common medium prominent yellowish brown (10YR 5/6) and few medium prominent strong brown (7.5YR 5/6) mottles; weak medium and coarse subangular blocky structure; few roots; friable; common fine dark brown (7.5YR 3/2) stains and concretions of iron and manganese oxide; medium acid; gradual wavy boundary.

Bg5—27 to 33 inches; gray (5Y 5/1) loam; many medium prominent strong brown (7.5YR 5/6) mottles; weak medium and coarse subangular blocky structure; friable; many medium dark brown (7.5YR 3/2) stains and concretions of iron and manganese oxide; about 2 percent coarse fragments; medium acid; abrupt smooth boundary.

Cg1—33 to 45 inches; gray (5Y 6/1) sandy loam; massive; very friable; about 2 percent coarse fragments; neutral; clear wavy boundary.

Cg2—45 to 57 inches; dark gray (N 4/0) gravelly loamy sand; single grained; loose; about 20 percent coarse fragments; slight effervescence; mildly alkaline; clear wavy boundary.

Cg3—57 to 68 inches; gray (N 5/0) loam; common fine and medium distinct olive gray (5Y 5/2) mottles; massive; firm; about 10 percent coarse fragments; strong effervescence; mildly alkaline.

The solum ranges from 20 to 40 inches in thickness. The content of coarse fragments ranges from 0 to 10 percent in the Ap horizon, from 0 to 15 percent in the Bg horizon, and from 2 to 25 percent in the Cg horizon.

The Ap horizon has chroma of 1 or 2. It is dominantly silt loam, but the range includes loam. Some pedons have a thin A horizon. The Bg horizon has hue of 10YR to 5Y or is neutral in hue. It has value of 4 to 6 and chroma of 0 to 2. It is dominantly silt loam or loam but has thin subhorizons of coarser or finer textured material in some pedons. The Cg horizon has hue of 10YR to 5Y or is neutral in hue. It has value of 3 to 6 and chroma of 0 to 2. Within a depth of 40 inches, it is silt loam, loam, sandy loam, or the gravelly analogs of those textures. Below a depth of 40 inches, it typically is stratified and the range includes loamy sand, sand, and the gravelly analogs of those textures. In some pedons it has thin strata of clay loam.

Jimtown Series

The Jimtown series consists of deep, somewhat poorly drained, moderately permeable soils on stream terraces and outwash plains. These soils formed in stratified glacial outwash. Slopes range from 0 to 6 percent.

Jimtown soils are commonly adjacent to Chili, Damascus, and Oshtemo soils and are similar to Haskins soils. Chili and Oshtemo soils are well drained and are in the higher positions on the landscape. Damascus soils are poorly drained and are in depressions. Haskins soils have more clay in the substratum than the Jimtown soils.

Typical pedon of Jimtown loam, 0 to 2 percent slopes, about 2 miles northeast of Gustavus Center; in Gustavus Township; 520 yards west of the intersection of Wakefield Creek Road and Barclay North Road along Wakefield Creek Road, then 245 yards north:

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) loam, light brownish gray (10YR 6/2) dry; moderate fine and medium granular structure; many roots; about 2 percent coarse fragments; neutral; abrupt smooth boundary.

BE—9 to 12 inches; brown (10YR 5/3) loam; common medium distinct yellowish brown (10YR 5/6) and few fine prominent yellowish red (5YR 5/8) mottles; weak medium subangular blocky structure; friable; few roots; common distinct dark grayish brown (10YR 4/2) organic coatings and stains in worm and root channels; common distinct light brownish gray (10YR 6/2) silt coatings on faces of peds; about 2 percent coarse fragments; slightly acid; clear wavy boundary.

Btg—12 to 22 inches; grayish brown (2.5Y 5/2) loam; many medium prominent strong brown (7.5YR 5/6), common medium faint light brownish gray (2.5Y 6/2), and few fine prominent yellowish red (5YR 5/8) mottles; weak medium subangular blocky structure; friable; few roots; many distinct gray (10YR 6/1) surfaces on peds; few faint grayish brown (10YR 5/2) and gray (10YR 6/1) clay films on faces of peds; about 5 percent coarse fragments; strongly acid; clear smooth boundary.

Bt1—22 to 30 inches; dark yellowish brown (10YR 4/4) gravelly loam; common medium distinct light brownish gray (10YR 6/2) and few fine prominent yellowish red (5YR 6/8) mottles; weak medium and fine subangular blocky structure; firm; many distinct gray (10YR 6/1) surfaces on peds; common distinct gray (10YR 6/1) clay films on faces of peds; sand grains coated and bridged with clay; common fine dark brown (7.5YR 3/2) stains and concretions of iron and manganese oxide; about 20 percent coarse fragments; strongly acid; clear smooth boundary.

Bt2—30 to 34 inches; dark yellowish brown (10YR 4/4) gravelly sandy clay loam; common medium prominent gray (N 6/0) and common fine distinct reddish yellow (5YR 6/8) mottles; weak medium and fine subangular blocky structure; firm; many distinct gray (10YR 6/1) surfaces on peds; common distinct gray (10YR 6/1) clay films on faces of peds; sand grains coated and bridged with clay; about 30 percent coarse fragments; strongly acid; clear smooth boundary.

Bt3—34 to 42 inches; brown (10YR 4/3) gravelly sandy clay loam; common medium faint grayish brown (10YR 5/2) and few fine prominent strong brown (7.5YR 5/6) mottles; weak medium and coarse subangular blocky structure; firm; many distinct gray (10YR 6/1) surfaces on peds; few faint gray (10YR 6/1) clay films bridging sand grains; few fine dark brown (7.5YR 3/2) stains of iron and manganese oxide; about 30 percent coarse fragments; medium acid; clear wavy boundary.

Cg1—42 to 60 inches; grayish brown (10YR 5/2) very gravelly sandy loam; common medium distinct dark yellowish brown (10YR 4/4) mottles; massive; very friable; about 55 percent coarse fragments; neutral; gradual wavy boundary.

Cg2—60 to 72 inches; gray (10YR 6/1) very gravelly loamy sand; single grained; loose; about 55 percent coarse fragments; strong effervescence; moderately alkaline.

The solum ranges from 30 to 48 inches in thickness. The content of coarse fragments ranges from 2 to 15 percent in the upper 20 inches and from 15 to 50 percent between depths of 20 and 40 inches. It is as much as 60 percent below a depth of 40 inches.

The Ap horizon has value of 3 or 4 and chroma of 1 to 3. It is dominantly loam, but the range includes silt loam and sandy loam. Some pedons have an A horizon and an E horizon. The Bt and Btg horizons have hue of 10YR to 5Y and value of 4 to 6. They are dominantly loam, sandy clay loam, clay loam, or the gravelly or very gravelly analogs of those textures. In some pedons, however, they have thin subhorizons of silt loam or sandy loam. The Cg or C horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 4. It is loamy sand, sandy loam, fine sandy loam, loamy fine sand, sand, or the gravelly or very gravelly analogs of those textures.

Lakin Series

The Lakin series consists of deep, excessively drained, rapidly permeable soils on stream terraces and dunes. These soils formed in sandy glacial outwash or windblown deposits. Slopes range from 2 to 8 percent.

Lakin soils are commonly adjacent to Elnora, Jimtown, and Seward soils and are similar to Oshtemo soils. Elnora and Seward soils are moderately well drained and are in positions on stream terraces similar to those of the Lakin soils. Jimtown soils are somewhat poorly drained and are in the lower positions on the stream terraces. Oshtemo soils contain more clay in the solum than the Lakin soils.

Typical pedon of Lakin loamy fine sand, 2 to 8 percent slopes, about 1.5 miles south of Newton Falls; in Newton Township; 280 yards west of the intersection of West River Road and Bright Baldwin Road along Bright Baldwin Road, then 110 yards south:

Ap—0 to 8 inches; brown (10YR 4/3) loamy fine sand, pale brown (10YR 6/3) dry; weak fine granular structure; very friable; many roots; about 1 percent coarse fragments; strongly acid; abrupt smooth boundary.

E—8 to 12 inches; strong brown (7.5YR 5/6) loamy fine sand; weak fine granular structure; very friable; common roots; common distinct dark grayish brown

(10YR 4/2) organic coatings and stains in old worm and root channels; about 1 percent coarse fragments; strongly acid; clear wavy boundary.

E&Bt1—12 to 23 inches; yellowish brown (10YR 5/6) loamy fine sand (E); very weak fine granular structure; discontinuous lamellae of brown (7.5YR 4/4) loamy fine sand (Bt); weak fine subangular blocky structure in the lamellae; very friable; common roots; sand grains coated and bridged with clay; few dark grayish brown (10YR 4/2) organic coatings and stains in worm and root channels; about 1 percent coarse fragments; strongly acid; clear wavy boundary.

E&Bt2—23 to 52 inches; light yellowish brown (10YR 6/4) fine sand (E); very weak fine granular structure; loose; discontinuous lamellae of brown (7.5YR 4/4) loamy fine sand (Bt); weak fine subangular blocky structure in the lamellae; very friable; few roots; sand grains coated and bridged with clay; few dark grayish brown (10YR 4/2) organic coatings and stains in worm and root channels; few fine black (10YR 2/1) stains and concretions of iron and manganese oxide; about 1 percent coarse fragments; strongly acid; clear wavy boundary.

C—52 to 80 inches; yellowish brown (10YR 5/4) sand and fine sand; single grained; loose; strongly acid.

The solum ranges from 48 to 78 inches in thickness. The content of fine gravel ranges from 0 to 3 percent throughout the profile.

The Ap horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. It is dominantly loamy fine sand, but the range includes loamy sand and fine sand. The E part of the E&Bt horizon has chroma of 4 to 6. The Bt part has hue of 10YR to 5YR, value of 3 or 4, and chroma of 3 or 4. It is loamy sand or loamy fine sand. The C horizon has hue of 10YR or 7.5YR and value of 4 or 5.

Lorain Series

The Lorain series consists of deep, very poorly drained soils in the basins of former glacial lakes on slack-water terraces and till plains. These soils formed in lacustrine material. They generally are slowly permeable. In places, however, the lacustrine material is underlain by loamy outwash that is moderately rapidly permeable. Slopes are 0 to 2 percent.

Lorain soils are commonly adjacent to Canadice, Caneadea, Geeburg, and Remsen soils. Canadice soils are poorly drained, and Caneadea soils are somewhat poorly drained. Both are in the slightly higher positions on slack-water terraces and lake plains. Geeburg soils are moderately well drained and are in the more sloping areas on till plains. Remsen soils are somewhat poorly drained and are in the slightly higher positions on the till plains.

Typical pedon of Lorain silty clay loam, about 2.5 miles north of Delightful; in Southington Township; 660 yards south of County Line Turnpike Road and 44 yards west of Barclay-Messerly Road:

Ap—0 to 7 inches; very dark gray (10YR 3/1) silty clay loam, gray (10YR 5/1) dry; weak medium and coarse granular structure; firm; many roots; slightly acid; abrupt smooth boundary.

BA—7 to 12 inches; dark gray (N 4/0) silty clay; common fine and medium prominent strong brown (7.5YR 5/8) and reddish brown (5YR 4/4) mottles; weak medium and coarse prismatic structure parting to moderate medium subangular and angular blocky; very firm; many roots; many faint very dark gray (10YR 3/1) organic coatings on faces of peds; strongly acid; clear wavy boundary.

Btg—12 to 31 inches; dark gray (N 4/0) silty clay; common fine and medium prominent reddish brown (5YR 4/4) and many fine and medium prominent strong brown (7.5YR 5/8) mottles; moderate medium and coarse prismatic structure parting to weak medium subangular and angular blocky; very firm; common roots; many faint and common faint very dark gray (10YR 3/1) and dark gray (10YR 4/1) clay films on vertical and horizontal faces of peds, respectively; strongly acid; clear wavy boundary.

Bt1—31 to 43 inches; yellowish brown (10YR 5/4) silty clay; many fine and medium distinct gray (10YR 5/1) and many medium prominent strong brown (7.5YR 5/8) mottles; weak medium prismatic structure parting to weak medium and coarse subangular and angular blocky; very firm; few roots; many faint dark gray (10YR 4/1) clay films on faces of peds; medium acid; gradual wavy boundary.

Bt2—43 to 49 inches; yellowish brown (10YR 5/4) silty clay; many medium prominent gray (5Y 5/1) mottles; weak coarse prismatic structure parting to weak coarse subangular blocky; very firm; common distinct dark gray (10YR 4/1) clay films on vertical faces of peds; about 2 percent coarse fragments; neutral; clear wavy boundary.

BC—49 to 54 inches; gray (5Y 5/1) silty clay; common fine and medium prominent yellowish brown (10YR 5/4) and common fine distinct grayish brown (2.5Y 5/2) mottles; weak coarse prismatic structure; very firm; about 2 percent coarse fragments; neutral; gradual wavy boundary.

Cg—54 to 62 inches; olive gray (5Y 5/2) silty clay; common fine and medium distinct grayish brown (2.5Y 5/2) mottles; massive; very firm; few fine and medium dark brown (7.5YR 3/2) stains and concretions of iron and manganese oxide; about 2 percent coarse fragments; strong effervescence; mildly alkaline.

The thickness of the solum and the depth to carbonates range from 40 to 60 inches. The content of coarse fragments ranges from 0 to 5 percent below a depth of 40 inches.

The Ap horizon has value of 2 or 3 and chroma of 1 or 2. Some pedons have an A horizon. The Btg and Bt horizons have hue of 10YR to 5Y or are neutral in hue. They have value of 4 or 5. They have chroma of 0 to 2 within a depth of 30 inches and chroma of 1 to 6 below that depth. They are silty clay, clay, or silty clay loam. The Cg horizon has hue of 10YR to 5Y, value of 4 or 5, and chroma of 1 or 2. It is dominantly silty clay or clay. In the loamy substratum phase, however, it is sandy loam or loam.

Lordstown Series

The Lordstown series consists of moderately deep, well drained, moderately permeable soils on uplands. These soils formed in glacial till over sandstone bedrock. Slopes range from 2 to 50 percent.

Lordstown soils are commonly adjacent to Loudonville and Mitiwanga soils and are similar to Brecksville and Loudonville soils. Loudonville soils have an argillic horizon. They are in positions on the landscape similar to those of Lordstown soils. Mitiwanga soils are somewhat poorly drained and are in the lower areas on bedrock-controlled ridgetops. Brecksville soils contain more clay in the subsoil than the Lordstown soils.

Typical pedon of Lordstown channery loam, in an area of Lordstown-Rock outcrop complex, 18 to 50 percent slopes, about 1.5 miles west of Hartford; in Hartford Township; 500 yards east of the intersection of Bushnell-Campbell Road and State Route 305 along State Route 305, then 17 yards south:

Oi—1 inch to 0; undecomposed and slightly decomposed leaf litter and twigs.

A1—0 to 2 inches; very dark brown (10YR 2/2) channery loam, gray (10YR 5/1) dry; strong fine granular structure; very friable; very many roots; common distinct brown (10YR 4/3) coatings in root channels; about 15 percent coarse fragments; very strongly acid; abrupt smooth boundary.

A2—2 to 4 inches; very dark grayish brown (10YR 3/2) channery loam, light brownish gray (10YR 6/2) dry; weak medium platy structure; friable; very many roots; common distinct brown (10YR 4/3) coatings in root channels; about 15 percent coarse fragments; very strongly acid; abrupt smooth boundary.

Bw1—4 to 8 inches; brown (7.5YR 4/4) channery loam; weak medium subangular blocky structure; friable; many roots; common distinct brown (10YR 4/3) coatings in root channels; about 25 percent coarse fragments; very strongly acid; clear wavy boundary.

Bw2—8 to 13 inches; light yellowish brown (10YR 6/4) channery loam; moderate medium subangular blocky structure; friable; common roots; common distinct brown (10YR 4/3) coatings in root channels; about 25 percent coarse fragments; very strongly acid; clear wavy boundary.

Bw3—13 to 20 inches; light yellowish brown (2.5Y 6/4) channery loam; moderate medium subangular blocky structure; friable; common roots; common distinct brown (10YR 4/3) coatings in root channels; about 25 percent coarse fragments; very strongly acid; gradual wavy boundary.

Bw4—20 to 26 inches; light yellowish brown (2.5Y 6/4) very channery loam; weak medium subangular blocky structure; friable; common roots; common distinct brown (10YR 4/3) coatings in root channels; about 40 percent coarse fragments; very strongly acid; abrupt irregular boundary.

2R—26 to 28 inches; thinly bedded, hard sandstone bedrock.

The thickness of the solum and the depth to bedrock range from 20 to 40 inches. The content of coarse fragments is 10 to 35 percent in the A horizon and 20 to 40 percent in the Bw horizon.

The A horizon has hue of 10YR or 7.5YR, value of 2 to 4, and chroma of 1 to 3. It is dominantly loam or channery loam, but the range includes silt loam. The Bw horizon has value of 4 to 6 and chroma of 3 to 6. It is channery silt loam, very channery silt loam, channery loam, or very channery loam. Some pedons have a C horizon.

Loudonville Series

The Loudonville series consists of moderately deep, well drained, moderately permeable soils on uplands. These soils formed in glacial till over sandstone bedrock. Slopes range from 2 to 18 percent.

Loudonville soils are commonly adjacent to Lordstown and Mitiwanga soils and are similar to Lordstown soils. Lordstown soils do not have an argillic horizon. They are in positions on the landscape similar to those of Loudonville soils. Mitiwanga soils are somewhat poorly drained and are in the lower positions on bedrock-controlled ridgetops.

Typical pedon of Loudonville silt loam, 2 to 6 percent slopes, about 0.7 mile south of Brookfield Center; in Brookfield Township; 666 yards east of State Route 7 and 590 yards north of Stewart-Sharon Road:

Ap—0 to 6 inches; brown (10YR 4/3) silt loam, light brownish gray (10YR 6/2) dry; moderate fine and medium granular structure; friable; many roots; about 3 percent coarse fragments; very strongly acid; clear wavy boundary.

BE—6 to 12 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium subangular blocky structure parting to moderate fine and medium granular; friable; common roots; common faint brown (10YR 5/3) silt coatings on faces of peds; common brown (10YR 4/3) organic coatings and stains in worm and root channels; about 3 percent coarse fragments; very strongly acid; clear wavy boundary.

Bt1—12 to 17 inches; yellowish brown (10YR 5/6) silt loam; weak medium subangular blocky structure; friable; common roots; few faint yellowish brown (10YR 5/4) clay films on faces of peds; about 10 percent coarse fragments; very strongly acid; gradual wavy boundary.

Bt2—17 to 26 inches; yellowish brown (10YR 5/6) silt loam; moderate fine and medium subangular blocky structure; firm; few roots; common distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; about 10 percent coarse fragments; very strongly acid; clear wavy boundary.

Bt3—26 to 32 inches; yellowish brown (10YR 5/4) loam; weak medium and coarse subangular blocky structure; firm; few roots; common distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; about 10 percent coarse fragments; very strongly acid; abrupt wavy boundary.

2R—32 to 34 inches; brown (10YR 4/3), hard sandstone bedrock.

The thickness of the solum and the depth to sandstone bedrock range from 20 to 40 inches. The content of coarse fragments ranges from 0 to 5 percent in the Ap horizon and from 2 to 15 percent in individual subhorizons of the Bt horizon.

The Ap horizon has value of 4 or 5 and chroma of 2 or 3. Some pedons have an A horizon and an E horizon. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is loam, clay loam, silt loam, or silty clay loam. Some pedons have a 2C horizon.

Mahoning Series

The Mahoning series consists of deep, somewhat poorly drained, slowly permeable and very slowly permeable soils on till plains. These soils formed in glacial till. Slopes range from 0 to 12 percent.

Mahoning soils are commonly adjacent to Condit and Ellsworth soils and are similar to Caneadea, Darien, and Remsen soils. Condit soils are poorly drained and are lower on the landscape than the Mahoning soils. Ellsworth soils are moderately well drained and are in the more sloping or more convex areas. Caneadea soils have fewer coarse fragments in the subsoil and substratum than the Mahoning soils. Darien soils have less clay in the subsoil than the Mahoning soils. Remsen soils have more clay in the subsoil and substratum than the Mahoning soils.

Typical pedon of Mahoning silt loam, 2 to 6 percent slopes, about 3.5 miles west of Cortland; in Bazetta Township; 1,130 yards north of the intersection of Hoagland-Blackstub Road and State Route 305 along Hoagland-Blackstub Road, then 660 yards east:

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate fine and medium granular structure; friable; many roots; about 2 percent coarse fragments; strongly acid; abrupt smooth boundary.

Bt1—7 to 16 inches; yellowish brown (10YR 5/4) silty clay loam; many fine and medium prominent strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; firm; common roots; many distinct light brownish gray (10YR 6/2) surfaces on peds; few faint and common faint grayish brown (10YR 5/2) clay films on horizontal and vertical faces of peds, respectively; common faint and many faint light brownish gray (10YR 6/2) silt coatings on horizontal and vertical faces of peds, respectively; about 2 percent coarse fragments; very strongly acid; clear wavy boundary.

Bt2—16 to 26 inches; yellowish brown (10YR 5/4) silty clay loam; common fine and medium distinct light brownish gray (10YR 6/2) and few medium prominent strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to moderate fine and medium angular and subangular blocky; firm; common roots; many distinct grayish brown (10YR 5/2) surfaces on peds; few distinct and many distinct grayish brown (10YR 5/2) clay films on horizontal and vertical faces of peds, respectively; few distinct light brownish gray (10YR 6/2) silt coatings on horizontal and vertical faces of peds; about 2 percent coarse fragments; common medium black (10YR 2/1) stains and concretions of iron and manganese oxide; very strongly acid; clear wavy boundary.

Bt3—26 to 33 inches; yellowish brown (10YR 5/4) silty clay loam; few fine and medium prominent strong brown (7.5YR 5/6) and common medium distinct light brownish gray (10YR 6/2) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; firm; few roots; many distinct grayish brown (10YR 5/2) surfaces on peds; few distinct and many distinct grayish brown (10YR 5/2) clay films on horizontal and vertical faces of peds, respectively; about 5 percent coarse fragments; common fine and medium dark brown (7.5YR 3/2) stains of iron and manganese oxide; very strongly acid; gradual wavy boundary.

Bt4—33 to 40 inches; dark yellowish brown (10YR 4/4) silty clay loam; few fine distinct light brownish gray (10YR 6/2) and few fine prominent yellowish red (5YR 5/8) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; many distinct grayish brown (10YR 5/2) surfaces on peds; few distinct and common distinct grayish brown (10YR 5/2) clay films on horizontal and vertical faces of peds, respectively; about 10 percent coarse fragments; neutral; clear wavy boundary.

C1—40 to 56 inches; dark yellowish brown (10YR 4/4) silty clay loam; few fine prominent yellowish red (5YR 5/8) mottles; weak thick platy structure; firm; common distinct grayish brown (2.5Y 5/2) surfaces on vertical partings; common medium light gray (10YR 7/1) splotches and streaks of calcium carbonate; about 5 percent coarse fragments; common fine and medium distinct dark brown (7.5YR 3/2) stains of iron and manganese oxide; slight effervescence; mildly alkaline; gradual wavy boundary.

C2—56 to 70 inches; yellowish brown (10YR 5/4) silty clay loam; few fine prominent yellowish red (5YR 5/8) mottles; moderate and strong medium platy structure; firm; common distinct grayish brown (2.5Y 5/2) surfaces on vertical partings; many medium light gray (10YR 7/1) splotches and streaks of calcium carbonate; about 5 percent coarse fragments; common fine and medium dark brown (7.5YR 3/2) stains of iron and manganese oxide; slight effervescence; mildly alkaline.

The solum ranges from 30 to 42 inches in thickness. The depth to bedrock is typically more than 60 inches, but it is 40 to 60 inches in the shale substratum phase. The content of coarse fragments ranges from 2 to 10 percent in the Bt and C horizons.

The Ap horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 or 3. Some pedons have an A horizon and an E horizon. The Bt horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 4. It is silty clay loam, silty clay, clay, or clay loam. The content of clay in this horizon ranges from 35 to 45 percent. The C horizon has hue of 10YR or 2.5Y and chroma of 2 to 4. It is silty clay loam or clay loam.

Mitiwanga Series

The Mitiwanga series consists of moderately deep, somewhat poorly drained, moderately permeable soils on uplands. These soils formed in glacial till over sandstone bedrock. Slopes range from 0 to 6 percent.

Mitiwanga soils are commonly adjacent to Lordstown and Loudonville soils. The adjacent soils are well drained and are higher on the landscape than the Mitiwanga soils or are on the steeper slopes.

Typical pedon of Mitiwanga silt loam, 0 to 2 percent slopes, about 1.5 miles west of Hartford Center; in Hartford Township; 700 yards east of the intersection of Bushnell-Campbell Road and State Route 305 along State Route 305, then 175 yards north:

Ap—0 to 4 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak medium granular structure; friable; many roots; about 2 percent coarse fragments; medium acid; clear wavy boundary.

E—4 to 9 inches; pale brown (10YR 6/3) silt loam; few fine distinct brownish yellow (10YR 6/6) mottles; weak medium granular structure; friable; common roots; dark grayish brown (10YR 4/2) organic coatings in root and earthworm channels; about 5 percent coarse fragments; very strongly acid; clear wavy boundary.

BE—9 to 13 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct brownish yellow (10YR 6/6) and grayish brown (10YR 5/2) mottles; weak fine and medium subangular blocky structure; friable; common roots; about 10 percent coarse fragments; very strongly acid; clear wavy boundary.

Bt1—13 to 18 inches; yellowish brown (10YR 5/4) clay loam; many medium prominent strong brown (7.5YR 5/6) and common medium prominent grayish brown (2.5Y 5/2) mottles; moderate medium subangular blocky structure; firm; common roots; many distinct light brownish gray (2.5Y 6/2) surfaces on peds; common distinct light brownish gray (2.5Y 6/2) clay films on vertical faces of peds; common distinct light brownish gray (10YR 6/2) and white (10YR 8/2 dry) silt coatings on faces of peds; about 10 percent coarse fragments; very strongly acid; clear wavy boundary.

Bt2—18 to 25 inches; grayish brown (10YR 5/2) clay loam; common medium prominent strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few roots; many distinct light gray (10YR 6/1) surfaces on peds; common distinct and few distinct light gray (10YR 6/1) clay films on vertical and horizontal faces of peds, respectively; brownish gray (10YR 6/2) and white (10YR 8/2 dry) silt coatings on vertical faces of peds; common medium black (10YR 2/1) stains and concretions of iron and manganese oxide; about 10 percent coarse fragments; very strongly acid; clear wavy boundary.

Bt3—25 to 31 inches; grayish brown (10YR 5/2) clay loam; common medium prominent strong brown (7.5YR 5/6) mottles; weak thick platy structure parting to moderate fine angular and subangular blocky; firm; many distinct gray (10YR 5/1) clay films on faces of peds; common medium black (10YR 2/1) stains and concretions of iron and manganese oxide; about 10 percent coarse fragments; very strongly acid; abrupt wavy boundary.

R—31 to 33 inches; hard sandstone bedrock.

The thickness of the solum and the depth to sandstone bedrock are dominantly 30 to 40 inches but range from 20 to 40 inches. The content of coarse fragments is 2 to 10 percent in the Ap horizon and 2 to 25 percent in individual subhorizons of the Bt horizon.

The Ap horizon is dominantly silt loam, but the range includes loam. Some pedons have an A horizon. The Bt horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 4. It is silt loam, silty clay loam, clay loam, loam, or the channery analogs of those textures.

Orrville Series

The Orrville series consists of deep, somewhat poorly drained, moderately permeable soils on flood plains. These soils formed in alluvium. Slopes are 0 to 2 percent.

Orrville soils are commonly adjacent to Holly and Tioga soils. Holly soils are poorly drained and are in low areas on the flood plains. Tioga soils are well drained. They generally are slightly higher on the landscape than the Orrville soils but in some areas are at the same level.

Typical pedon of Orrville silt loam, frequently flooded, about 1.2 miles west of Bristolville; in Bristol Township; 80 yards north of the intersection of State Route 88 and Corey Hunt Road along Corey Hunt Road, then 50 yards east:

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak medium and coarse granular structure; friable; many roots; about 1 percent coarse fragments; medium acid; smooth boundary.

Bw—10 to 15 inches; brown (10YR 4/3) silt loam; common medium faint dark grayish brown (10YR 4/2) mottles; weak fine subangular blocky structure; friable; common roots; common distinct grayish brown (10YR 5/2) silt coatings on faces of peds; common faint dark grayish brown (10YR 4/2) organic coatings in worm and root channels; about 1 percent coarse fragments; strongly acid; clear smooth boundary.

Bg1—15 to 24 inches; grayish brown (10YR 5/2) silt loam; many medium distinct dark yellowish brown (10YR 4/4) and common medium prominent yellowish brown (10YR 5/8) mottles; weak medium and coarse subangular blocky structure; friable; few roots; thin strata of loam; common faint dark grayish brown (10YR 4/2) organic coatings and stains in worm and root channels; about 1 percent coarse fragments; strongly acid; gradual smooth boundary.

Bg2—24 to 36 inches; grayish brown (2.5Y 5/2) silt loam; common fine and medium prominent strong brown (7.5YR 5/6) mottles; weak coarse subangular blocky structure; friable; few roots; thin strata of loam; about 1 percent coarse fragments; strongly acid; clear smooth boundary.

Cg1—36 to 45 inches; gray (5Y 6/1) fine sandy loam; common medium prominent yellowish brown (10YR 5/6) mottles; massive; friable; a thin layer of dark olive gray (5Y 3/2) silt loam that has a high concentration of partially decomposed organic material consisting of twigs, leaves, and other woody fragments in the lower part; about 2 percent coarse fragments; medium acid; abrupt smooth boundary.

Cg2—45 to 60 inches; dark gray (N 4/0) stratified sandy loam and loamy sand; single grained; loose; about 2 percent coarse fragments; medium acid.

The solum ranges from 24 to 40 inches in thickness. The content of coarse fragments ranges from 0 to 5 percent in the Ap horizon, from 0 to 15 percent in the Bw and Bg horizons, and from 0 to 25 percent in the Cg horizon.

The Bw and Bg horizons have hue of 10YR or 2.5Y or are neutral in hue. They have value of 4 to 6 and chroma of 0 to 6. They are dominantly silt loam, loam, or clay loam but have thin subhorizons of sandy loam or silty clay loam in some pedons. The Cg or C horizon has hue of 10YR to 5Y or is neutral in hue. It has value of 4 to 6 and chroma of 0 to 4. It is dominantly silt loam, loam, fine sandy loam, or sandy loam. Below a depth of 40 inches, the Cg horizon typically is stratified and the range includes loamy sand and gravelly analogs. Some pedons have thin stony layers.

Oshtemo Series

The Oshtemo series consists of deep, well drained soils that formed in glacial outwash on stream terraces, outwash plains, and kames. Permeability is moderately rapid in the subsoil and very rapid in the substratum. Slopes range from 2 to 50 percent.

Oshtemo soils are commonly adjacent to Chili and Jimtown soils and are similar to Lakin soils. Chili and Jimtown soils have more clay in the upper part of the subsoil than the Oshtemo soils. Chili soils are in positions on the landscape similar to those of the Oshtemo soils. Jimtown soils are commonly on the lower parts of the landscape. Lakin soils contain less clay in the solum than the Oshtemo soils.

Typical pedon of Oshtemo sandy loam, 2 to 6 percent slopes, about 3.3 miles southwest of Cortland; in Bazetta Township; 1,100 yards north of the intersection of State Route 46 and McCleary-Jacoby Road along McCleary-Jacoby Road, then 1,560 yards west:

Ap—0 to 8 inches; brown (10YR 4/3) sandy loam, pale brown (10YR 6/3) dry; weak medium and coarse granular structure; very friable; many roots; about 5 percent coarse fragments; medium acid; abrupt smooth boundary.

BE—8 to 13 inches; yellowish brown (10YR 5/6) sandy loam; weak fine subangular blocky structure; friable; common roots; common distinct dark grayish brown (10YR 4/2) coatings and stains in worm and root channels; about 5 percent coarse fragments; medium acid; clear wavy boundary.

Bt1—13 to 25 inches; brown (7.5YR 5/4) sandy loam; weak coarse subangular blocky structure; friable; few roots; common distinct brown (7.5YR 4/4) and common prominent yellowish red (5YR 4/6) clay films on faces of peds; common distinct dark grayish brown (10YR 4/2) organic coatings and stains in worm and root channels; about 10 percent coarse fragments; strongly acid; clear wavy boundary.

Bt2—25 to 41 inches; brown (7.5YR 4/4) sandy loam; weak coarse subangular blocky structure; friable; few roots; common distinct dark brown (7.5YR 4/4) and common distinct reddish brown (5YR 4/4) clay films on faces of peds; about 5 percent coarse fragments; strongly acid; gradual wavy boundary.

BC1—41 to 49 inches; brown (7.5YR 5/4) loamy sand; weak coarse subangular blocky structure; very friable; few distinct dark brown (7.5YR 4/4) and reddish brown (5YR 4/4) clay films on faces of peds; sand grains and pebbles coated and bridged with clay; pockets of sandy loam; about 5 percent coarse fragments; strongly acid; gradual wavy boundary.

BC2—49 to 58 inches; dark yellowish brown (10YR 4/4) loamy sand; few coarse distinct light yellowish brown (10YR 6/4) mottles; weak coarse and very coarse subangular blocky structure; very friable; about 10 percent coarse fragments; strongly acid; abrupt irregular boundary.

C—58 to 80 inches; yellowish brown (10YR 5/4) gravelly loamy sand; single grained; loose; about 20 percent coarse fragments; medium acid.

The solum ranges from 40 to 65 inches in thickness. The content of coarse fragments ranges from 1 to 10 percent in the Ap horizon and in the upper part of the Bt horizon, from 1 to 30 percent in the lower part of the solum, and from 10 to 50 percent in the C horizon.

The Ap horizon has value of 4 or 5 and chroma of 2 or 3. Some pedons have an A horizon and an E horizon. The Bt horizon has hue of 5YR to 10YR, value of 3 to 5, and chroma of 3 to 6. It is sandy clay loam, sandy loam, or the gravelly analogs of those textures. The C horizon has value of 5 or 6 and chroma of 2 to 4. The fine-earth material in this horizon is loamy sand or sand.

Platea Series

The Platea series consists of deep, somewhat poorly drained soils that formed in glacial till on uplands. These soils have a dense fragipan. Permeability is moderately slow above the fragipan and very slow in the fragipan. Slopes range from 0 to 12 percent.

Platea soils are commonly adjacent to Sebring soils and are similar to Ravenna, Wadsworth, and Venango soils. Sebring soils are poorly drained and are lower on the landscape than the Platea soils. In Ravenna and Wadsworth soils, part of the argillic horizon is above the fragipan. The Venango soils in Trumbull County do not have an argillic horizon in the fragipan.

Typical pedon of Platea silt loam, 2 to 6 percent slopes, about 2.5 miles north of Gustavus; in Gustavus Township; 190 yards west of State Route 193 and 25 feet south of the northern boundary of Trumbull County:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; many roots; about 2 percent coarse fragments; strongly acid; abrupt smooth boundary.

Bw1—8 to 14 inches; brown (10YR 5/3) silt loam; many medium prominent yellowish brown (10YR 5/8) and common fine distinct light brownish gray (10YR 6/2) mottles; moderate fine and medium subangular blocky structure; friable; common roots; common faint dark grayish brown (10YR 4/2) organic coatings and stains in worm and root channels; common distinct light brownish gray (10YR 6/2) and pale brown (10YR 6/3) silt coatings on faces of peds; about 3 percent coarse fragments; strongly acid; clear wavy boundary.

Bw2—14 to 21 inches; yellowish brown (10YR 5/4) silty clay loam; many medium prominent strong brown (7.5YR 5/8) and common medium distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; firm; friable; many prominent gray (10YR 5/1) surfaces on peds; common prominent light brownish gray (2.5Y 6/2) silt coatings on faces of peds; about 3 percent coarse fragments; strongly acid; clear wavy boundary.

Btx—21 to 35 inches; dark yellowish brown (10YR 4/4) silt loam; common medium distinct grayish brown (10YR 5/2) mottles; moderate very coarse prismatic structure parting to moderate medium platy; very firm, brittle; few roots in vertical cracks; many prominent gray (10YR 5/1) clay films on faces of peds; strong brown (7.5YR 5/8) rind between the clay films and the prism interior; many fine and medium very dark gray (10YR 3/1) and dark brown (7.5YR 3/2) stains and concretions of iron and manganese oxide; about 5 percent coarse fragments; medium acid; gradual wavy boundary.

C1—35 to 45 inches; yellowish brown (10YR 5/4) silty clay loam; common medium prominent strong brown (7.5YR 5/8) mottles; massive; firm; about 10 percent coarse fragments; slight effervescence; mildly alkaline; gradual wavy boundary.

C2—45 to 65 inches; yellowish brown (10YR 5/4) silty clay loam; massive; firm; about 14 percent coarse fragments; strong effervescence; moderately alkaline.

The solum ranges from 34 to 48 inches in thickness. The depth to carbonates ranges from 30 to 42 inches. The content of coarse fragments ranges from 0 to 5 percent above the fragipan and from 2 to 15 percent in the fragipan and the C horizon.

The Ap horizon has chroma of 2 or 3. Some pedons have an A horizon and an E horizon. The Bw horizon has hue of 10YR or 2.5Y and value of 4 or 5. The Btx horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 or 4. It is silt loam, silty clay loam, or clay loam. The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 to 4. It is silty clay loam or silt loam.

The sloping Platea soils in this county have more sand in the subsoil than is definitive for the series. This difference, however, does not significantly affect the use and management of the soils.

Ravenna Series

The Ravenna series consists of deep, somewhat poorly drained soils that formed in glacial till on uplands. These soils have a dense fragipan. Permeability is moderate above the fragipan and slow in the fragipan. Slopes range from 0 to 6 percent.

Ravenna soils are commonly adjacent to Canfield, Sebring, and Wooster soils and are similar to Platea, Venango, and Wadsworth soils. Canfield soils are moderately well drained and are on the higher parts of the landscape. Sebring soils are poorly drained and are lower on the landscape than the Ravenna soils. Wooster soils are well drained and are on the steeper slopes. Platea and Venango soils do not have an argillic horizon above the fragipan. Wadsworth soils contain less sand in the subsoil than the Ravenna soils.

Typical pedon of Ravenna silt loam, 2 to 6 percent slopes, about 0.9 mile south of Brookfield Center; in Brookfield Township; 135 yards east of State Route 7 and 90 yards north of Old Nike Site Road:

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (2.5Y 6/2) dry; moderate medium granular structure; friable; many roots; about 2 percent coarse fragments; very strongly acid; abrupt smooth boundary.

BE—9 to 15 inches; yellowish brown (10YR 5/6) silt loam; common medium prominent light brownish gray (10YR 6/2) and few fine prominent strong brown (7.5YR 5/8) mottles; weak medium subangular blocky structure; friable; common roots; few distinct pale brown (10YR 6/3) silt coatings on faces of peds; grayish brown (10YR 5/2) organic stains in old root and worm channels; about 3 percent coarse fragments; very strongly acid; clear wavy boundary.

Bt—15 to 22 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct light brownish gray (10YR 6/2) and common medium prominent strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; common roots; many distinct grayish brown (10YR 5/2) surfaces on peds; few distinct grayish brown (10YR 5/2) clay films on faces of peds; many distinct and common distinct very pale brown (10YR 7/3) and white (10YR 8/1 dry) silt coatings on vertical and horizontal faces of peds, respectively; common fine dark brown (7.5YR 3/2) stains and concretions of iron and manganese oxide; gray (10YR 5/1) horizontal clay flows ¼ to ½ inch thick at the base of the horizon; yellowish brown (10YR 5/6) rind ⅛ to ¼ inch thick between the clay flows and the prism interior; about 5 percent coarse fragments; very strongly acid; clear wavy boundary.

Btx1—22 to 32 inches; yellowish brown (10YR 5/4) loam; common medium distinct light brownish gray (10YR 6/2) and common medium prominent yellowish brown (10YR 5/8) mottles; weak very coarse prismatic structure parting to moderate thick platy; very firm; brittle; few roots on vertical prism faces; many prominent and few distinct gray (10YR 5/1) clay films on vertical and horizontal faces, respectively; gray (10YR 5/1) clay seams 8 inches apart on faces of prisms; strong brown (7.5YR 5/6) rind ⅛ to ¼ inch wide between the seam and the prism interior; common distinct very pale brown (10YR 7/3) silt coatings on faces of peds; common medium dark brown (7.5YR 3/2) stains and concretions of iron and manganese oxide; about 10 percent coarse fragments; very strongly acid; gradual wavy boundary.

Btx2—32 to 40 inches; yellowish brown (10YR 5/4) loam; many medium distinct gray (10YR 6/1) and common fine and medium distinct brownish yellow (10YR 6/6) mottles; weak very coarse prismatic structure parting to moderate medium platy; very firm; brittle; many prominent and few distinct gray (10YR 5/1) clay films on vertical and horizontal faces of peds, respectively; gray (10YR 5/1) clay seams 8 to 12 inches apart on faces of prisms; strong brown (7.5YR 5/6) rind ⅛ to ¼ inch wide between the seam and the prism interior; many medium very dark brown (10YR 2/2) stains of iron and manganese oxide; about 10 percent coarse fragments; medium acid; clear wavy boundary.

Btx3—40 to 48 inches; yellowish brown (10YR 5/4) loam; common fine and medium distinct gray (10YR 6/1) and common fine faint yellowish brown (10YR 5/6) mottles; weak very coarse prismatic structure parting to weak medium platy; firm; brittle; many prominent gray (10YR 5/1) clay films on seams 8 to 12 inches apart on faces of prisms; strong brown (7.5YR 5/6) rind ⅛ to ¼ inch wide between the clay films and the prism interior; few fine very dark brown (10YR 2/2) stains of iron and manganese oxide; about 10 percent coarse fragments; slightly acid; clear wavy boundary.

BC—48 to 54 inches; yellowish brown (10YR 5/4) loam; common fine distinct light brownish gray (10YR 6/2) and common medium faint yellowish brown (10YR 5/6) mottles; weak coarse and very coarse subangular blocky structure; firm; many prominent gray (10YR 5/1) clay films on seams 8 to 15 inches apart on faces of prisms; strong brown (7.5YR 5/6) rind ⅛ to ¼ inch wide between the clay films and the ped interior; few medium very dark brown (10YR 2/2) stains of iron and manganese oxide; about 10 percent coarse fragments; slightly acid; clear wavy boundary.

C—54 to 74 inches; yellowish brown (10YR 5/4) loam; common medium distinct grayish brown (10YR 5/2) and common fine faint yellowish brown (10YR 5/6) mottles; massive; firm; many prominent gray (10YR 5/1) vertical partings 12 to 20 inches apart; common very dark brown (10YR 2/2) stains and concretions of iron and manganese oxide; about 10 percent coarse fragments in the upper part of the horizon and as much as 20 percent in the lower part; slightly acid.

The thickness of the solum ranges from 40 to 80 inches. The depth to carbonates ranges from 60 to 100 inches. The content of coarse fragments ranges from 2 to 10 percent above the fragipan, from 2 to 15 percent in the fragipan, and from 5 to 25 percent in the C horizon.

The Ap horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 to 3. Some pedons have an A horizon. The Bt horizon has hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 2 to 6. It is silt loam, loam, or clay loam. The content of clay in this horizon ranges from 18 to 27 percent. The Btx horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 or 4. It is loam, silt loam, or sandy loam. The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 or 4. It is silt loam, loam, sandy loam, or the gravelly analogs of those textures.

Rawson Series

The Rawson series consists of deep, moderately well drained soils that formed in glacial outwash and in the underlying glacial till or lacustrine material. These soils are on terraces and till plains. Permeability is moderate in the loamy material and slow or very slow in the underlying material. Slopes range from 2 to 6 percent.

The Rawson soils in this county have gray mottles closer to the surface than is definitive for the series. This difference, however, does not significantly affect the use and management of the soils.

Rawson soils are commonly adjacent to Fitchville and Haskins soils, which are somewhat poorly drained and are lower on the landscape than the Rawson soils.

Typical pedon of Rawson silt loam, 2 to 6 percent slopes, about 1.4 miles northwest of West Farmington; in Farmington Township; 290 yards south of the intersection of Larsen West Road and Curtis Middlefield

Road along Curtis Middlefield Road, then 450 yards west:

Ap—0 to 8 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak fine and medium subangular blocky structure; friable; many roots; about 3 percent coarse fragments; medium acid; abrupt smooth boundary.

BE—8 to 11 inches; yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure; friable; common roots; many distinct brown (10YR 4/3) organic coatings and stains in worm and root channels; common faint brown (10YR 5/3) silt coatings on faces of peds; about 3 percent coarse fragments; medium acid; clear wavy boundary.

Bt1—11 to 17 inches; yellowish brown (10YR 5/6) clay loam; moderate fine and medium subangular blocky structure; firm; common roots; few faint dark yellowish brown (10YR 4/4) clay films on faces of peds; common distinct very dark grayish brown (10YR 3/2) organic coatings and stains in worm and root channels; about 2 percent coarse fragments; strongly acid; clear wavy boundary.

Bt2—17 to 22 inches; yellowish brown (10YR 5/4) loam; common fine distinct grayish brown (10YR 5/2) and many medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; common roots; many faint and common faint brown (10YR 5/3) clay films on vertical and horizontal faces of peds, respectively; common distinct very dark grayish brown (10YR 3/2) organic coatings and stains in worm and root channels; common fine and medium black (10YR 2/1) stains and concretions of iron and manganese oxide; about 2 percent coarse fragments; strongly acid; clear wavy boundary.

Bt3—22 to 33 inches; brown (7.5YR 4/4) gravelly sandy clay loam; common fine prominent grayish brown (10YR 5/2) and many medium distinct strong brown (7.5YR 5/6) mottles; weak medium and coarse subangular blocky structure; firm; few roots; common distinct brown (10YR 5/3) clay films on faces of peds; common distinct pale brown (10YR 6/3) silt coatings on faces of peds; many fine and medium black (10YR 2/1) stains and concretions of iron and manganese oxide; about 25 percent coarse fragments; strongly acid; abrupt smooth boundary.

2Bt4—33 to 44 inches; brown (10YR 4/3) clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; common distinct gray (10YR 5/1) and grayish brown (10YR 5/2) clay films on vertical faces of peds; common medium dark brown (7.5YR 3/2) stains and concretions of iron and manganese oxide; about 10 percent coarse fragments; neutral; gradual smooth boundary.

2C—44 to 60 inches; yellowish brown (10YR 5/4) clay; common medium distinct yellowish brown (10YR 5/6) mottles; massive; firm; common distinct grayish brown (10YR 5/2) surfaces on vertical fracture planes; about 10 percent coarse fragments; strong effervescence; moderately alkaline.

The solum ranges from 24 to 48 inches in thickness. The content of coarse fragments ranges from 0 to 10 percent in the A horizon, from 2 to 30 percent in the Bt horizon, and from 0 to 10 percent in the 2Bt and 2C horizons.

The Ap horizon has value of 4 or 5 and chroma of 2 or 3. It is dominantly silt loam, but the range includes loam and sandy loam. Some pedons have an A horizon and an E horizon. The Bt horizon has chroma of 3 to 6. It is clay loam, sandy clay loam, loam, or the gravelly analogs of those textures. The 2Bt and 2C horizons have value of 4 to 6 and chroma of 2 to 4. They are clay, silty clay, silty clay loam, or clay loam.

Remsen Series

The Remsen series consists of deep, somewhat poorly drained, very slowly permeable soils on till plains. These soils formed in glacial till. Slopes range from 0 to 6 percent.

Remsen soils are commonly adjacent to Geeburg and Trumbull soils and are similar to Caneadea and Mahoning soils. Geeburg soils are moderately well drained and are on the higher parts of the landscape. Trumbull soils are poorly drained and are lower on the landscape than the Remsen soils. Caneadea soils have fewer coarse fragments in the subsoil and substratum than the Remsen soils. Mahoning soils have less clay in the subsoil and substratum than the Remsen soils.

Typical pedon of Remsen silt loam, 2 to 6 percent slopes, about 1.7 miles south of Bristolville; in Bristol Township; 250 yards west of the intersection of State Route 45 and Housel-Craft Road along Housel-Craft Road, then 50 yards south:

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, light gray (2.5Y 7/2) dry; weak and fine and medium subangular blocky structure parting to moderate medium granular; friable; many roots; about 2 percent coarse fragments; strongly acid; abrupt smooth boundary.

Bt1—7 to 11 inches; yellowish brown (10YR 5/4) silty clay loam; common fine distinct gray (10YR 6/1) and many medium prominent strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; common roots; many distinct grayish brown (2.5Y 5/2) surfaces on peds; common grayish brown (2.5Y 5/2) clay films on faces of peds; about 2 percent coarse fragments; very strongly acid; clear wavy boundary.

Bt2—11 to 18 inches; brown (10YR 5/3) silty clay; common fine distinct gray (10YR 6/1) and many medium prominent strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky and angular blocky; firm; common roots; many distinct and common faint grayish brown (2.5Y 5/2) clay films on vertical and horizontal faces of peds, respectively; about 2 percent coarse fragments; very strongly acid; clear wavy boundary.

Bt3—18 to 24 inches; olive brown (2.5Y 4/4) clay; few medium prominent gray (10YR 6/1) and common fine faint light yellowish brown (2.5Y 6/4) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky and angular blocky; very firm; few roots; many distinct and common distinct grayish brown (2.5Y 5/2) clay films on vertical and horizontal faces of peds, respectively; about 3 percent coarse fragments; very strongly acid; clear wavy boundary.

Btg1—24 to 34 inches; grayish brown (2.5Y 5/2) clay; common medium distinct light yellowish brown (2.5Y 6/4) and few fine distinct gray (10YR 6/1) mottles; moderate medium and coarse prismatic structure parting to moderate fine and medium angular blocky and subangular blocky; very firm; few roots; many distinct and common distinct gray (10YR 5/1) clay films on vertical and horizontal faces of peds, respectively; about 3 percent coarse fragments; slightly acid; gradual wavy boundary.

Btg2—34 to 40 inches; grayish brown (2.5Y 5/2) clay; common fine and medium distinct light yellowish brown (2.5Y 6/4) and few medium distinct gray (10YR 6/1) mottles; moderate coarse prismatic structure parting to moderate medium angular blocky and subangular blocky; very firm; few roots; many distinct and common distinct gray (5Y 5/1) clay films on vertical and horizontal faces of peds, respectively; about 3 percent coarse fragments; neutral; gradual wavy boundary.

BCg—40 to 46 inches; grayish brown (2.5Y 5/2) clay; common fine and medium distinct light yellowish brown (10YR 6/4) and few medium distinct gray (10YR 6/1) mottles; moderate coarse prismatic structure parting to moderate medium angular blocky and subangular blocky; very firm; common distinct gray (5Y 5/1) clay films on faces of peds; about 3 percent coarse fragments; slight effervescence; mildly alkaline; clear wavy boundary.

Cg1—46 to 56 inches; grayish brown (2.5Y 5/2) silty clay; common medium faint light yellowish brown (2.5Y 6/4) mottles; massive with vertical partings; very firm; common distinct gray (5Y 5/1) surfaces on vertical fracture planes; about 10 percent coarse fragments; slight effervescence; mildly alkaline; clear wavy boundary.

Cg2—56 to 64 inches; grayish brown (2.5Y 5/2) silty clay; common medium distinct light yellowish brown (2.5Y 6/4) mottles; massive with vertical partings; very firm; common distinct gray (5Y 5/1) surfaces on vertical fracture planes; common distinct pale brown (10YR 6/3) carbonate coatings on vertical fracture planes; about 5 percent coarse fragments; strong effervescence; moderately alkaline.

The thickness of the solum and the depth to carbonates range from 24 to 48 inches. The content of coarse fragments, mostly small shale and sandstone fragments, ranges from 1 to 10 percent in the subsoil and substratum.

The Ap horizon has hue of 10YR or 2.5Y and value of 4 or 5. Some pedons have an A horizon and an E horizon. The content of clay in the Bt and Btg horizons ranges from 45 and 60 percent, but it can be less than 35 percent in individual subhorizons. The Cg horizon has hue of 2.5Y or 5Y and value of 4 or 5. It is clay or silty clay.

Rittman Series

The Rittman series consists of deep, moderately well drained soils that formed in glacial till on uplands. These soils have a dense fragipan. Permeability is moderate above the fragipan and slow in the fragipan. Slopes range from 2 to 12 percent.

Rittman soils are commonly adjacent to Sebring and Wadsworth soils and are similar to Cambridge and Canfield soils. Sebring soils are poorly drained, and Wadsworth soils are somewhat poorly drained. Both are on the lower parts of the landscape. Cambridge soils do not have an argillic horizon above the fragipan. Canfield soils have less clay in the subsoil and substratum than the Rittman soils.

Typical pedon of Rittman silt loam, 2 to 6 percent slopes, about 3.5 miles east of Niles; in Liberty Township; 580 yards north of the intersection of Anderson-Morris Road and State Route 11:

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (2.5Y 6/2) dry; moderate medium and coarse granular structure; friable; many roots; about 3 percent coarse fragments; strongly acid; abrupt smooth boundary.

BE—9 to 16 inches; yellowish brown (10YR 5/4) silt loam; common medium faint yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; many roots; dark grayish brown (10YR 4/2) organic coatings on vertical faces of peds; about 3 percent coarse fragments; very strongly acid; clear wavy boundary.

Bt1—16 to 22 inches; yellowish brown (10YR 5/4) clay loam; moderate fine and medium subangular blocky structure; firm; common roots; few faint dark yellowish brown (10YR 4/4) clay films on faces of peds; common faint light yellowish brown (10YR 6/4) silt coatings on faces of peds; about 5 percent coarse fragments; very strongly acid; clear wavy boundary.

Bt2—22 to 28 inches; brown (7.5YR 4/4) clay loam; common medium distinct strong brown (7.5YR 5/6) and common medium prominent grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to moderate fine and medium subangular and angular blocky; firm; common roots; common distinct gray (10YR 5/1) clay films on faces of peds; many distinct and common distinct pale brown (10YR 6/3) silt coatings on vertical and horizontal faces of peds, respectively; common fine very dark gray (10YR 3/1) stains of iron and manganese oxide; about 5 percent coarse fragments, very strongly acid; clear wavy boundary.

Btx—28 to 46 inches; dark yellowish brown (10YR 4/4) clay loam; weak very coarse prismatic structure parting to moderate thin and medium platy; very firm; brittle; many prominent and common distinct gray (10YR 5/1) clay films on vertical and horizontal faces of peds, respectively; strong brown (7.5YR 5/6) rind between the clay films and the prism interior; common fine very dark gray (N 3/0) stains of iron and manganese oxide; about 10 percent coarse fragments; very strongly acid in the upper part and medium acid in the lower part; clear wavy boundary.

BC—46 to 56 inches; dark yellowish brown (10YR 4/4) silty clay loam; weak coarse subangular blocky structure; firm; common distinct gray (10YR 5/1) clay films on vertical faces of peds; strong brown (7.5YR 5/6) rind between the clay films and the prism interior; about 10 percent coarse fragments; medium acid; gradual wavy boundary.

C1—56 to 65 inches; yellowish brown (10YR 5/4) silty clay loam; massive; firm; few fine distinct very dark gray (N 3/0) stains of iron and manganese oxide; about 10 percent coarse fragments; slightly acid; gradual wavy boundary.

C2—65 to 72 inches; yellowish brown (10YR 5/4) silty clay loam; massive; firm; common fine distinct very dark gray (N 3/0) stains of iron and manganese oxide; about 10 percent coarse fragments; slight effervescence; mildly alkaline.

The solum ranges from 42 to 60 inches in thickness. Depth to the top of the fragipan ranges from 18 to 36 inches. The content of coarse fragments ranges from 0 to 10 percent above the Btx horizon and from 2 to 15 percent in the Btx and C horizons.

The Ap horizon has value of 4 or 5 and chroma of 2 or 3. Some pedons have an A horizon and an E horizon. The Bt horizon has chroma of 4 to 6. It is clay loam or silty clay loam. The Btx horizon has value of 4 or 5 and chroma of 3 to 6. It is clay loam, silty clay loam, or loam. The C horizon has value of 4 or 5 and chroma of 3 or 4. It is silty clay loam or clay loam.

Sebring Series

The Sebring series consists of deep, poorly drained, slowly permeable or moderately slowly permeable soils in the basins of former glacial lakes on slack-water terraces and upland plains. These soils formed in lacustrine material. Slopes are 0 to 2 percent.

Sebring soils are commonly adjacent to Fitchville, Glenford, Ravenna, and Wadsworth soils. The adjacent soils are better drained than the Sebring soils. Fitchville and Glenford soils are on the higher parts of terraces and lake plains. Ravenna and Wadsworth soils are on the higher parts of till plains.

Typical pedon of Sebring silt loam, about 2.3 miles west of Hartford; in Hartford Township; 500 yards east of the intersection of Warner Road and State Route 305 along State Route 305, then 110 yards north:

Ap—0 to 6 inches; dark gray (10YR 4/1) silt loam, light brownish gray (2.5Y 6/2) dry; weak medium and coarse granular structure; friable; many roots; few fine black (10YR 2/1) stains and concretions of iron and manganese oxide; medium acid; abrupt smooth boundary.

Eg1—6 to 10 inches; gray (10YR 6/1) silt loam; common medium prominent strong brown (7.5YR 5/8) mottles; weak medium subangular blocky structure; friable; common roots; grayish brown (10YR 5/2) krotovina (crayfish channel); many distinct and few faint light brownish gray (2.5Y 6/2) silt coatings on vertical and horizontal faces of peds, respectively; few fine black (10YR 2/1) stains and concretions of iron and manganese oxide; very strongly acid; clear smooth boundary.

Eg2—10 to 15 inches; light brownish gray (2.5Y 6/2) silt loam; many coarse prominent yellowish red (5YR 5/8) mottles; weak medium subangular blocky structure; friable; few roots; grayish brown (10YR 5/2) krotovina (crayfish channel); many distinct and few faint gray (10YR 6/1) silt coatings on vertical and horizontal faces of prisms, respectively; few fine black (10YR 2/1) stains and concretions of iron and manganese oxide; very strongly acid; clear smooth boundary.

Btg1—15 to 22 inches; light brownish gray (2.5Y 6/2) silt loam; many coarse prominent strong brown (7.5YR 5/8) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few roots; few distinct gray (10YR 5/1) clay films on faces of peds; few fine black (10YR 2/1) stains and concretions of iron and manganese oxide; very strongly acid; clear smooth boundary.

Btg2—22 to 30 inches; light brownish gray (2.5Y 6/2) silt loam; common coarse prominent strong brown (7.5YR 5/8) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few roots; common distinct gray (10YR 5/1) clay films on faces of peds; few fine black (10YR 2/1) stains and concretions of iron and manganese oxide; medium acid; abrupt smooth boundary.

Bt—30 to 36 inches; yellowish brown (10YR 5/6) silt loam; common medium distinct yellowish brown (10YR 5/4) and many coarse prominent gray (10YR 6/1) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; common distinct gray (10YR 5/1) clay films on faces of peds; common medium (10YR 2/1) stains and concretions of iron and manganese oxide; slightly acid; gradual smooth boundary.

BC—36 to 53 inches; yellowish brown (10YR 5/6) silt loam; common medium prominent gray (10YR 6/1) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; many distinct and few distinct dark gray (N 4/0) clay films on vertical and horizontal faces of peds, respectively; common medium very dark brown (10YR 2/2) stains and concretions of iron and manganese oxide; neutral; clear smooth boundary.

C1—53 to 59 inches; yellowish brown (10YR 5/6) silt loam; common medium prominent gray (5Y 6/1) mottles; massive with horizontal partings along bedding planes; friable; laminated; common medium very dark brown (10YR 2/2) stains and concretions of iron and manganese oxide; neutral; clear smooth boundary.

C2—59 to 69 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct gray (5Y 5/1) mottles; massive with horizontal partings along bedding planes; very friable; laminated; slight effervescence; mildly alkaline.

The solum ranges from 30 to 55 inches in thickness. The depth to glacial till is 40 to 60 inches in the till substratum phase. The solum commonly has no coarse fragments. In some pedons, however, the content of these fragments is as much as 3 percent in the Btg, Bt, and C horizons. Also, it is as much as 15 percent in the C horizon of the till substratum phase.

The Ap horizon has value of 4 or 5 and chroma of 1 or 2. Some pedons have an A horizon. The Btg and Bt horizons have hue of 10YR to 5Y or are neutral in hue. They have value of 4 to 6. They have chroma of 0 to 2 within a depth of 30 inches and chroma of 0 to 6 below that depth. They are dominantly silty clay loam or silt loam but have thin strata of loam or clay loam in some pedons. The C horizon has hue of 10YR to 5Y or is neutral in hue. It has value of 4 to 6 and chroma of 0 to 6. It is dominantly silt loam or silty clay loam, but the range includes loam and clay loam in the till substratum phase.

Seward Series

The Seward series consists of deep, moderately well drained soils that formed in sandy glacial outwash and the underlying glacial till or lacustrine material. These soils are on terraces and till plains. Permeability is moderately rapid in the upper part of the subsoil and slow or very slow in the lower part and in the substratum. Slopes range from 2 to 6 percent.

Seward soils are commonly adjacent to Elnora, Lakin, and Oshtemo soils. The adjacent soils are sandy in the substratum. They are in positions on stream terraces similar to those of the Seward soils.

Typical pedon of Seward loamy fine sand, 2 to 6 percent slopes, about 2.6 miles southeast of Newton Falls; in Newton Township; 80 yards west of the intersection of Newton Falls Tomlinson Road and McClure East Road along McClure East Road, then 55 yards south:

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) loamy fine sand; weak fine granular structure; very friable; many roots; strongly acid; abrupt smooth boundary.

E1—10 to 16 inches; yellowish brown (10YR 5/6) loamy fine sand; weak fine and medium granular structure; very friable; common roots; common distinct dark grayish brown (10YR 4/2) organic coatings in old worm and root channels; medium acid; clear wavy boundary.

E2—16 to 25 inches; yellowish brown (10YR 5/6) loamy fine sand; weak fine and medium subangular blocky structure; very friable; common roots; strongly acid; clear wavy boundary.

Bt1—25 to 30 inches; brown (7.5YR 5/4) fine sandy loam; weak medium subangular blocky structure; friable; common roots; few faint dark brown (7.5YR 4/4) clay films on faces of peds; sand grains coated and bridged with clay; strongly acid; clear wavy boundary.

2Bt2—30 to 34 inches; brown (10YR 5/3) silty clay loam; common medium prominent gray (5Y 6/1) and common medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; few roots; common distinct dark grayish brown (2.5Y 4/2) clay films on faces of peds; few medium very dark brown (10YR 2/2) stains of iron and manganese oxide; medium acid; abrupt wavy boundary.

2BC—34 to 42 inches; yellowish brown (10YR 5/4) silty clay loam; common medium prominent brownish yellow (10YR 6/8) and gray (5Y 6/1) mottles; moderate medium prismatic structure parting to weak medium subangular blocky; firm; common distinct grayish brown (2.5Y 5/2) clay films on faces of peds; common medium black (10YR 2/1) stains of iron and manganese oxide; slightly acid; gradual wavy boundary.

2C1—42 to 55 inches; yellowish brown (10YR 5/4) silty clay loam; few common prominent gray (5Y 6/1) mottles; massive with some vertical partings; firm; grayish brown (2.5Y 5/2) surfaces on vertical fracture planes; few medium very dark gray (10YR 3/1) stains of iron and manganese oxide; slightly acid; gradual wavy boundary.

2C2—55 to 70 inches; light olive brown (2.5Y 5/4) silty clay; massive with some vertical partings; firm; grayish brown (2.5Y 5/2) surfaces on vertical fracture planes; few fine very dark gray (10YR 3/1) stains of iron and manganese oxide; neutral.

The solum ranges from 25 to 48 inches in thickness. The content of coarse fragments ranges from 0 to 3 percent in the upper part of the solum and from 0 to 8 percent in the 2Bt and 2C horizons.

The Ap horizon has value of 4 or 5 and chroma of 2 to 4. Some pedons have an A horizon. The E horizon has value of 5 or 6 and chroma of 3 to 6. It is loamy fine sand, fine sand, or loamy sand. The Bt horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 or 4. It is dominantly fine sandy loam or sandy loam but has thin subhorizons of sandy clay loam in some pedons. The 2Bt and 2C horizons have value of 3 to 5 and chroma of 1 to 4. They are clay, silty clay, silty clay loam, or clay loam.

Tioga Series

The Tioga series consists of deep, well drained soils that formed in alluvium on flood plains. Permeability is moderate or moderately rapid. Slopes are 0 to 2 percent.

Tioga soils are commonly adjacent to Orrville and Holly soils. Orrville soils are somewhat poorly drained, and Holly soils are poorly drained. Both generally are lower on the landscape than the Tioga soils, but Orrville soils are at the same level in some areas.

Typical pedon of Tioga loam, occasionally flooded, about 3 miles northeast of Hubbard; in Hubbard Township; 670 yards south of the intersection of Chestnut Ridge Road and Price Shaffer Road along Price Shaffer Road, then 23 yards east:

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) loam, pale brown (10YR 6/3) dry; moderate fine and medium granular structure; friable; many roots; about 2 percent coarse fragments; neutral; abrupt smooth boundary.

Bw1—10 to 13 inches; brown (7.5YR 5/4) loam; weak fine and medium subangular blocky structure; friable; common roots; common distinct dark grayish brown (10YR 4/2) organic stains in root channels; about 2 percent coarse fragments; slightly acid; clear wavy boundary.

Bw2—13 to 21 inches; brown (7.5YR 5/4) sandy loam; weak medium and coarse subangular blocky structure; friable; common roots; common distinct dark grayish brown (10YR 4/2) organic stains in root channels; about 2 percent coarse fragments; medium acid; clear wavy boundary.

Bw3—21 to 32 inches; yellowish brown (10YR 5/4) sandy loam; weak medium and coarse subangular blocky structure; friable; few roots; about 2 percent coarse fragments; medium acid; abrupt smooth boundary.

C1—32 to 40 inches; yellowish brown (10YR 5/4) loamy sand; single grained; very friable; about 10 percent coarse fragments; medium acid; abrupt smooth boundary.

C2—40 to 44 inches; dark yellowish brown (10YR 4/4) sandy loam; common medium and coarse distinct pale brown (10YR 6/3) mottles; massive; friable; few fine and medium very dark grayish brown (10YR 3/2) stains and concretions of iron and manganese oxide; about 3 percent coarse fragments; medium acid; abrupt smooth boundary.

C3—44 to 56 inches; yellowish brown (10YR 5/4) loamy sand; common fine and medium faint pale brown (10YR 6/3) and common fine and medium distinct light brownish gray (10YR 6/2) mottles; single grained; loose; few fine and medium very dark grayish brown (10YR 3/2) stains and concretions of iron and manganese oxide; about 3 percent coarse fragments; medium acid; clear wavy boundary.

C4—56 to 62 inches; dark yellowish brown (10YR 4/4) gravelly loamy sand; common fine and medium distinct pale brown (10YR 6/3) and light brownish gray (10YR 6/2) mottles; single grained; loose; common medium and coarse black (10YR 2/1) and dark brown (7.5YR 3/2) stains and concretions of iron and manganese oxide; about 15 percent coarse fragments; slightly acid.

The solum ranges from 18 to 40 inches in thickness. The content of coarse fragments ranges from 0 to 15 percent in the solum and from 0 to 25 percent in the C horizon.

The Ap horizon has value of 3 to 5 and chroma of 2 to 4. It is dominantly loam, but the range includes fine sandy loam. The Bw horizon has value of 3 to 5 and chroma of 2 to 4. It is dominantly loam or sandy loam but has subhorizons of loamy sand in some pedons. The C horizon has chroma of 2 to 4. It is dominantly sandy loam or loamy sand but has subhorizons of fine sandy loam or loam or of gravelly analogs.

Trumbull Series

The Trumbull series consists of deep, poorly drained, slowly permeable or very slowly permeable soils on till plains. These soils formed in glacial till. Slopes are 0 to 2 percent.

Trumbull soils are adjacent to Geeburg and Remsen soils and are similar to Canadice soils. Geeburg and Remsen soils are better drained than the Trumbull soils and are higher on the landscape. Canadice soils generally have fewer coarse fragments in the subsoil and substratum than the Trumbull soils.

Typical pedon of Trumbull silty clay loam, about 0.9 mile northeast of Delightful; in Southington Township; 1,000 feet south of the intersection of State Route 305 and Anderson Anthony Road along Anderson Anthony Road, then 490 yards west:

A—0 to 2 inches; very dark grayish brown (10YR 3/2) silty clay loam, dark grayish brown (10YR 4/2) dry; moderate and strong medium granular structure; friable; many roots; very strongly acid; clear wavy boundary.

Eg—2 to 5 inches; dark gray (10YR 4/1) silty clay loam; few fine and medium prominent brown (7.5YR 4/4) and few fine and medium prominent strong brown (7.5YR 5/8) mottles; weak fine and medium subangular blocky structure parting to moderate medium granular; firm; many roots; very strongly acid; clear wavy boundary.

Btg1—5 to 9 inches; dark gray (10YR 4/1) clay; common medium distinct dark yellowish brown (10YR 4/4) and few medium prominent yellowish brown (10YR 5/6) mottles; moderate coarse prismatic structure parting to weak medium subangular blocky; about 2 percent coarse fragments; very firm; many roots; very strongly acid; clear wavy boundary.

Btg2—9 to 16 inches; gray (10YR 5/1) clay; common medium prominent strong brown (7.5YR 5/6) and few fine and medium prominent brown (7.5YR 4/4) mottles; moderate coarse prismatic structure parting to weak medium and coarse subangular and angular blocky; very firm; common roots; common faint and few faint dark gray (10YR 4/1) clay films on vertical and horizontal faces of peds, respectively; few distinct light brownish gray (10YR 6/2) silt coatings on faces of peds; about 2 percent coarse fragments; very strongly acid; gradual wavy boundary.

Btg3—16 to 26 inches; gray (10YR 5/1) clay; common medium prominent strong brown (7.5YR 5/6) and common medium prominent yellowish red (5YR 4/6) mottles; moderate coarse prismatic structure parting to moderate medium subangular and angular blocky; very firm; common roots; many faint and common faint dark gray (10YR 4/1) clay films on vertical and horizontal faces of peds, respectively; few distinct light brownish gray (10YR 6/2) silt coatings on faces of peds; about 2 percent coarse fragments; very strongly acid; gradual wavy boundary.

Btg4—26 to 34 inches; gray (10YR 5/1) clay; many medium and coarse prominent strong brown (7.5YR 5/6) and few fine prominent yellowish red (5YR 4/6) mottles; moderate coarse prismatic structure parting to moderate medium and coarse subangular and angular blocky; very firm; few roots; many distinct and common faint dark gray (10YR 4/1) clay films on vertical and horizontal faces of peds, respectively; about 2 percent coarse fragments; strongly acid; clear wavy boundary.

Bt—34 to 44 inches; yellowish brown (10YR 5/4) silty clay; many fine prominent strong brown (7.5YR 5/6) and common fine and medium distinct gray (10YR 5/1) mottles; weak coarse prismatic structure parting to moderate medium subangular and angular blocky; very firm; common distinct and few faint dark gray (10YR 4/1) clay films on vertical and horizontal faces of peds, respectively; about 2 percent coarse fragments; medium acid; gradual wavy boundary.

BC—44 to 51 inches; brown (10YR 4/3) silty clay; many fine and medium distinct gray (10YR 5/1) and common medium and coarse prominent strong brown (7.5YR 5/6) mottles; weak coarse prismatic structure parting to weak medium subangular blocky; firm; about 3 percent coarse fragments; slightly acid; clear wavy boundary.

C—51 to 62 inches; dark gray (10YR 4/1) silty clay; many medium prominent olive brown (2.5Y 4/4) and few fine prominent olive yellow (2.5Y 6/8) mottles; massive; firm; about 4 percent coarse fragments; slight effervescence; mildly alkaline.

The thickness of the solum and the depth to carbonates range from 40 to 60 inches. The content of coarse fragments ranges from 2 to 10 percent in the Btg, Bt, and C horizons.

The A horizon has value of 2 or 3 and chroma of 1 or 2. Pedons in cultivated areas have an Ap horizon. Within a depth of 30 inches, the Btg and Bt horizons have hue of 10YR or 2.5Y and chroma of 1 or 2. Below that depth, they have hue of 10YR or 2.5Y and chroma of 1 to 4 or are neutral in hue and have chroma of 0. They are dominantly silty clay or clay but have thin subhorizons of silty clay loam or clay loam in some pedons. The content of clay in these horizons ranges from 40 to 60 percent. The Cg horizon has hue of 10YR to 5Y, value of 4 or 5, and chroma of 1 to 4. It is dominantly silty clay or clay but has thin subhorizons of silty clay loam or clay loam in some pedons.

Venango Series

The Venango series consists of deep, somewhat poorly drained soils that formed in glacial till on uplands. These soils have a dense fragipan. Permeability is moderate above the fragipan and slow or very slow in the fragipan. Slopes range from 0 to 6 percent.

The Venango soils in this county have a lower increase in content of clay in the subsoil than is definitive for the series. This difference, however, does not significantly affect the use and management of the soils.

Venango soils are commonly adjacent to Cambridge and Sebring soils and are similar to Platea, Ravenna, and Wadsworth soils. Cambridge soils are moderately well drained and are on the higher parts of the landscape. Sebring soils are poorly drained and are lower on the landscape than the Venango soils. Platea soils have an argillic horizon in the fragipan. Ravenna and Wadsworth soils have an argillic horizon above the fragipan.

Typical pedon of Venango silt loam, 0 to 2 percent slopes, about 4 miles north of Kinsman; in Kinsman Township; 920 yards west of Ward North Road and 32 yards south of Stanhope-McCormick Road:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (2.5Y 6/2) dry; moderate medium granular structure; friable; many roots; about 5 percent coarse fragments; strongly acid; abrupt smooth boundary.

BA—8 to 12 inches; pale brown (10YR 6/3) silt loam; many medium prominent strong brown (7.5YR 5/8) and common fine and medium faint grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; friable; common roots; few distinct dark grayish brown (10YR 4/2) organic coatings on faces of peds; common distinct light brownish gray (10YR 6/2) silt coatings on faces of peds; about 10 percent coarse fragments; strongly acid; clear wavy boundary.

Bw1—12 to 16 inches; yellowish brown (10YR 5/4) silt loam; common medium prominent strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; firm; common roots; many distinct light brownish gray (10YR 6/2) silt coatings on faces of peds; few medium dark brown (7.5YR 3/2) stains of iron and manganese oxide; about 10 percent coarse fragments; strongly acid; clear wavy boundary.

Bw2—16 to 22 inches; yellowish brown (10YR 5/4) loam; many medium prominent strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; firm; few roots; many distinct light brownish gray (10YR 6/2) silt coatings on vertical faces of peds and common distinct light brownish gray (10YR 6/2) silt coatings on horizontal faces of peds; about 10 percent coarse fragments; very strongly acid; clear wavy boundary.

Btx1—22 to 34 inches; dark yellowish brown (10YR 4/4) loam; common fine and medium faint brown (10YR 5/3) mottles; weak very coarse prismatic structure parting to weak thick platy; very firm; brittle; many prominent gray (10YR 5/1) clay films on faces of prisms and few prominent gray (10YR 5/1) clay films on horizontal faces of plates; strong brown (7.5YR 5/6) rind between the clay films and the prism interior; many distinct and few faint light brownish gray (10YR 6/2) silt coatings on vertical and horizontal faces of peds, respectively; common fine dark brown (7.5YR 3/2) stains of iron and manganese oxide; about 10 percent coarse fragments; medium acid; gradual wavy boundary.

Btx2—34 to 46 inches; dark yellowish brown (10YR 4/4) silt loam; weak very coarse prismatic structure parting to weak thick platy; very firm; brittle; many prominent gray (10YR 6/1) clay films on faces of prisms; few distinct gray (10YR 6/1) clay films on horizontal faces of plates; strong brown (7.5YR 5/6) rind between the clay films and the prism interior;

few distinct light brownish gray (10YR 6/2) silt coatings on faces of peds; common fine dark brown (7.5YR 3/2) stains of iron and manganese oxide; about 10 percent coarse fragments; strongly acid; clear wavy boundary.

BC—46 to 56 inches; yellowish brown (10YR 5/4) loam; weak coarse subangular blocky structure; firm; common distinct gray (10YR 6/1) clay films on vertical faces of prisms; few faint light brownish gray (10YR 6/2) loamy coatings on vertical faces of prisms; few fine and medium dark brown (7.5YR 3/2) stains of iron and manganese oxide; about 10 percent coarse fragments; slightly acid; gradual wavy boundary.

C—56 to 66 inches; yellowish brown (10YR 5/4) loam; massive; firm; few distinct gray (10YR 6/1) clay films on vertical partings; few fine and medium dark brown (7.5YR 3/2) stains of iron and manganese oxide; about 10 percent coarse fragments; neutral.

The solum ranges from 36 to 72 inches in thickness. The depth to carbonates is more than 48 inches. The content of coarse fragments ranges from 2 to 15 percent above the fragipan and from 5 to 25 percent in the fragipan and the C horizon.

The Ap horizon has hue of 10YR or 2.5Y and chroma of 2 or 3. Some pedons have an A horizon and an E horizon. The Bw horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 or 4. It is loam, silt loam, or clay loam. The Btx and C horizons are loam, silt loam, or gravelly loam. The Btx horizon has hue of 10YR to 5Y, value of 4 to 6, and chroma of 2 to 6. The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4.

Wadsworth Series

The Wadsworth series consists of deep, somewhat poorly drained soils that formed in glacial till on uplands. These soils have a dense fragipan. Permeability is moderate or moderately slow above the fragipan and slow or very slow in the fragipan and substratum. Slopes range from 0 to 6 percent.

Wadsworth soils are commonly adjacent to Rittman and Sebring soils and are similar to Platea, Ravenna, and Venango soils. Rittman soils are moderately well drained and are on the higher parts of the landscape. Sebring soils are poorly drained and are lower on the landscape than the Wadsworth soils. Platea and Venango soils do not have an argillic horizon above the fragipan. Ravenna soils contain more sand in the subsoil than the Wadsworth soils.

Typical pedon of Wadsworth silt loam, 0 to 2 percent slopes, about 2.3 miles northeast of Girard; in Liberty Township; 330 yards southeast of the intersection of Tibbetts Corners Wick Road and Naylor Road along Naylor Road, then 30 yards north:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate fine and medium granular structure; friable; many roots; about 2 percent coarse fragments; strongly acid; abrupt smooth boundary.

BE—8 to 14 inches; yellowish brown (10YR 5/4) silt loam; common fine prominent yellowish brown (10YR 5/8) and common medium distinct light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; friable; common roots; common distinct light brownish gray (2.5Y 6/2) silt coatings on vertical faces of peds; common dark grayish brown (10YR 4/2) organic coatings and stains in worm and root channels; about 2 percent coarse fragments; very strongly acid; clear wavy boundary.

Bt—14 to 25 inches; strong brown (7.5YR 5/6) silty clay loam; common medium distinct yellowish brown (10YR 5/6) and many medium prominent grayish brown (10YR 5/2) mottles; moderate coarse prismatic structure parting to moderate medium subangular; firm; common roots; many distinct gray (10YR 5/1) surfaces on peds; common distinct gray (10YR 5/1) clay films on faces of peds; common distinct light brownish gray (10YR 6/2) silt coatings on vertical faces of peds; about 2 percent coarse fragments; very strongly acid; clear wavy boundary.

Btx1—25 to 38 inches; dark yellowish brown (10YR 4/4) clay loam; weak very coarse prismatic structure parting to weak medium platy; very firm; brittle; many prominent and few prominent gray (10YR 5/1) clay films on vertical and horizontal faces of peds, respectively; thin yellowish brown (10YR 5/6) rind between the clay films and the prism interior; common prominent light brownish gray (2.5Y 6/2) silt coatings on faces of peds; common medium black (10YR 2/1) stains and concretions of iron and manganese oxide; about 5 percent coarse fragments; very strongly acid; gradual wavy boundary.

Btx2—38 to 48 inches; yellowish brown (10YR 5/4) clay loam; weak very coarse prismatic structure parting to weak thick platy; very firm; brittle; many prominent and few prominent gray (10YR 5/1) clay films on vertical and horizontal faces of peds, respectively; yellowish brown (10YR 5/8) rind between the clay films and the prism interior; common medium black (10YR 2/1) stains and concretions of iron and manganese oxide; about 10 percent coarse fragments; medium acid; gradual wavy boundary.

BC—48 to 58 inches; yellowish brown (10YR 5/4) clay loam; many medium prominent yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure; firm; few distinct gray (10YR 5/1) clay films on vertical faces of peds; about 10 percent coarse fragments; slightly acid; gradual wavy boundary.

C1—58 to 68 inches; yellowish brown (10YR 5/4) clay loam; few fine prominent yellowish brown (10YR 5/8) mottles; massive; firm; about 10 percent coarse fragments; neutral; gradual wavy boundary.

C2—68 to 80 inches; yellowish brown (10YR 5/4) clay loam; massive; firm; about 10 percent coarse fragments; strong effervescence; moderately alkaline.

The solum ranges from 34 to 60 inches in thickness. The content of coarse fragments ranges from 0 to 4 percent above the fragipan and from 5 to 15 percent in the fragipan and the C horizon.

The Ap horizon has hue or 10YR of 2.5Y, value of 4 or 5, and chroma of 1 to 3. Some pedons have an A horizon and an E horizon. The Bt horizon has hue of 7.5YR, 10YR, or 2.5Y, value of 4 or 5, and chroma of 3 to 6. It is silt loam or silty clay loam. The Btx and C horizons are clay loam, silty clay loam, or silt loam. The Btx horizon has hue of 10YR or 2.5Y and chroma of 3 to 6. The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 to 6.

Wooster Series

The Wooster series consists of deep, well drained, moderately slowly permeable soils on uplands. These soils formed in glacial till. They have a dense fragipan. Slopes range from 25 to 50 percent.

Wooster soils are commonly adjacent to Canfield and Ravenna soils, which are in the less sloping areas. Canfield soils are moderately well drained, and Ravenna soils are somewhat poorly drained.

Typical pedon of Wooster silt loam, 25 to 50 percent slopes, about 2.5 miles north of Brookfield Center; in Brookfield Township; 260 yards north of the intersection of State Route 7 and Boyle Road along State Route 7, then 415 yards east:

Oi—2 inches to 0; forest litter of partially decomposed leaves and twigs.

A—0 to 3 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine and medium granular structure; friable; common roots; about 3 percent coarse fragments; very strongly acid; clear wavy boundary.

E—3 to 6 inches; brown (10YR 5/3) silt loam; weak medium subangular blocky structure; friable; common roots; very dark gray (10YR 3/1) organic stains in root channels; about 3 percent coarse fragments; very strongly acid; clear wavy boundary.

BE—6 to 10 inches; yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure; friable; common roots; very dark gray (10YR 3/1) organic stains in root channels; about 5 percent coarse fragments; very strongly acid; clear wavy boundary.

Bt1—10 to 13 inches; yellowish brown (10YR 5/4) silt loam; common fine faint yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; common roots; few faint brown (10YR 5/3) and few faint light yellowish brown (10YR 6/4) clay films on faces of peds; about 5 percent coarse fragments; very strongly acid; clear wavy boundary.

Bt2—13 to 23 inches; yellowish brown (10YR 5/4) silt loam; common medium faint yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; common roots; few faint brown (10YR 5/3) and few faint dark yellowish brown (10YR 4/4) clay films on faces of peds; about 10 percent coarse fragments; very strongly acid; clear wavy boundary.

Btx1—23 to 33 inches; brown (10YR 4/3) loam; weak very coarse prismatic structure parting to moderate medium platy; very firm; brittle; few faint gray (10YR 6/1) clay films on faces of peds; strong brown (7.5YR 5/6) rind between the clay films and the prism interior; few faint light brownish gray (10YR 6/2) silt coatings on vertical faces of peds; few fine very dark grayish brown (10YR 3/2) stains of iron and manganese oxide; about 10 percent coarse fragments; strongly acid; clear wavy boundary.

Btx2—33 to 40 inches; brown (10YR 4/3) loam; weak very coarse prismatic structure parting to weak thick platy; very firm; brittle; common faint grayish brown (10YR 5/2) clay films on faces of peds; strong brown (7.5YR 5/6) rind between the clay films and the prism interior; few faint light brownish gray (10YR 6/2) silt coatings on vertical faces of peds; few medium black (10YR 2/1) stains and concretions of iron and manganese oxide; 10 percent coarse fragments; strongly acid; gradual wavy boundary.

Btx3—40 to 50 inches; dark brown (10YR 4/3) loam; weak very coarse prismatic structure parting to weak thick platy; very firm; brittle; common faint grayish brown (10YR 5/2) clay films on faces of peds; strong brown (7.5YR 5/6) rind between the clay films and the prism interior; few medium very dark gray (10YR 3/1) stains and concretions of iron and manganese oxide; about 10 percent coarse fragments; strongly acid; gradual wavy boundary.

Btx4—50 to 58 inches; brown (10YR 4/3) loam; weak very coarse prismatic structure parting to weak thick platy; very firm; brittle; common faint grayish brown (10YR 5/2) clay films on faces of peds; strong brown (7.5YR 5/6) rind between the clay films and the prism interior; about 10 percent coarse fragments; medium acid; clear wavy boundary.

C—58 to 66 inches; brown (10YR 4/3) gravelly loam; many medium distinct yellowish brown (10YR 5/6) mottles; massive; firm; about 30 percent coarse fragments; neutral.

The solum ranges from 40 to 60 inches in thickness. Carbonates are at a depth of 60 to 100 inches in some pedons. The content of coarse fragments, dominantly sandstone fragments, ranges from 2 to 20 percent above the fragipan, from 5 to 25 percent in the fragipan, and from 5 to 30 percent in the C horizon.

The A horizon has value of 2 or 3 and chroma of 1 or 2. It is dominantly silt loam but is loam or gravelly loam in some pedons. The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. It is dominantly loam, silt loam, or the gravelly analogs of those textures, but in some pedons it has subhorizons of clay loam. The Btx horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is dominantly loam, silt loam, or the gravelly analogs of those textures, but in some pedons it has thin subhorizons of clay loam or silty clay loam. The C horizon has hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 4 to 6. It is dominantly loam or gravelly loam, but the range includes gravelly sandy loam and gravelly silt loam.

Formation of the Soils

This section describes how the major factors of soil formation have affected the soils in Trumbull County and explains some of the processes of soil formation.

Factors of Soil Formation

Soils form through processes that act on deposited or accumulated geologic material. The major factors of soil formation are parent material, climate, relief, living organisms, and time.

Climate and living organisms, particularly vegetation, are the active forces of soil formation. Their effect on the parent material is modified by relief and by the length of time that the parent material has been acted upon. The relative importance of each factor differs from place to place. In some areas one factor determines most of the soil properties. Normally, however, the interaction of all five factors determines what kind of soil forms in any given place.

Parent Material

The soils in Trumbull County formed in several kinds of parent material. These are glacial till, glacial outwash, lacustrine material, shale residuum, accumulated organic material, windblown deposits, and recent alluvium derived from these various kinds of material.

The county was covered by glaciers several times during the Pleistocene *(23)*. Glacial drift, a general term for extensive glacial deposits that include both till and outwash, is the most extensive kind of parent material in the county. The till is fairly homogenous and uniform in texture, and the soils that formed in this material have a medium textured to fine textured subsoil. Many of the soils on terraces formed in glacial outwash. Nearly all of the soils on uplands, including Mahoning, Ravenna, Platea, Remsen, Geeburg, Ellsworth, Rittman, and Canfield soils, formed in glacial till. An exception is Brecksville soils, which formed in shale residuum on side slopes in dissected areas.

Sand and gravel outwash was deposited by the many streams of glacial meltwater. In places glacial kames formed. Much of this fairly well sorted, coarse textured material was covered by loamy outwash. Chili and Jimtown soils formed in these materials. Chili soils are dominantly brown and strong brown because natural drainage is good. Jimtown soils are mottled with light brownish gray because they formed in areas where the water table is high and aeration is poor during a part of the year. The county has a few dunes. Lakin soils formed in the windblown, sandy material on these dunes.

The major areas of lacustrine material, or lake-bottom sediments, are in the Mahoning and Grand River systems. The interlayered silty and clayey characteristics of the parent material in these areas are evident in the medium textured to fine textured subsoil of the Sebring, Fitchville, Glenford, Canadice, and Caneadea soils.

Alluvial material was carried and deposited by floodwaters. It is the youngest parent material in the county. It is still accumulating, as fresh sediments are added periodically when streams overflow their banks. These sediments are derived mainly from the surface layer of soils and exposed glacial drift in the higher surrounding areas. Holly, Orrville, and Tioga soils formed in deep, silty or loamy, relatively fertile, strongly acid to mildly alkaline alluvial material.

Organic material has accumulated in a few scattered areas along Mosquito and Pymatuning Creeks and in the valleys of the Mahoning and Grand Rivers. This material consists mainly of the decomposed remains of trees, sedges, and grasses. It is in depressions and drainageways that are permanently wet because of a high water table and seepage. Carlisle soils formed in deep, fertile, black to very dark gray, very strongly acid to neutral organic material.

Climate

Because it is fairly uniform, the climate in Trumbull County has not resulted in significant differences among the soils in the county. It has favored both physical change and chemical weathering of the parent material and biological activity. Rainfall and temperature have favored plant growth and the subsequent accumulation of some organic matter in all of the soils in the county.

The amount of rainfall has been adequate for percolating water to leach carbonates to a depth of about 3 feet in some soils, such as Remsen and Mahoning soils, and more than 4 feet in other soils, such as Chili and Rittman soils. Wetting and drying cycles have favored the translocation of clay minerals and the development of soil structure in Mahoning, Ellsworth, and other soils.

Temperature variations have favored physical change and chemical weathering of the parent material. Freezing and thawing contribute to the development of soil structure, and warm temperatures in the summer promote chemical reactions in the weathering of primary minerals.

Relief

Relief can account for the formation of different soils from the same kind of parent material. Ellsworth, Mahoning, and Condit soils, for example, formed in glacial till. The moderately well drained Ellsworth soils formed in areas where the slope is not steep enough for excessive erosion and not so nearly level that runoff is ponded. The somewhat poorly drained Mahoning soils formed in areas where runoff is slow or medium. The poorly drained Condit soils formed in depressions and on flats where the water table is high several months of the year.

Living Organisms

Plants, animals, bacteria, fungi, and other living organisms affect soil formation. At the time Trumbull County was settled, the native vegetation consisted of hardwoods, including beech, maple, oak, hickory, ash, and elm *(9)*. The soils that formed in these forested areas are subject to leaching. As a result, the subsoil generally is lower in content of exchangeable bases than the substratum.

Small animals, insects, earthworms, and roots leave channels in the soil, making it more permeable. Animals mix the soil material and contribute organic matter to the soil. Wormholes or worm casts are plentiful in the highly organic surface layer of forested and grassed mineral soils, such as Ellsworth and Rittman soils. Crawfish channels are prevalent in the poorly drained or very poorly drained Canadice, Sebring, and Lorain soils.

Human activities, mainly plowing and planting, also affect the formation of soils. In some areas soil formation is affected by a drainage or irrigation system or the removal of soil material for construction purposes. Applications of lime and fertilizer change the chemistry of the soils.

Time

Time is needed for the other soil-forming factors to produce their effects. The age of a soil is indicated, to some extent, by the degree of profile development. In many areas factors other than time have been responsible for most of the variations in the kind and distinctness of horizons in the different soils. If the parent material weathers slowly, the profile forms slowly. If slopes are steep and soil is removed almost as fast as it forms, no distinct horizons can form.

Most of the soils in the county have well developed profiles, including Ellsworth, Mahoning, and Chili soils. Periodic depositions of fresh sediments interrupt soil formation on flood plains. Holly and Orrville soils, which are on the flood plains, are examples of soils in which horizons are not well expressed.

Processes of Soil Formation

The processes of soil formation have resulted in distinct changes in the parent material in which most of the soils in the county formed. For example, the soils that formed in glacial till on uplands and in glacial outwash on terraces along the major valleys show evidence of distinct changes. In contrast, the soils on flood plains differ only slightly from the material in which they formed.

Four main processes are responsible for horizon differentiation. These are additions, removals, transfers, and transformations *(14)*. Some of these processes promote horizon differentiation, and others retard differentiation or obliterate existing differences.

The accumulation of organic matter is an example of an addition to the soil. Carlisle, Lorain, and other soils that formed in areas where a high water table has restricted the decomposition of organic matter have a thick, dark surface layer. The surface layer is high in content of organic matter and has good structure. Base saturation exceeds 50 percent. Some organic matter accumulates as a thin mat on the surface of most soils, but this mat is generally obliterated by cultivation. Severe erosion can remove all evidence of this addition to the soil.

The leaching of carbonates from calcareous parent material is a significant loss that precedes many other chemical changes in the soil. Most of the glacial till in Trumbull County has a low content of carbonates, generally 5 to 15 percent. In most of the soils, carbonates have leached to a depth of 36 inches or more; consequently, the upper 36 inches is acid. Other minerals in the soil are subject to the same chemical weathering, but their resistance is higher and therefore removal is slower. Following the removal of carbonates, alteration of such minerals as biotite and feldspar results in changes in color within the profile. Free iron oxides are produced and, if segregated by a fluctuating high water table, are the cause of gray colors and mottling. This process is evident in Sebring soils. Unless the water table is seasonally high, the upper horizons typically have brownish colors that have stronger chroma or redder hue than is typical in the C horizon.

Seasonal wetting and drying of the soil are largely responsible for the transfer of clay from the A horizon to the faces of peds in the B horizon. The fine clay particles become suspended in percolating water moving through the A horizon and are carried downward to the B horizon. This transfer of fine clay accounts for the common or many clay films on the faces of peds in the B horizon of Ellsworth and Fitchville soils.

Transformations of mineral compounds occur in most of the soils. The results are most apparent if the formation of horizons is not affected by rapid erosion or by the accumulation of material at the surface. The primary silicate minerals are weathered chemically. As this weathering occurs, secondary minerals, mainly layer-lattice silicate clays, are produced. Most of these clays remain in place in the profile. Clay from the A horizon, however, is transferred to the lower horizons.

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Glossary

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.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

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.

Bedding planes. Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bedrock-controlled topography. A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

California bearing ratio (CBR). The load-supporting capacity of a soil as compared to that of a standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a channer.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

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.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are:

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Depth, soil. The depth to bedrock. Deep soils are more than 40 inches deep over bedrock, moderately deep soils are 20 to 40 inches deep over bedrock, and shallow soils are 10 to 20 inches deep over bedrock.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Esker (geology). A narrow, winding ridge of stratified gravelly and sandy drift deposited by a stream flowing in a tunnel beneath a glacier.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, or clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 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.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, any plowed or disturbed surface layer.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) granular, prismatic, or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame (geology). An irregular, short ridge or hill of stratified glacial drift.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium,* from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse,* more than 15 millimeters (about 0.6 inch).

Muck. Dark colored, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color 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 plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

Parent material. The unconsolidated organic and mineral material in which soil forms.

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.

Perimeter drain. An artificial drain installed around the perimeter of a septic tank absorption field to lower the water table; also called a curtain drain.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
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.

Sandstone. Sedimentary rock containing dominantly sand-sized particles.

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 rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

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 substratum. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

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.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slippage (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

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 ensure satisfactory performance of the soil for a specific use.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the substratum. The living roots and plant and animal activities are largely confined to the solum.

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 soil blowing and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from soil blowing and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Breaking up a compact subsoil by pulling a special chisel through the soil.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from about 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons. It includes all subdivisions of these horizons.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

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.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, that are in soils in extremely small amounts. They are essential to plant growth.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve. A sedimentary layer of a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Water bar. A shallow trench and a mound of earth constructed at an angle across a road or trail to intercept and divert surface runoff and control erosion.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.