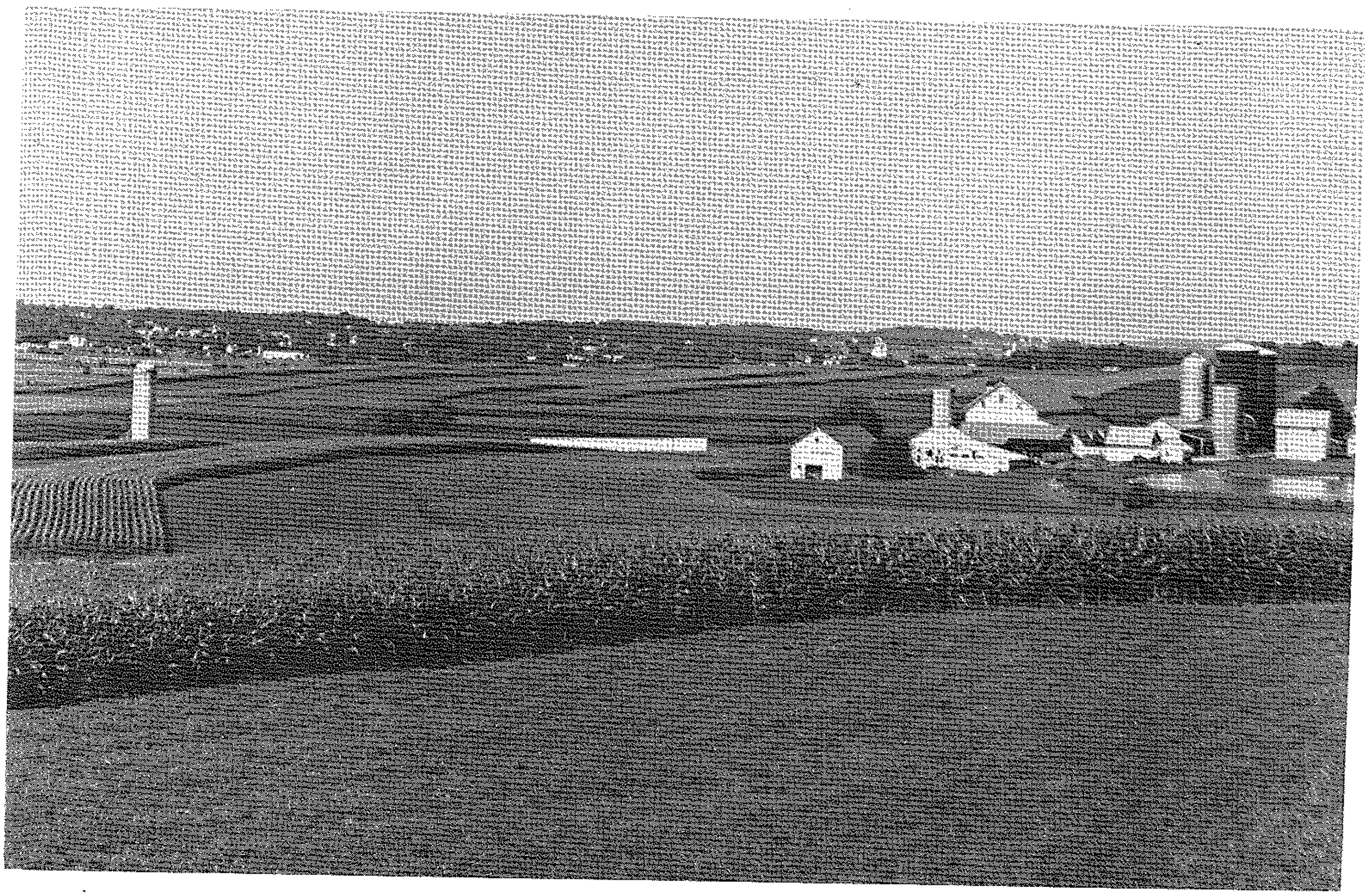
United States Department of Agriculture

Soil Conservation Service

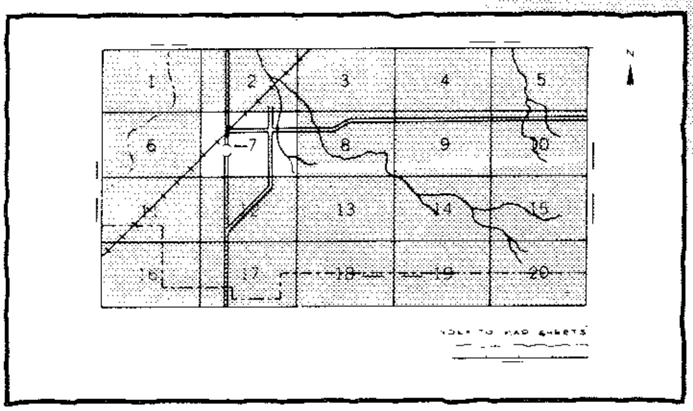
In cooperation with Ohio Department of Natural Resources, Division of Lands and Soil, and the Ohio Agricultural Research and Development Center

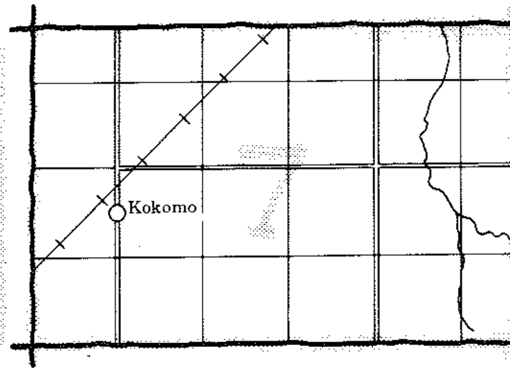
Soil Survey of Wayne County Ohio



HOW TO US

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





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

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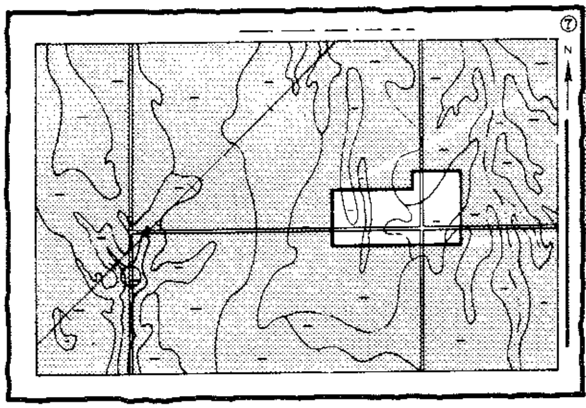
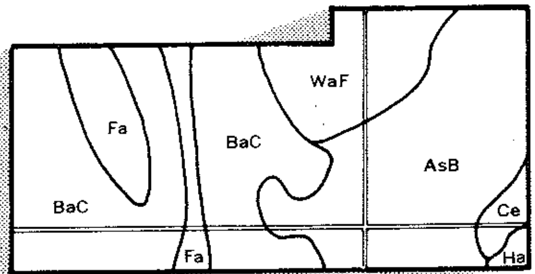
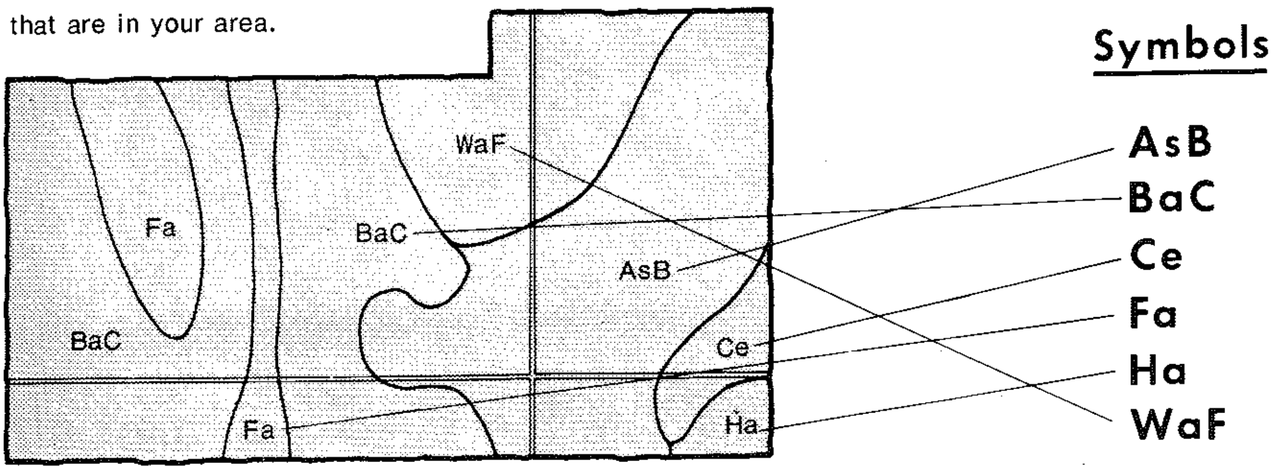




4. List the map unit symbols that are in your area.



IS SOIL SURVEY

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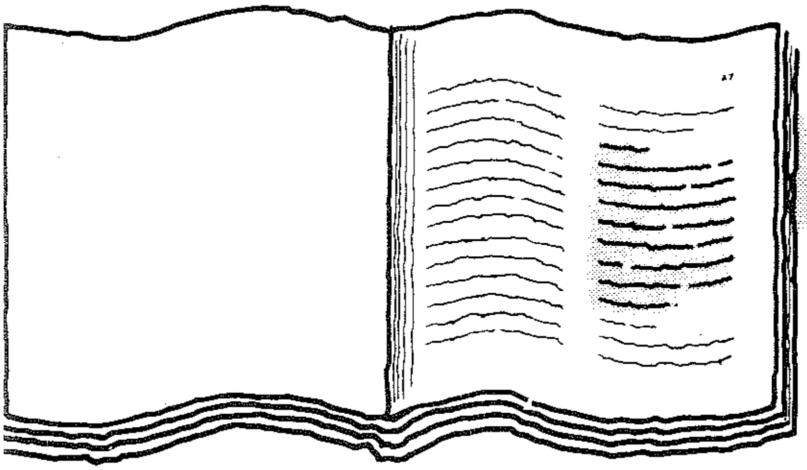
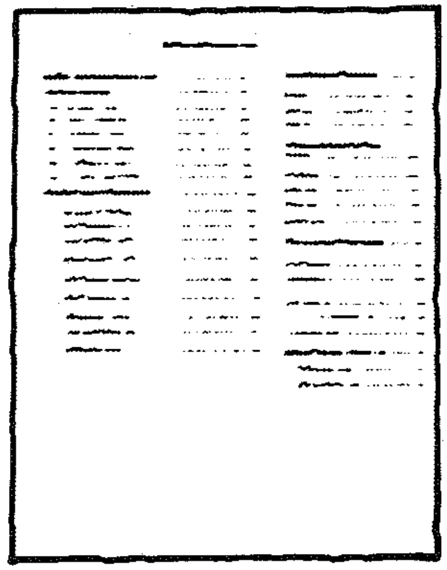
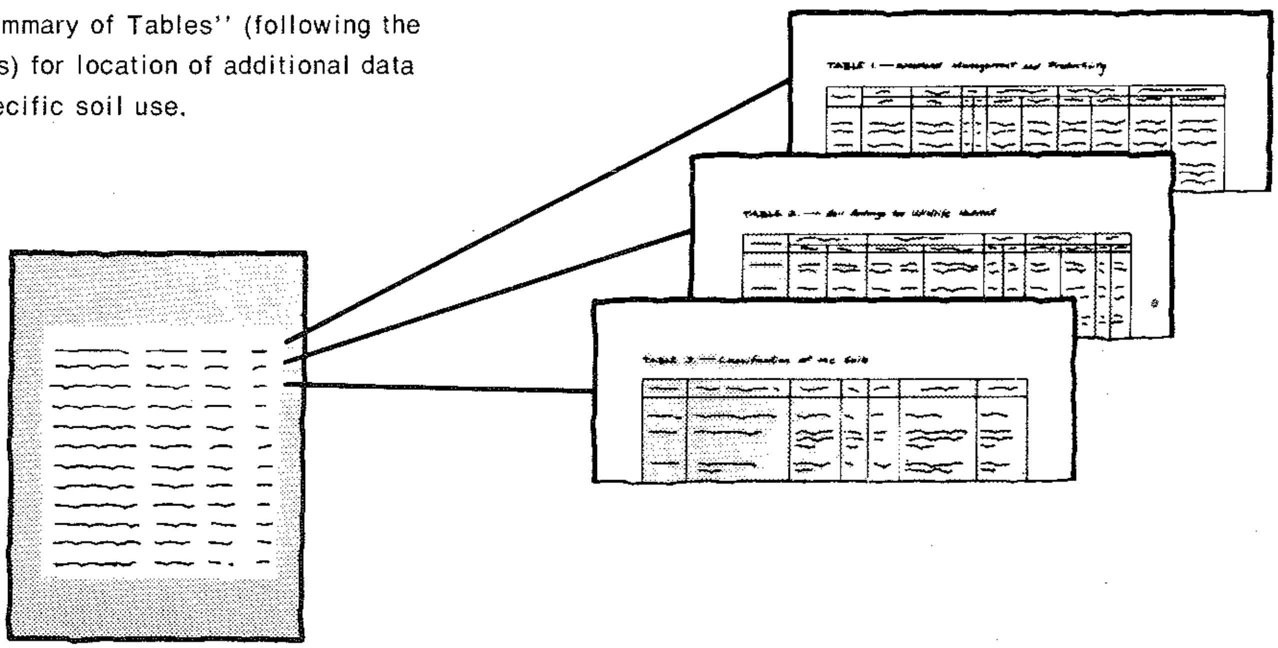




See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



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

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

This survey was made by the Soil Conservation Service in cooperation with the Ohio Department of Natural Resources, Division of Lands and Soil, and the Ohio Agricultural Research and Development Center. This survey was funded in part by the Wayne County Commissioners. It is part of the technical assistance furnished to the Wayne Soil and Water Conservation District. Major fieldwork was completed in 1980. Soil names and descriptions were approved in 1981. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1981.

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.

Part of Wayne County was included in the Soil Survey of the Wooster Area, which was published in 1905.

Cover: Stripcropping and grass cover are used to control erosion in this area of the Canfield-Wooster-Riddles association.

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Soil Series

Issued July 1984

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Summary of Tables

Foreword

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

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

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

Robert R. Shaw
State Conservationist
Soil Conservation Service

Location of Wayne County in Ohio.

Soil Survey of Wayne County, Ohio

By M. F. Bureau, T. E. Graham, and R. J. Scherzinger,
Soil Conservation Service

Fieldwork by M. F. Bureau, T. E. Graham, R. J. Scherzinger,
E. N. Hayhurst, D. E. Ludwick, and M. M. Cashell,
Soil Conservation Service

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

WAYNE COUNTY is in northeastern Ohio. It takes in an area of about 561 square miles, or 358,912 acres. In 1980, the county had a population of 97,408. Wooster, the county seat, is the largest city. The Ohio Agricultural Research and Development Center, the major center of agricultural research in Ohio, is located about 1 mile south of Wooster.

Wayne County is the leading county in Ohio in the production of dairy products, and it ranks third in total cash receipts from farming (5). Although the county is dominantly agricultural, nonfarm development, particularly residential development, is steadily taking place.

General Nature of the County

This section gives an overview of the early history of the area and briefly discusses present-day farming, industry, and transportation in Wayne County as well as natural resources, educational and research facilities, physiography, and climate.

Early Settlement

Ward Konkle, Wayne County Historical Society, helped prepare this section.

The original Wayne County was established on August 15, 1796, by proclamation of General Arthur St. Clair, governor of the Northwest Territory. Wayne County was named in honor of General Anthony Wayne. It was the sixth county to be formed in the territory and comprised about one-third of the present State of Ohio, all of Michigan, and parts of Indiana, Illinois, and Wisconsin.

The boundaries of Wayne County were redrawn by the Ohio Legislature in 1808 to include all of the present Wayne County and parts of what are now Holmes and Ashland Counties. When those two counties were established—Holmes in 1824 and Ashland in 1846—the boundaries of Wayne County were fixed as they are today.

The first white settler of record in the county was William Larwill, a native of Kent, England, who arrived in 1806. Early settlers found the land densely covered with hardwood forest except the marshy bottom lands, which are mainly in the lower Killbuck Valley. The chief Indian tribes living in the area were the Delaware, Wyandot, and Shawnee. The first town was named Wooster to commemorate a Revolutionary War general. The first courthouse was established in 1811; by then, Wooster had been selected as the county seat. When news of the War of 1812 reached Wooster, the first fort was built to protect the early settlers.

Farming

Farming is the principal land use in Wayne County. In 1967, about 60 percent of the land was used as cropland and 12 percent was used as pasture (10). Wayne County is the largest producer of dairy products in Ohio (4). Dairy products account for more than 50 percent of all cash receipts from farm marketing. Cattle and calves account for about 15 percent; poultry, 3 percent; hogs, 6 percent; corn, 8 percent; soybeans, 4 percent; and wheat, 3 percent. A large percentage of the milk produced is used for making cheese. In some parts of the county, potatoes and small fruits are important crops. The total cash receipts from farm marketing in Wayne County during 1980 were 109.3 million dollars.

In 1980, 8,485,000 bushels of corn were harvested for grain (5). Also harvested that year were 660,000 bushels of soybeans, 728,000 bushels of wheat, 879,000 bushels of oats for grain, and 172,000 tons of hay. The oats are used mainly by the Amish as feed for horses. Much of the corn is chopped for silage.

In 1980, there were about 2,070 farms in Wayne County averaging 139 acres each (5). Many of the smaller farms are in the more hilly southern part of the county and especially in the south-central and southeastern parts where the Amish culture is dominant. The larger farms, ranging from about 500 to 800 acres or more, are mainly in the north-central and northern parts of the county, where most of the land is gently rolling.

Industry

Industry in Wayne County is highly diversified. Factories in Wooster manufacture plastic and rubber products, paintbrushes, firefighting equipment, custom trucks, potato chips, and many other products. Wooster is Ohio's largest center for services to the oil and gas industry. The products of factories in Orrville range from jams, jellies, and ice cream to pipe organs. Rittman has the nation's largest salt plant and the world's largest paperboard and package factory. In addition to Orrville and Wooster, several other communities have facilities for handling grain, cattle, and other agricultural products.

Transportation

Wayne County is served by 3 railroads, a major bus company and 3 smaller buslines, and about 40 trucking firms. State Routes 3, 83, and 385 and U.S. Routes 30 and 250 are major highways connecting Wooster with other areas of commerce. There are two airstrips for small planes in the county. The Wayne County Airport is near Smithville, and the other airstrip is near Orrville.

Natural Resources

The natural resources of Wayne County include its soil, which lends itself to producing high yields of crops and pasture. Erosion is a major hazard on the sloping to very steep soils. Poor natural drainage is the major limitation on the less sloping soils. Nevertheless, most of the soils are highly productive if adequate artificial drainage is provided, if erosion is controlled, and if the soil is otherwise well managed. The large acreage of prime farmland in the county is under pressure for nonagricultural uses.

Major deposits of sand and gravel suitable for commercial use are in the Killbuck Creek valley just south of Wooster and along the eastern border of the county in Chippewa and Baughman Townships. Surface mining for coal is widespread in the south-central and southeastern parts of the county. Limestone is quarried just west of Fredericksburg. Also, there is extensive exploration for oil and natural gas.

In Rittman, a major salt company extracts common salt from brine solution pumped from deep deposits. Clay tile is manufactured near Orrville from local clay deposits.

Education and Research

Wayne County is well endowed with educational and research facilities. The state agricultural research center, a 2-year agricultural school, and a 2-year general and technical college (which is a branch of Akron University) are located in the county. The College of Wooster, a 4-year liberal arts college, and a 2-year business college are in the city of Wooster.

The Ohio Agricultural Research and Development Center is located a mile south of Wooster on State Routes 250 and 83. Its main purpose is to conduct basic and applied research in agriculture and home economics and their related fields (fig. 1). The land used by the research center includes about 2,000 acres in Wayne County and 5,000 acres in other parts of Ohio. The professional staff of the research center consists of about 250 scientists, including 160 faculty members at Ohio State University who work part-time at the center. About 300 to 350 research projects are in progress at any one time.

The Agricultural Technical Institute, a branch of Ohio State University, is located at the Ohio Agricultural Research and Development Center. This institute offers a 2-year Associate of Applied Science degree in various specialized agricultural technologies. About 800 students are enrolled.

Attractions at the research center include the 75-acre Secrest Arboretum, which features a collection of yews, a dawn redwood planting, a rhododendron display, a collection of flowering crabapples, and a collection of old roses consisting of some 500 varieties. The Fisher Auditorium houses a statistics laboratory and a research library of 70,000 volumes as well as the auditorium itself, which seats 1,000 persons. Thousands of people visit the research center annually for specialized field days or guided tours.

Physiography, Relief, and Drainage

Wayne County is a county of contrasts. Although the entire area has been glaciated, the landforms are

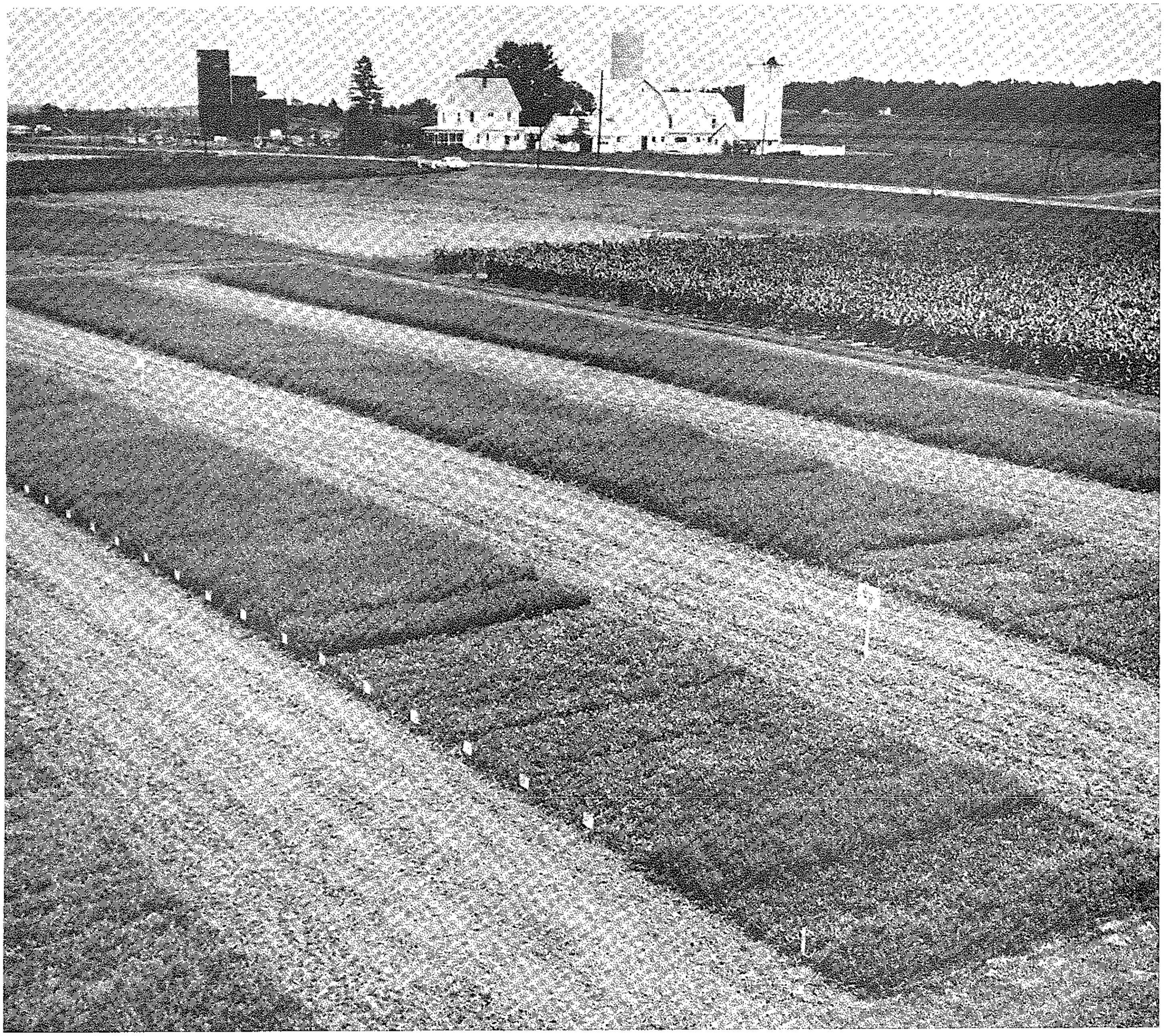

Figure 1.—Research and trial plots at the Ohio Agricultural Research and Development Center. Canfield and Wooster soils are the dominant soils in this area.

sufficiently diverse to include postglacial lakebeds; broad, flat wetlands; and steep, hilly country.

The northern two-thirds of the county is dominantly gently sloping glacial ground moraines (15). A large part of the prime farmland in Wayne County is in this area. In Milton and Chippewa Townships, there are broad, flat lowlands where the soils formed in silty material. The soils in much of this area are poorly drained, and in some places there are small organic deposits. Silty deposits that have greater relief extend southward toward Orrville. Some scattered silty deposits in Congress Township are the remnants of a postglacial lakebed.

West and north of the city of Wooster, Killbuck Creek has carved out a very prominent north-south valley, which has steep, rocky side slopes. The land close to this valley is deeply dissected by many small tributaries. South of Wooster, the valley walls are farther apart and not so steep. The flood plain of Killbuck Creek is inundated all year in many places. This wet, low region extends southward into Holmes County and is locally known as Killbuck Swamp.

In the southern third of Wayne County, the flat lowlands in the west are surrounded by higher, hilly land. There are large organic deposits in this area. Many of the low areas are subject to flooding. In general, the most rugged terrain lies along the southern edge of the county, where the relief is greatest and the underlying bedrock outcrops prominently in many places.

Seven watersheds make up more than 90 percent of Wayne County. The most extensive of them is the Killbuck Creek drainage system. It crosses the western half of the county from north to south and drains about 73,300 acres, or 20 percent of the county. Apple Creek is a major tributary of Killbuck Creek. Apple Creek and its tributaries drain about 35,200 acres in the central part of the county.

The Chippewa Creek system in the northeastern part of the county drains about 68,000 acres. Just south of it, Newman Creek drains an area of about 26,600 acres, which abuts on the county line to the east.

Sugar Creek drains an area of about 67,200 acres, which extends from the north-central part of the county to the southeast corner. In the south-central part, Salt Creek drains an area of about 16,700 acres, which lies between the Killbuck Creek watershed and the headwaters of Apple Creek and of Little Sugar Creek.

The watershed of Muddy Fork is mainly in Ashland County; about 43,500 acres is in Wayne County along the western border. The Kiser Ditch, a major tributary in Clinton and Plain Townships, flows north and northwest into the Muddy Fork.

About 28,400 acres along the county line, or almost 8 percent of Wayne County, is drained by other, smaller waterways, which flow into the surrounding counties.

Climate

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

Wayne County is cold in winter but quite hot in summer. Precipitation in winter, which is generally snow, results in an accumulation of moisture in most soils by spring sufficient enough to minimize drought in summer. The normal annual precipitation is adequate for all crops that are adapted to the temperature and length of the growing season in the area.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Wooster, Ohio, in the period 1951 to 1978. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 27 degrees F, and the average daily minimum temperature is 19 degrees. The lowest temperature on record, which occurred at Wooster on January 24, 1963, 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 June 26, 1952, is 99 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (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, 21 inches, or 60 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 17 inches. The heaviest 1-day rainfall during the period of record was 9.37 inches at Wooster on July 5, 1969. Thunderstorms occur on about 40 days each year, and most occur in summer.

The average seasonal snowfall is 36 inches. The greatest snow depth at any one time during the period of record was 20 inches. On an average of 28 days, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 65 percent of the time possible in summer and 35 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 12 miles per hour, in spring.

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

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 the 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 biologic 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 considerable 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, acidity, 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 interpreted the data from these analyses and tests as well as the field-observed characteristics and the soil properties in terms of expected behavior of the soils under different uses. Interpretations for all of the soils were field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and new interpretations sometimes are developed to meet local needs. Data were 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 were 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 state with a fairly high degree of probability 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.

A part of Wayne County was included in the Soil Survey of the the Wooster Area, published in 1905 (11). This soil survey provides additional information about Wayne County and contains larger maps that show the soils in greater detail.

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 mentioned 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 soils 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.

General Soil Map Units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit, or association, on the general soil map 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 other associations 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.

Soil Descriptions

1. Canfield-Wooster-Riddles Association

Nearly level to moderately steep, moderately well drained and well drained, deep soils that formed mainly in loamy glacial till

The soils in this association are in areas dominated by broad, nearly level and gently sloping till plains that have low hills and ridges with broad bases. They are also near major drainageways and in other areas characterized by sloping and moderately steep hillsides and high ridges that have well-defined local relief.

This association makes up about 47 percent of the county. It is about 35 percent Canfield soils, 15 percent Wooster soils, 15 percent Riddles soils, and 35 percent soils of minor extent.

Canfield soils are mainly between drainageways on uplands. They are nearly level to sloping and are moderately well drained. They have a fragipan between depths of 15 and 30 inches that restricts root growth. Permeability is moderate above the fragipan and slow in the fragipan. The content of organic matter is moderate or moderately low, and the available water capacity in the zone above the fragipan is low. A seasonal high water table is at a depth of 18 to 36 inches during extended wet periods.

Wooster soils generally are on side slopes along drainageways and on the steeper knolls and ridges. They are gently sloping to moderately steep. They are well drained. They have a fragipan between depths of 20 and 36 inches that restricts root growth. Permeability is moderately slow. The content of organic matter is moderate or moderately low, and the available water capacity in the zone above the fragipan is low. Wooster soils have a seasonal high water table at a depth of 48 to 72 inches.

Riddles soils are in positions similar to those of Wooster soils. They are gently sloping to moderately steep, and they are well drained. Permeability is moderate, and the content of organic matter is moderate or moderately low. The available water capacity is moderate or high.

Some of the minor soils in this association are the somewhat poorly drained Ravenna and Orrville soils, the poorly drained Sebring soils, and the well drained Berks soils. Ravenna soils are in low-lying and nearly level areas adjacent to Canfield soils. Orrville soils are on flood plains. Sebring soils are in shallow depressions and along small drainageways. Berks soils are on side slopes along waterways.

The soils making up this association are used mainly for general farming and dairy farming. The main crops are corn, soybeans, and small grains. In some areas the soils are used for hay and pasture. Many of the steeper soils are wooded. The nearly level and gently sloping soils are well suited to crops and pasture (fig. 2). The sloping and moderately steep soils are moderately well suited and poorly suited to row crops and small grains and are well suited and moderately well suited to hay and pasture. The soils are well suited to use as woodland. They are dominantly moderately well suited as a site for buildings and septic tank absorption fields.

The hazard of erosion, seasonal wetness, and the moderately slow or slow permeability are the main limitations. Conservation tillage, which leaves crop residue on the surface, stripcropping, grassed waterways, and other conservation practices reduce runoff and soil erosion in cultivated areas. The Wooster and Riddles soils are better suited to use as a site for buildings than the Canfield soils. The seasonal high water table and slow permeability limit the use of the Canfield soils as a site for septic tank absorption fields and buildings. Perimeter drains around septic tank absorption fields and drains at the base of footings reduce seasonal wetness.

Figure 2.—Wooster-Riddles silt loams, 2 to 6 percent slopes, in an area of the Canfield-Wooster-Riddles association. The soils are well suited to grasses and legumes for hay and pasture.

2. Rittman-Wadsworth Association

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

The soils in this association are in broad areas that have low hills and ridges with broad bases. The sloping and moderately steep soils are mainly adjacent to drainageways. In some places they are on long, uniform side slopes of knolls and ridges.

This association makes up about 12 percent of the county. It is about 55 percent Rittman soils, 30 percent Wadsworth soils, and 15 percent soils of minor extent.

Rittman soils are gently sloping to moderately steep. They are mainly on side slopes of ridges, knolls, and drainageways. They are moderately well drained. Rittman soils have a fragipan between depths of 18 and 32 inches that restricts root growth. Permeability is moderate above the fragipan and slow in the fragipan. The content of organic matter is moderate or moderately low, and the available water capacity is low. A seasonal high water table is at a depth of 18 to 36 inches during extended wet periods.

Wadsworth soils are nearly level and gently sloping and are somewhat poorly drained. They have a fragipan between depths of 18 and 30 inches that restricts root growth. Permeability is moderate or moderately slow above the fragipan and slow or very slow in the fragipan. The content of organic matter is moderate, and the available water capacity is low. Wadsworth soils have a seasonal high water table at a depth of 12 to 24 inches during extended wet periods.

Some of the minor soils in this association are the poorly drained Sebring soils, the somewhat poorly drained Fitchville and Orrville soils, and the well drained Mechanicsburg soils. Fitchville and Sebring soils are in depressions and low-lying areas. Orrville soils are on flood plains along small streams. Mechanicsburg soils are on the steeper side slopes along drainageways and on a few knolls.

The soils making up this association are used mainly for dairy farming and general farming. The main crops are corn, soybeans, and small grains. In some areas the soils are used for hay and pasture. In a few areas they are wooded. The nearly level and gently sloping soils are well suited to row crops, hay, and pasture. The sloping and moderately steep soils are moderately well suited and poorly suited to row crops and small grains and well suited and moderately well suited to hay and pasture. The soils are dominantly moderately well suited or poorly suited as a site for buildings and septic tank absorption fields.

The hazard of erosion, seasonal wetness, and the slowly or very slowly permeable fragipan limit the use of these soils. Conservation tillage, which leaves crop residue on the surface, stripcropping, grassed waterways, and other conservation practices reduce runoff and erosion in cultivated areas. Subsurface drains can be used to lower the seasonal high water table. Water moves downslope along the top of the fragipan and can cause wetness around foundations and in basements. Drains at the base of footings can remove excess water from along foundations and basement walls. Perimeter drains around septic tank absorption fields help lower the seasonal high water table.

3. Bennington-Cardington Association

Nearly level to sloping, somewhat poorly drained and moderately well drained, deep soils that formed in loamy glacial till

The soils in this association are in broad, mainly flat areas that have some local relief, on broad, low knolls and ridges that have gently sloping and sloping side slopes, along drainageways, and on end moraines.

This association makes up about 6 percent of the county. It is about 40 percent Bennington soils, 40 percent Cardington soils, and 20 percent soils of minor extent.

Bennington soils are on flats and low knolls. They are nearly level and gently sloping and are somewhat poorly drained. Permeability is slow. The content of organic matter and the available water capacity are moderate. A seasonal high water table is at a depth of 12 to 30 inches during extended wet periods.

Cardington soils are on knolls and end moraines and on side slopes of ridges and along drainageways. They are gently sloping and sloping and are moderately well drained. Permeability is moderately slow, and the available water capacity is moderate. A seasonal high water table is at a depth of 24 to 42 inches during extended wet periods.

Some of the minor soils in this association are the well drained Alexandria soils on side slopes adjacent to waterways and the poorly drained Condit soils in small drainageways and slight depressions and on flats.

The soils making up this association are used mainly for dairy farming and general farming. The main crops are corn, soybeans, small grains, and hay. The soils are also used as pasture, and in a few areas they are wooded. The nearly level and gently sloping soils are well suited to row crops, small grains, hay, and pasture. The sloping soils are moderately well suited to corn and soybeans and are suited to hay and pasture. The soils are well suited to woodland. They are moderately well suited and poorly suited as a site for buildings and septic tank absorption fields.

The hazard of erosion, seasonal wetness, and the slow or moderately slow permeability limit the use of these soils. Conservation tillage, which leaves crop residue on the surface, stripcropping, and grassed waterways reduce runoff and erosion in areas that are farmed. Subsurface drains can be used to lower the seasonal high water table in the Bennington soils. Drains at the base of footings and exterior coating on basement walls help prevent wet basements. Perimeter drains around septic tank absorption fields lower the seasonal high water table.

4. Riddles-Cardington Association

Gently sloping to steep, well drained and moderately well drained, deep soils that formed in loamy glacial till

The soils in this association are dominantly on uniform slopes on hills and ridges. The slopes generally are short. Some areas are deeply dissected by tributaries of the major streams.

This association makes up about 3 percent of the county. It is about 60 percent Riddles soils, 35 percent Cardington soils, and 5 percent soils of minor extent.

Riddles soils are on the steeper part of side slopes of ridges and along drainageways. They are gently sloping to steep and are well drained. Permeability is moderate. The content of organic matter is moderate or moderately low. The available water capacity is moderate or high.

Cardington soils are on hills and ridgetops and on some side slopes. They are gently sloping and sloping and are moderately well drained. Permeability is moderately slow. The content of organic matter is moderate or moderately low, and the available water capacity is moderate. A seasonal high water table is at a depth of 24 to 42 inches during extended wet periods.

Some of the minor soils in this association are the somewhat poorly drained Bennington soils in flatter areas and at the head of drainageways and Orrville soils on flood plains.

The soils in this association are used mainly for general farming and dairy farming. The main crops are corn, soybeans, small grains, and hay. The soils are also used as pasture and woodland. The gently sloping soils are well suited to the commonly grown row crops and to pasture and are well suited and moderately well suited as a site for buildings and septic tank absorption fields.

The sloping soils are well suited to hay and pasture and moderately well suited to row crops, to building site development, and to septic tank absorption fields. The moderately steep and steep soils are poorly suited or not suited to continuous row crops, building site development, and septic tank absorption fields. The soils in this association are well suited to woodland.

The hazard of erosion, the seasonal high water table, and the slope limit the use of these soils. Conservation tillage, which leaves crop residue on the surface, stripcropping where it is practical, and grassed waterways help reduce runoff and soil erosion in cultivated areas. Riddles soils are better suited as a site for buildings and septic tank absorption fields than Cardington soils. Drains at the base of footings and exterior coating on basement walls can be used to help prevent wet basements on the Cardington soils. Buildings on sloping and moderately steep soils should be designed to conform to the natural slope of the land.

5. Mechanicsburg-Berks Association

Gently sloping to very steep, well drained, deep and moderately deep soils that formed in loamy glacial till and in residuum of siltstone, shale, and fine-grained sandstone

The soils in this association are in deeply dissected areas characterized by narrow ridges and on side slopes adjacent to major drainageways. Some are on high knolls and broader ridges.

This association makes up about 7 percent of the county. It is about 45 percent Mechanicsburg soils, 15 percent Berks soils, and 40 percent soils of minor extent.

Mechanicsburg soils commonly are on ridges and knolls and on side slopes along major drainageways. They are well drained and gently sloping to moderately steep. Permeability is moderate. The content of organic matter is moderate or moderately low, and the available water capacity is low or moderate.

Berks soils are on side slopes along drainageways. They are well drained and moderately steep to very steep. Permeability is moderate or moderately rapid. The content of organic matter is moderate, and the available water capacity is very low.

Some of the minor soils in this association are the moderately well drained Canfield soils, the well drained Dekalb, Wooster, and Loudonville soils, and the somewhat poorly drained Mitiwanga soils. Canfield and Mitiwanga soils are in depressions and on flats and low knolls. Dekalb and Loudonville soils are intermingled with the major soils. Wooster soils are on knolls, ridges, and side slopes.

The soils in this association are used mainly for general farming and dairy farming. Corn, soybeans, small grains, and hay are the principal crops on the gently sloping soils. The soils on side slopes along most of the deeper drainageways are in mixed hardwoods and evergreens. Except for the gently sloping and sloping Mechanicsburg soils in broad areas, the soils in this association are poorly suited or not suited to row crops, building site development, and septic tank absorption fields. Only the gently sloping soils are well suited to hay and pasture. The steeper soils are best suited to use as woodland.

The slope, the moderate depth to bedrock, the low and very low available water capacity, and the hazard of erosion are the major limitations. The soils are droughty in extended dry periods. The Mechanicsburg soils are better suited to most uses than the Berks soils because they are deeper to bedrock and not so steep. Tillage that leaves crop residue on the surface, stripcropping, and grassed waterways reduce runoff and soil erosion in cultivated areas. The soils are well suited to no-till. Buildings in many areas should be designed to conform to the natural slope of the land.

6. Chili-Jimtown-Bogart Association

Nearly level to very steep, well drained to somewhat poorly drained, deep soils that formed in sandy and loamy glacial outwash

The soils in this association are on side slopes of drainageways, on slope breaks between terraces and flood plains, and on flats, knolls, and slight rises on stream terraces, outwash plains, and kames. The soils are dominantly gently sloping.

This association makes up about 7 percent of the county. It is about 40 percent Chili soils, 20 percent Jimtown soils, 15 percent Bogart soils, and 25 percent soils of minor extent.

Chili soils are on flats, knolls, side slopes of deeply entrenched drainageways, and slope breaks between terraces and flood plains. They are gently sloping to very steep and are well drained. Permeability is moderately rapid. The content of organic matter is moderate or moderately low. The available water capacity is moderate or low.

Jimtown soils are on flats and slight rises on stream terraces and outwash plains where local relief is slight. They are nearly level and gently sloping and are somewhat poorly drained. Permeability and the content of organic matter are moderate. The available water capacity is moderate or high. A seasonal high water table is at a depth of 12 to 30 inches during extended wet periods.

Bogart soils are on flats and slight rises on stream terraces, outwash plains, and kames. They are moderately well drained, nearly level and gently sloping soils. Permeability is moderate or moderately rapid in the subsoil and rapid in the substratum. The content of organic matter and the available water capacity are moderate. These soils have a seasonal high water table at a depth of 24 to 42 inches.

Some of the minor soils in this association are the somewhat poorly drained Euclid, Fitchville, and Orrville soils and the very poorly drained Luray soils. Euclid soils are on low stream terraces, and Orrville soils are on flood plains. Both soils are subject to flooding. Fitchville and Luray soils are in depressions and low-lying level areas that have slight rises.

The soils making up this association are used mainly for general farming and dairy farming. The soils are used for corn, soybeans, small grains, hay, and pasture. In some areas they are used as woodland. The nearly level and gently sloping soils are well suited to row crops, hay, pasture, and trees. The moderately steep to very steep soils are poorly suited or not suited to row crops. They are well suited to trees. The nearly level and gently sloping Chili soils are suited as sites for buildings and septic tank absorption fields. The sloping to very steep Chili soils and the Bogart and Jimtown soils are moderately well suited or not suited to these uses.

The hazard of erosion, seasonal wetness, slope, and seepage are the main land use limitations. Conservation tillage, which leaves crop residue on the surface, stripcropping, grassed waterways, and other conservation practices reduce runoff and soil erosion on cultivated fields. A subsurface drainage system commonly is used to lower the seasonal high water table in the Jimtown soils. The Chili soils are better suited as a site for buildings and septic tank absorption fields than the Bogart and Jimtown soils. Effluent from septic tank absorption fields can contaminate underground water supplies, but placing the field in suitable fill material reduces this hazard. Drains at the base of footings and other subsurface drains can be used to remove excess water around foundations and to lower the seasonal high water table in Jimtown and Bogart soils.

7. Fitchville-Glenford Association

Nearly level to moderately steep, somewhat poorly drained and moderately well drained, deep soils that formed in silty lacustrine deposits

The soils in this association are dominantly on broad flats and gentle slopes on glacial lakebeds and terraces along streams. Some sloping and moderately steep soils are in dissected areas.

This association makes up about 8 percent of the county. It is about 40 percent Fitchville soils, 35 percent Glenford soils, and 25 percent soils of minor extent.

Fitchville soils dominate the flats, foot slopes, and toe slopes. They are also along small drainageways. They are nearly level and gently sloping and are somewhat poorly drained. Permeability is moderately slow. The content of organic matter is moderate, and the available water capacity is high. A seasonal high water table is between depths of 12 and 30 inches during extended wet periods.

Glenford soils are on the higher parts of the landscape and on side slopes along drainageways. They are nearly level to moderately steep and are moderately well drained. Permeability is moderately slow. The content of organic matter is moderate, and the available water capacity is moderate or high. A seasonal high water table is between depths of 24 and 42 inches during extended wet periods.

Some of the minor soils in this association are the well drained Chili soils, the very poorly drained Luray soils, the somewhat poorly drained Orrville soils, and the poorly drained Sebring soils. Chili soils are on knolls, on side slopes, and on slope breaks between terraces and flood plains. Luray soils are in depressions and low areas adjacent to drainageways. Orrville soils are on flood plains. Sebring soils are on flats and in shallow depressions.

The soils making up this association are used mainly for general farming and dairy farming. The main crops are corn, soybeans, small grains, and hay. The soils are also used as pasture. In a few areas they are wooded. The less sloping soils are well suited to row crops, and the steeper soils are poorly suited or not suited to this use. In most areas the soils are well suited to hay and pasture. The soils are poorly suited and moderately well suited as a site for buildings and septic tank absorption fields.

Seasonal wetness, frost action, the moderately slow permeability, slope, and the hazard of erosion limit the use of these soils. On the Fitchville soils, surface and subsurface drains can remove excess surface water and lower the seasonal high water table. Conservation tillage, which leaves crop residue on the surface, contour tillage, rotations that include grasses and legumes, and grassed waterways help reduce soil loss by erosion and surface crusting. Drains at the base of footings and exterior coating on basement walls help prevent wet basements. Artificial drainage and strengthening or replacing the base material of local roads and streets help to prevent damage caused by frost action and low soil strength.

8. Melvin-Euclid-Orrville Association

Nearly level, poorly drained and somewhat poorly drained, deep soils that formed in silty and loamy alluvium

The soils in this association are on flood plains and low stream terraces in valleys that range in width from less than 1/4 mile to 3/4 mile. The soils are nearly level.

This association makes up about 10 percent of the county. It is about 20 percent Melvin soils, 20 percent Euclid soils, 15 percent Orrville soils, and 45 percent soils of minor extent.

Melvin soils are on flood plains and are frequently flooded. They are poorly drained. Permeability and the content of organic matter are moderate. The available water capacity is moderate or high. A seasonal high water table is near or above the surface. Runoff is very slow or is ponded.

Euclid soils are on low stream terraces and are occasionally flooded. They are somewhat poorly drained.

Permeability is moderately slow. The content of organic matter is moderate, and the available water capacity is high. A seasonal high water table is between depths of 12 and 30 inches during extended wet periods. Runoff is slow.

Orrville soils are on flood plains and are occasionally flooded. They are somewhat poorly drained. Permeability and the content of organic matter are moderate. The available water capacity is moderate to high. A seasonal high water table is between depths of 12 and 30 inches during extended wet periods. Runoff is slow.

Some of the minor soils in the association are the moderately well drained Bogart and Glenford soils, the somewhat poorly drained Jimtown soils, and the very poorly drained Carlisle and Luray soils. Bogart, Glenford, and Jimtown soils are on terraces adjacent to flood plains. Carlisle soils are in low-lying areas and depressions on the flood plains. Luray soils are in slight depressions.

The soils making up this association are used for general farming and dairy farming. The main crops are corn, soybeans, and hay. The soils are also used as pasture and for recreation uses. In some areas the soils are wooded or are in cattails, reeds, and sedges. Soils that are not ponded are well suited or moderately well suited to row crops and well suited to hay, pasture, and woodland. The ponded Melvin soils are not suited to most uses other than woodland and habitat for wetland wildlife. The soils generally are not suitable as a site for buildings and septic tank absorption fields.

Seasonal wetness, ponding, and flooding are limitations for most uses. Planting of row crops is delayed in most years. Surface and subsurface drains can be used to improve drainage. In some areas outlets for drainage systems are difficult to install because of the low position on the landscape.

Detailed Soil Map Units

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

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

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

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

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

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

A *soil complex* consists of two or more soils in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Wooster-Riddles silt loams, 2 to 6 percent slopes, is an example.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. 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.

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

AdD—Alexandria silt loam, 12 to 18 percent slopes. This is a deep, moderately steep, well drained soil on uplands. This soil is mainly on side slopes of stream valleys. In most areas the slopes are short and complex. The areas commonly are long and narrow and range from 3 to 10 acres in size. Some areas are on small rounded knolls and range from 5 to 10 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 8 inches thick. The subsoil is dark yellowish brown, firm silty clay loam about 26 inches thick. The substratum to a depth of about 60 inches is dark brown and dark yellowish brown, firm, calcareous clay loam glacial till. In a few eroded areas, the surface layer is lighter in color and thinner. In a few areas the soil is moderately well drained and has gray mottles in the upper part of the subsoil.

Included with this soil in mapping are small areas of the somewhat poorly drained Bennington soils in seep spots and narrow strips of the somewhat poorly drained Orrville soils on flood plains. Also included are some small, severely eroded spots on knolls and the steeper parts of hills where the soil has a surface layer of silty clay loam. The included soils make up 5 to 15 percent of most areas.

Permeability is moderately slow. Root penetration is mainly restricted to the moderately deep or deep zone above the compact glacial till. The available water capacity is moderate, and tilth is good. Runoff is rapid. The subsoil is strongly acid or medium acid in the upper part and medium acid to mildly alkaline in the lower part.

The content of organic matter is moderately low. A seasonal high water table is at a depth of 48 to 72 inches during extended wet periods.

In a few small areas this soil is used for crops. This soil is poorly suited to corn and soybeans because of the slope and the very severe hazard of erosion. Row crops can be grown occasionally if erosion is controlled and the soil is well managed. The slope hinders the use of machinery and the installation of erosion control practices. Because much rainfall is lost as runoff, this soil is droughty in dry seasons. Runoff from higher adjacent soils causes gullies to form if the surface is unprotected. No-till and other kinds of conservation tillage, which leave crop residue on the surface, contour tillage, cover crops, rotations that include grasses and legumes, and grassed waterways help reduce runoff and erosion; however, such practices as contour stripcropping are not adapted to the complex slopes. Random subsurface drains are used to drain the included Bennington soils in seep spots.

This soil is used as pasture. It is moderately well suited to grasses and legumes for hay and pasture. The natural drainage is favorable for alfalfa. The pastures can be grazed early in spring. If this soil is plowed for seedbed preparation or the pasture is overgrazed, erosion is a severe hazard. Reseeding with a cover crop or companion crop, using a mulch, or no-till seeding reduces the risk of erosion.

In some areas this soil is used as woodland. It is well suited to trees and to use as habitat for woodland wildlife. Locating hauling roads and skid trails on the contour or on nearby less sloping soils and seeding disturbed areas with a quick-growing cover crop help reduce runoff and erosion.

This soil is poorly suited as a site for buildings and to septic tank absorption fields. The slope interferes with both of these uses. The moderately slow permeability also restricts the use of this soil as septic tank absorption fields. Buildings should be designed to conform to the natural shape of the land. Plant cover and properly designed water control practices help reduce erosion and runoff during construction. Septic tank effluent can move laterally through this soil and surface downslope. Placing the distribution lines of a septic tank system on the contour and enlarging the absorption field increase the absorption of effluent. In constructing local roads and streets, using a suitable base material improves soil strength.

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

AdF—Alexandria silt loam, 18 to 50 percent slopes. This is a deep, steep and very steep, well drained soil on the side slopes of V-shaped valleys and on valley walls. The areas generally have short slopes. They commonly are long and narrow and range from 5 to 30 acres in size.

Typically, the surface layer is very dark gray, friable silt loam about 4 inches thick. The subsurface layer is pale brown, friable silt loam about 6 inches thick. The subsoil is yellowish brown and dark yellowish brown, firm silty clay loam about 26 inches thick. It is mottled below a depth of about 20 inches. The substratum to a depth of about 60 inches is dark brown and dark yellowish brown, mottled, firm, calcareous clay loam glacial till. In a few areas the soil is moderately well drained and has gray mottles in the upper part of the subsoil.

Included with this soil in mapping are small areas of vertical banks, small landslips adjacent to streams, and bedrock outcroppings on the lower part of slopes. Also included are long, narrow strips of the somewhat poorly drained Orrville soils and of the moderately well drained Lobdell soils on flood plains. The included areas make up 5 to 15 percent of most mapped areas.

Permeability is moderately slow. Root penetration is mainly restricted to the moderately deep or deep zone above the compact glacial till. The available water capacity is moderate, and tilth is good. Runoff is very rapid. The subsoil is strongly acid or medium acid in the upper part and medium acid to mildly alkaline in the lower part. The content of organic matter is moderate. A seasonal high water table is at a depth of 48 to 72 inches during extended wet periods.

This soil generally is not suited to corn, soybeans, and hay. Even the areas that have slopes of 18 to 25 percent are poorly suited to pasture. If this soil is plowed for seedbed preparation or the pasture is overgrazed, erosion is a very severe hazard. Reseeding by the no-till method reduces the risk of erosion.

This soil is used as woodland or as natural areas for wildlife. It is well suited to trees and to use as habitat for woodland wildlife. The steep and very steep slope severely limits the use of equipment. Placing skid trails and logging roads on the contour and seeding disturbed areas with a quick-growing cover crop help reduce runoff and erosion.

This soil generally is not suited as a site for buildings and septic tank absorption fields because of the slope.

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

BnA—Bennington silt loam, 0 to 2 percent slopes. This is a deep, nearly level, somewhat poorly drained soil on upland flats that have a few low knolls. The areas generally are irregular in shape. They range from 3 to 400 acres in size.

Typically, the surface layer is grayish brown, friable silt loam about 12 inches thick. The subsoil is about 24 inches thick. It is yellowish brown and dark yellowish brown, mottled, firm clay loam and silty clay loam. The substratum to a depth of about 60 inches is dark yellowish brown, very firm, calcareous clay loam and silty clay loam glacial till. In small depressions there is silty material in the upper part of the subsoil. In some areas, bedrock is at a depth of 40 to 60 inches.

Included with this soil in mapping and making up 5 to 15 percent of most areas are small areas of the poorly drained Condit soils in shallow depressions and drainageways and the moderately deep Mitiwanga soils on flats.

A perched seasonal high water table is at a depth of 12 to 30 inches during extended wet periods. Permeability is slow. Root penetration is mainly restricted to the moderately deep zone above the compact glacial till. The available water capacity is moderate, and tilth is good. Runoff is slow. The subsoil is very strongly acid to medium acid in the upper part and medium acid to neutral in the lower part. The content of organic matter is moderate.

This soil is used for crops. It is well suited to corn, soybeans, and small grains. Seasonal wetness is the main concern in management. Surface drains are used to remove excess surface water. Subsurface drains are commonly used to lower the seasonal high water table. In some areas, outlets for subsurface drains are difficult to install because this soil is in low-lying positions. The surface layer crusts after hard rains. Crusting slows infiltration and hinders the emergence of seedlings.

This soil is well suited to pasture and hay. However, pastures should not be grazed early in spring. Grazing when the soil is wet and soft causes soil compaction and poor tilth, damages plants, and reduces air and water movement in the soil. Pasture and hay plants normally grow well during the dry part of the summer. Species that are tolerant of wetness should be selected for seeding.

In some areas this soil is used as woodland. It is well suited to trees and to use as habitat for openland and woodland wildlife. Trees that tolerate some seasonal wetness should be selected for planting.

This soil is poorly suited as a site for buildings and septic tank absorption fields because of its seasonal wetness and slow permeability. Building sites should be landscaped so that surface runoff drains away from foundations. Drains at the base of footings and exterior coating on basement walls help prevent wet basements. The low knolls are the best sites for buildings. Intercepting surface runoff from higher adjacent soils by diversions or surface drains also helps reduce the seasonal wetness. Septic tank absorption fields commonly are enlarged to increase the absorption of effluent. Perimeter drains around an absorption field help lower the seasonal high water table. In constructing local roads, providing artificial drainage and strengthening or replacing the base material help prevent damage resulting from frost action and low soil strength.

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

BnB—Bennington silt loam, 2 to 6 percent slopes. This is a deep, gently sloping, somewhat poorly drained soil on broad, gently undulating ground moraines and slightly convex knolls on uplands. The areas generally are irregular in shape. They range from 5 to 500 acres in size.

Typically, the surface layer is grayish brown, friable silt loam about 10 inches thick. The subsurface layer is pale brown, mottled, friable silt loam about 1 inch thick. The subsoil is yellowish brown and dark yellowish brown, mottled, firm clay loam and silty clay loam about 23 inches thick. The substratum to a depth of about 60 inches is dark yellowish brown, very firm, calcareous clay loam, loam, and silty clay loam glacial till. In some eroded areas the surface layer is lighter in color and has more clay. In some depressions there is more silt in the upper part of the subsoil. In some areas bedrock is at a depth of 40 to 60 inches.

Included with this soil in mapping and making up 10 to 15 percent of most areas are small areas of the moderately well drained Cardington soils on convex knolls, the poorly drained Condit soils in depressions and shallow drainageways, and the moderately deep Mitiwanga soils on flats.

A perched seasonal high water table is between depths of 12 and 30 inches during extended wet periods. Permeability is slow. Root growth is mainly restricted to the moderately deep zone above the compact glacial till. The available water capacity is moderate, and tilth is good. Runoff is medium. The subsoil is very strongly acid to medium acid in the upper part and medium acid to neutral in the lower part. The content of organic matter is moderate.

This soil is used for crops. It is well suited to corn, soybeans, and small grains. Wetness and a moderate hazard of erosion are the main management concerns. Conservation tillage, which leaves crop residue on the surface, contour tillage, rotations that include grasses and legumes, and grassed waterways help reduce erosion. Subsurface drains are commonly used to lower the seasonal high water table.

This soil is well suited to pasture and hay. However, pastures should not be grazed early in spring. Grazing when the soil is wet and soft causes compaction and poor tilth, damages plants, and reduces air and water movement in the soil. Species that tolerate wetness should be selected for planting. Minimum tillage, reseeding with a cover crop or companion crop, or using a mulch reduces the risk of erosion. Pasture and hay plants normally grow well during the dry part of the summer.

In some areas this soil is used as woodland. It is well suited to trees and to use as habitat for openland and woodland wildlife. Trees that tolerate some seasonal wetness should be selected for planting.

This soil is poorly suited as a site for buildings and septic tank absorption fields because of its seasonal wetness and slow permeability. Building sites should be landscaped so that surface runoff drains away from foundations. Drains at the base of footings and exterior coating on basement walls help prevent wet basements. Intercepting surface runoff from higher adjacent soils by diversions or surface drains also helps reduce the seasonal wetness. Enlarging septic tank absorption fields increases the absorption of effluent. Perimeter drains around the absorption field help lower the seasonal high water table. In constructing local roads, providing artificial drainage and strengthening or replacing the base material help prevent damage resulting from frost action and low soil strength.

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

BrD—Berks silt loam, 12 to 18 percent slopes. This is a moderately deep, moderately steep, well drained soil on the side slopes of V-shaped valleys and on short slopes on the sides of wide valleys. The areas generally are long and narrow and range from 3 to 15 acres in size.

Typically, the surface layer is brown, friable silt loam about 8 inches thick. The subsoil is about 24 inches thick. It is yellowish brown, friable silt loam and channery silt loam in the upper part and brown, friable, very channery silt loam and extremely channery silt loam in the lower part. Sandstone bedrock is at a depth of about 32 inches. In some areas the surface layer is channery silt loam or loam. In a few areas the subsoil has more sand.

Included with this soil in mapping are small areas of Loudonville soils, which have fewer coarse fragments in the subsoil. Also included are a few seep spots and springs on the lower part of slopes. The included areas make up 10 to 15 percent of most mapped areas.

Permeability is moderate or moderately rapid. The root zone is moderately deep. The available water capacity is very low, and tilth is good. Runoff is rapid. The subsoil is very strongly acid or strongly acid. The content of organic matter is moderate.

This soil is poorly suited to row crops and small grains because of the slope, the very low available water capacity, and the severe hazard of erosion. Row crops can be grown occasionally under good management if erosion is controlled. The slope causes some difficulty in the use of machinery and in installing erosion control practices. Because of the slope, much of the rainfall is lost as runoff. The soil is droughty during dry periods. Runoff from adjoining soils can cause gullies to form if the surface is unprotected. Conservation tillage, which leaves crop residue on the surface, contour stripcropping, cover crops, rotations that include grasses and legumes, and grassed waterways help reduce runoff and erosion. In areas where this soil has uniform slopes, it is well suited to erosion control practices. These practices are not easily adapted to the narrower, more complex slopes. Leaving crop residue on the surface in the fall and not plowing until spring also help to protect the soil against erosion.

In a few areas this soil is used as pasture. It is moderately well suited to grasses and legumes for hay and pasture. The good natural drainage is favorable for alfalfa. Pastures can be grazed early in spring. The slope does not limit intensive pasture management. If this soil is plowed for seedbed preparation or the pasture is overgrazed, erosion is a very severe hazard. Reseeding with a cover crop or companion crop, using a mulch, or no-till seeding reduces the risk of erosion.

In many areas this soil is used as woodland. It is moderately well suited to trees. Species that are tolerant of a very low available water capacity and a large amount of rock fragments in the subsoil should be selected for planting.

This soil is poorly suited as a site for buildings and generally is not suited to septic tank absorption fields. The slope and bedrock between depths of 20 and 40 inches limit excavation for basements and utility lines. Buildings should be designed to conform to the natural shape of the land. Altering building sites on this soil can create areas of unstable fill that has steeper slopes and is subject to hillside slippage. Special building and landscape designs may be needed to prevent the soil in such areas from slipping downhill. Runoff and erosion increase during construction, but they can be reduced by maintaining plant cover and using other water control practices.

This soil is in capability subclass IVe and in woodland suitability subclass 3f.

BrE—Berks silt loam, 18 to 25 percent slopes. This is a moderately deep, steep, well drained soil at the head of deeply entrenched drainageways and on side slopes of wide valleys. The areas are mainly long and narrow and range from 3 to 20 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 yellowish brown, friable silt loam and channery silt loam, and the lower part is brown, friable very channery silt loam and extremely channery silt loam. Sandstone bedrock is at a depth of about 30 inches. In a few places the surface layer is channery silt loam or loam. In some areas there is more sand in the subsoil.

Included with this soil in mapping are small areas of Loudonville soils, which have fewer coarse fragments in the subsoil. Also included are a few seep spots and springs on the lower part of slopes and bedrock outcroppings on the upper part. The included areas make up 10 to 15 percent of most mapped areas.

Permeability is moderate or moderately rapid. The root zone is moderately deep. The available water capacity is very low, and tilth is good. Runoff is very rapid. The subsoil is very strongly acid or strongly acid. The content of organic matter is moderate.

This soil is poorly suited to row crops and small grains because of the steep slope. Erosion is a very severe hazard if this soil is cultivated. Under good management, row crops can be grown occasionally if erosion is controlled. The soil is droughty during dry periods.

In a few areas this soil is used as pasture. It is poorly suited to grasses and legumes for pasture. The slope limits the use of machinery. Pastures can be grazed early in spring. Because the soil is droughty, plants do not make much growth during the dry part of some summers. If the soil is plowed to prepare a seedbed or the pasture is overgrazed, erosion is a very severe hazard. No-till seeding helps reduce runoff and erosion.

This soil is used mainly as woodland. It is moderately well suited to trees. The steep slopes interfere with the use of equipment for planting, mowing, and disking. Seedling mortality can be reduced by selecting only those species for planting that tolerate a very low available water capacity and a large amount of rock fragments in the subsoil.

This soil generally is not suited as a site for buildings and septic tank absorption fields, because the slopes are steep and bedrock is at a depth between 20 and 40 inches.

This soil is in capability subclass IVe and in woodland suitability subclass 3f.

BrF—Berks silt loam, 25 to 70 percent slopes. This is a moderately deep, very steep, well drained soil on side slopes of deeply entrenched, V-shaped valleys and of wide valleys. The areas commonly are long and narrow and are parallel to streams, but they bend and fork where tributary streams enter. Most areas are on one side of a valley and face in one direction. In a few places the areas are on both sides of narrow valleys. The areas generally range from 10 to 500 acres in size.

Typically, the surface layer is dark gray, friable silt loam about 2 inches thick. The subsurface layer is pale brown, friable silt loam about 4 inches thick. The subsoil is about 22 inches thick. The upper part is yellowish brown, friable channery silt loam and very channery silt loam, and the lower part is brown, friable extremely channery silt loam. Brown sandstone is at a depth of about 28 inches. In some areas the soil is deeper to bedrock. In a few places the surface layer is channery silt loam or loam. In some areas the subsoil has more sand.

Included with this soil in mapping are narrow strips of the somewhat poorly drained Orrville soils along drainageways and a few nearly vertical rock cliffs on shoulder slopes. Also included are a few springs on the lower part of slopes and small piles of rock rubble at the base of slopes. The included areas make up 10 to 20 percent of most mapped areas.

Permeability is moderate or moderately rapid. The root zone is moderately deep. The available water capacity is very low, and tilth is good. Runoff is very rapid. The subsoil is very strongly acid or strongly acid. The content of organic matter is moderate.

This soil is not suited to crops and pasture because the slopes are very steep and erosion is a very severe hazard.

This soil is used as woodland and as natural habitat for wildlife. It is moderately well suited to trees. The very steep slopes limit intensive practices for woodland improvement and make logging difficult. Constructing skid trails on the contour wherever possible and seeding disturbed areas with a quick-growing cover crop help reduce runoff and erosion. Seedling mortality can be reduced by selecting only those species for planting that are tolerant of a very low available water capacity and a large amount of rock fragments in the subsoil.

The slope severely limits the use of this soil as a site for buildings and septic tank absorption fields. The soil generally is not suitable for these uses.

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

BsB—Bethesda silty clay loam, 2 to 12 percent slopes. This is a deep, gently sloping and sloping, well drained soil in areas that have been surface mined for coal. It is on top of mine-spoil ridges and benches. This soil is a mixture of rock fragments and partly weathered fine-earth material that was in or below the profile of the original soil. In most places, this soil has been graded and the larger stones have been buried. The areas generally are irregular in shape and range in size from about 2 to 20 acres.

Typically, the surface layer is dark gray, friable silty clay loam about 6 inches thick. The substratum to a depth of about 60 inches is multicolored, firm very shaly silty clay loam and very channery silty clay loam. In some areas the surface layer is stony silty clay loam. In a few areas the slopes are 0 to 2 percent or 12 to 18 percent.

Included with this soil in mapping are small areas where there are layers of sandy loam, loamy sand, or toxic coal material in the substratum. Most of these areas support little or no plant growth. Long, narrow, very steep areas of ungraded spoil material are also included. Also included are small reclaimed areas where the surface layer consists of natural soil material 6 to 18 inches thick; in these areas the soil has a higher available water capacity and is more productive. The included areas make up 5 to 25 percent of most mapped areas.

Permeability is moderately slow. The depth of the root zone is highly variable within short distances, because the material varies in density. The available water capacity is low. Tilth is poor, and runoff is medium or rapid. The frost action potential is moderate, and the shrink-swell potential is low. Reaction in the substratum typically is strongly acid to extremely acid. The content of organic matter is low.

This soil generally is not suited to the commonly grown field crops because of its acidity, low fertility, low content of organic matter, and droughtiness. The surface layer has weak structure, and it puddles and crusts easily.

Much of the acreage is seeded to grasses and is used for grazing. This soil is poorly suited to use as pasture. In areas that have not been limed and fertilized, this soil generally supports only thin stands of grasses and is barren in spots. Acidity, low fertility, and droughtiness are major concerns in pasture management. Much of the rainfall runs off because the soil structure is poor and the plant cover is sparse. Establishing ground cover and applying mulch reduce runoff and erosion, improve tilth, increase the content of organic matter, and improve water intake. Proper stocking and rotation grazing are needed. Controlled grazing is important to reduce soil compaction and maintain good pasture stands. In many areas there are potential reservoir sites for livestock water.

In some more sloping areas that were mined earlier, this soil is in black locust. In some areas this soil is used as habitat for wildlife. It is moderately well suited to trees that are tolerant of strongly acid to extremely acid conditions and of droughtiness. It is not suited to less tolerant species. Grasses provide the needed ground cover, particularly in the more sloping areas, while tree seedlings are being established.

Once this soil has settled, it is moderately well suited as a site for buildings. It is poorly suited to use as septic tank absorption fields. Onsite investigation is needed to determine suitability. The thickness of the soil material over bedrock, the stability and bearing strength of the soil, the control of storm water runoff, and the risk of corrosion of uncoated steel and concrete are important considerations. Stones in the substratum hinder shallow excavations. Placing septic tank absorption systems in suitable fill material increases the absorption of effluent.

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

BsF—Bethesda silty clay loam, 18 to 70 percent slopes. This is a deep, steep and very steep, well drained soil on side slopes in areas that have been surface mined for coal. It is a mixture of rock fragments and partly weathered fine-earth material that was in or below the profile of the original soil. In most areas this soil has not been graded. The slopes generally are short and uneven. The individual areas generally are long and narrow and range from about 2 to 10 acres in size.

Typically, the surface layer is dark gray, friable silty clay loam about 5 inches thick. The substratum to a depth of about 60 inches is multicolored, firm very shaly silty clay loam. In some places the surface layer is channery silty clay loam or stony silty clay loam. In a few places the substratum is medium acid to neutral. Some areas on the upper part of slopes have been graded.

Included with this soil in mapping are small areas of rock outcroppings and areas in which the surface layer is sandy loam. In some included areas the soils are deeply gullied or have tree stumps, logs, and partly decomposed brush in the substratum. Also included are narrow strips of soils that have slopes of 12 to 18 percent and are on short escarpments. The included areas make up 5 to 25 percent of most mapped areas.

Permeability is moderately slow. The depth of the root zone is highly variable within short distances because the material varies in density. The available water capacity is low. Tilth is poor, and runoff is very rapid. The frost action potential is moderate, and the shrink-swell potential is low. Reaction in the substratum varies widely, but it is typically strongly acid to extremely acid. The content of organic matter is very low.

Most of the acreage is idle land or has sparse plant cover. Black locust has been planted in some of the areas that were mined earlier. This soil generally is not suited to row crops, hay, and pasture because of the steep and very steep, uneven slopes, the very severe hazard of erosion, droughtiness, and the restricted root zone.

This soil is moderately well suited to trees that tolerate strongly acid to extremely acid conditions, droughtiness, and a restricted root zone. It is not suited to less tolerant species. The steep and very steep slopes make mechanical planting impractical.

This soil generally is not suited as a site for buildings and septic tank absorption fields because of the steep and very steep slopes, the possibility of hillside slippage, and the moderately slow permeability. This soil is highly corrosive to concrete.

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

BtA—Bogart loam, 0 to 2 percent slopes. This is a deep, nearly level, moderately well drained soil on the flat part of stream terraces and on outwash plains. The areas generally are irregular in shape and range from 5 to 25 acres in size.

Typically, the surface layer is dark brown, friable loam about 10 inches thick. The subsoil is about 35 inches thick. The upper part is yellowish brown, friable loam and gravelly loam; the middle part is brown, mottled, friable gravelly loam; and the lower part is dark brown, mottled, friable gravelly sandy clay loam and gravelly sandy loam. The substratum to a depth of about 60 inches is dark brown, loose gravelly loamy sand. In some areas the surface layer and the upper part of the subsoil are silt loam. In places, glacial till or lacustrine silty and clayey sediments are between depths of 30 and 60 inches. In a few areas the soil is well drained and does not have mottles in the subsoil.

Included with this soil in mapping and making up 5 to 15 percent of most areas are small areas of the somewhat poorly drained Jimtown soils in depressions and shallow drainageways.

The seasonal high water table is at a depth of 24 to 42 inches during extended wet periods. Permeability is moderate or moderately rapid in the subsoil and rapid in the substratum. The root zone is deep. The available water capacity is moderate, and tilth is good. Runoff is slow. The subsoil is very strongly acid to slightly acid. The content of organic matter is moderate.

This soil is used for crops. It is well suited to corn, soybeans, and small grains. Droughtiness is a hazard in extended dry periods. In most years, however, rainfall is timely and droughtiness does not limit growth. Natural drainage generally is adequate for farming, although random subsurface drains are needed in areas of the included wetter soils. The surface layer can be worked within a fairly wide range of moisture content. This soil is suited to irrigation.

This soil is used as pasture in only a few areas because it is so well suited to crops. It is well suited to grasses and legumes for hay and pasture. Deep-rooted legumes, such as alfalfa, grow well.

This soil is not extensively used as woodland, though many species are well suited to this soil. This soil is also well suited to use as habitat for openland and woodland wildlife. Plant competition can be reduced by spraying, mowing, or disking.

This soil is moderately well suited as a site for buildings and septic tank absorption fields. Seasonal wetness limits these uses. Diversions help convey runoff from higher adjacent soils away from building sites and septic tank absorption fields. Subsurface drains lower the seasonal high water table. Building sites should be landscaped so that surface runoff drains away from foundations. Drains at the base of footings can remove the excess water around foundations and basement walls. Coating the exterior of basement walls also helps prevent wet basements. Perimeter drains around septic tank absorption fields help lower the seasonal high water table. If this soil is used for septic tank absorption fields, the underground water supply can become contaminated because permeability is rapid in the substratum. Placing septic tank absorption fields in suitable fill material reduces this hazard. In constructing local roads and streets, strengthening or replacing the base material helps to reduce damage caused by frost action.

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

BtB—Bogart loam, 2 to 6 percent slopes. This is a deep, gently sloping, moderately well drained soil in slightly convex areas on stream terraces, outwash plains, and kames. The areas generally are long and narrow or are rounded. They range from 5 to 20 acres in size.

Typically, the surface layer is dark brown, friable loam about 9 inches thick. The subsoil is about 41 inches thick. The upper part is yellowish brown, friable loam; the middle part is yellowish brown and brown, mottled, friable gravelly loam and very gravelly loam; and the lower part is dark brown, mottled, friable very gravelly sandy clay loam and gravelly sandy loam. The substratum to a depth of about 60 inches is dark brown, loose gravelly loamy sand. In some areas the surface layer and the upper part of the subsoil are silt loam. In places, glacial till or lacustrine silty and clayey sediments are between depths of 30 and 48 inches. In a few areas, the soil is well drained and the subsoil is not mottled.

Included with this soil in mapping and making up 5 to 15 percent of most areas are small areas of the somewhat poorly drained Jimtown and Fitchville soils in depressions and shallow drainageways.

The seasonal high water table is between depths of 24 and 42 inches during extended wet periods. Permeability is moderate or moderately rapid in the subsoil and rapid in the substratum. The root zone is deep. The available water capacity is moderate, and tilth is good. Runoff is medium. The subsoil is very strongly acid to slightly acid. The content of organic matter is moderate.

This soil is used for crops. It is well suited to corn, soybeans, and small grains. A moderate hazard of erosion is the main concern in management. This soil tends to be droughty in extended dry periods. The surface layer can be worked within a fairly wide range of moisture content. This soil is suited to irrigation if erosion is controlled. Conservation tillage, which leaves crop residue on the surface, contour tillage, cover crops, rotations that include grasses and legumes, and grassed waterways help reduce runoff and erosion. Leaving crop residue on the surface in the fall and not plowing until spring also protect the soil against erosion. Natural drainage generally is adequate for crops, although random subsurface drains are needed in areas of the included wetter soils.

This soil is well suited to grasses and legumes for hay and pasture. Deep-rooted legumes, such as alfalfa, grow well. If the soil is plowed for seedbed preparation or the pasture is overgrazed, erosion is a moderate hazard. Reseeding with a cover crop or companion crop, using a mulch, or no-till seeding reduces the risk of erosion.

This soil is not extensively used as woodland, though it is well suited to a wide variety of trees. It is suited to use as habitat for openland and woodland wildlife.

This soil is moderately well suited as a site for buildings and septic tank absorption fields. Seasonal wetness is a limitation. Subsurface drains can lower the seasonal high water table. Diversions help convey runoff from higher adjacent soils away from building sites and septic tank absorption fields. Building sites can be landscaped so that surface runoff drains away from foundations. Drains at the base of footings can remove the excess water around foundations and basement walls. Coating the exterior of basement walls also helps prevent wet basements. Maintaining plant cover on a construction site helps reduce erosion. Perimeter drains around septic tank absorption fields help lower the seasonal high water table. Because permeability is rapid in the substratum, underground water supplies may become contaminated if this soil is used for septic tank absorption fields. Placing absorption fields in suitable fill material reduces this hazard. In constructing local roads and streets, strengthening or replacing the base material helps to reduce damage caused by frost action.

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

CdA—Canfield silt loam, 0 to 2 percent slopes. This is a deep, nearly level, moderately well drained soil on slightly convex slopes on uplands. A fragipan at a depth of 15 to 30 inches restricts root growth. Most areas are rectangular and range from 2 to 15 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 47 inches thick. The upper part is yellowish brown and light olive brown, firm silt loam and loam; and the middle and lower parts are a dark yellowish brown and light olive brown, very firm and brittle loam fragipan. The subsoil is mottled below a depth of about 16 inches. The substratum to a depth of about 60 inches is light olive brown, friable loam glacial till. In some areas there are more coarse fragments in the substratum and the fragipan is not so well developed. In some areas bedrock or water-deposited material is within a depth of 60 inches.

Included with this soil in mapping and making up 15 to 20 percent of most areas are small areas of the somewhat poorly drained Ravenna soils in depressions and shallow drainageways.

A perched seasonal high water table is at a depth of 18 to 36 inches during extended wet periods. Permeability is moderate above the fragipan and slow in the fragipan. The root zone is mainly restricted by the fragipan at a depth of 15 to 30 inches. The available water capacity in this zone is low. Tilth is good. Runoff is slow. The subsoil is very strongly acid or strongly acid in the upper part and very strongly acid to neutral in the lower part. The content of organic matter is moderate.

This soil is used mainly for crops. In some areas it is used for potatoes and nursery stock. It is well suited to corn, soybeans, small grains, and nursery stock (fig. 3). Surface crusting, seasonal wetness, and the restricted rooting depth are the main concerns in management. Incorporating crop residue or other organic matter into the surface layer increases water infiltration, improves tilth and fertility, and reduces crusting. Subsurface drains are used to lower the perched seasonal high water table in order to permit earlier planting in spring.

This soil is well suited to grasses and legumes for hay and pasture. However, pastures should not be grazed early in spring because of the seasonal wetness. Most pastures are in a rotation with cultivated crops.

This soil is well suited to woodland, but because of its suitability for crops, it is rarely used for trees and other plants grown to provide habitat for wildlife. Seedling mortality and windthrow can be reduced by planting only those species that are tolerant of a root-restricting layer at a depth of 15 to 30 inches.

This soil is moderately well suited as a site for buildings and poorly suited to use as septic tank absorption fields. Its seasonal wetness and slow permeability limit these uses. Building sites should be landscaped to allow runoff to drain away from foundations. Footing drains remove excess water from around foundations and basement walls. Exterior coating on basement walls also helps prevent wet basements. The included areas of somewhat poorly drained soils should be avoided in selecting sites for buildings and for septic tank absorption fields. Perimeter drains around an absorption field help lower the seasonal high water table. Diversions and drainage ditches help convey runoff from higher adjacent soils away from septic tank absorption fields. Enlarging the absorption field increases the absorption of effluent. Artificial drainage and the use of a suitable base material reduce damage to local roads and streets by frost action.

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

CdB—Canfield silt loam, 2 to 6 percent slopes. This is a deep, gently sloping, moderately well drained soil on uplands. A fragipan at a depth of 15 to 30 inches restricts root growth. Slopes typically are long and uniform. The areas generally are irregular in shape and range from 3 to 500 acres in size.

Typically, the surface layer is brown, friable silt loam about 8 inches thick. The subsurface layer is brown, friable silt loam about 2 inches thick. The subsoil is about 45 inches thick. The upper part is yellowish brown and light olive brown, friable and firm loam and silt loam; the middle and lower parts are a dark yellowish brown and light olive brown, very firm and brittle loam fragipan. The subsoil is mottled from a depth of about 21 to 40 inches. The substratum to a depth of about 72 inches is light olive brown, friable gravelly loam glacial till. In some eroded spots, yellowish brown subsoil material is mixed into the surface layer. In some areas bedrock is between depths of 40 and 60 inches.

Included with this soil in mapping and making up 5 to 15 percent of most areas are small areas of the somewhat poorly drained Ravenna soils in depressions and shallow drainageways and the well drained Riddles soils on some of the higher knolls.

A perched seasonal high water table is between depths of 18 and 36 inches during extended wet periods.

Figure 3.—Nursery rows of young evergreen shrubs adjoin a cornfield in an area of Canfield silt loam, 0 to 2 percent slopes. This soil is well suited to these uses.

Permeability is moderate above the fragipan and slow in the fragipan. The root zone is restricted to the soil layers above the fragipan. The available water capacity in this zone is low. Tilth is good. Runoff is medium. The subsoil is very strongly acid or strongly acid above the fragipan and very strongly acid to neutral in the fragipan. The content of organic matter is moderate.

This soil is commonly used for corn, soybeans, and small grains. In some areas it is used for potatoes. It is well suited to corn, soybeans, small grains, and hay. A moderate hazard of erosion, surface crusting, and the restricted rooting depth are the main concerns in management. Seasonal wetness delays planting in spring. Conservation tillage, which leaves crop residue on the surface, contour tillage, contour stripcropping, cover crops, rotations that include grasses and legumes, and grassed waterways help reduce runoff and erosion. Deferring plowing until spring, after leaving crop residue on the surface over winter, also protects the soil against erosion. Incorporating crop residue or other organic matter into the surface layer increases water intake, improves tilth and fertility, and reduces crusting. Random subsurface drains are commonly used to drain seep spots and areas of the included wetter soils. In some areas, subsurface drains are used to lower the seasonal high water table.

This soil is used as pasture. It is well suited to a variety of pasture plants. If the pasture is overgrazed or the soil is plowed for seedbed preparation, erosion is a moderate hazard. Reseeding with a cover or companion crop, mulching, and no-till seeding help reduce the risk of erosion.

In some areas this soil is used as woodland. It is well suited to trees and to use as habitat for openland and woodland wildlife. A wide variety of trees and shrubs grow well if competing vegetation is controlled by spraying, mowing, or disking.

This soil is moderately well suited as a site for buildings and poorly suited as a site for septic tank absorption fields because of seasonal wetness and the slow permeability. Open ditches and subsurface drains are used to lower the seasonal high water table.

Diversions and drainage ditches help divert runoff from higher adjacent soils. Water moves downslope along the top of the fragipan and can cause wetness in basements and around foundations. Drains at the base of footings can remove the excess water around foundations and basement walls. Also, exterior wall coatings are commonly used to help prevent wet basements. Building sites should be landscaped to provide good surface drainage away from foundations. Perimeter drains around a septic tank absorption field help lower the seasonal high water table. Placing the distribution lines of a septic tank absorption system across the slope reduces lateral seepage of effluent to the surface. Artificial drainage and the use of suitable base material help prevent damage by frost action to local roads and streets. Wherever possible, buildings and septic tank absorption fields should be located on the included better drained soils.

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

CdB2—Canfield silt loam, 2 to 6 percent slopes, eroded. This is a deep, gently sloping, moderately well drained soil on slightly convex knolls and on side slopes along natural drainageways on uplands. A fragipan at a depth of 15 to 28 inches restricts root growth. Erosion has removed part of the original surface layer. The present surface layer is a mixture of the original surface layer and subsoil material. Most areas are rounded to oblong and 2 to 15 acres in size.

Typically, the surface layer is mixed, dark grayish brown and yellowish brown, friable silt loam about 8 inches thick. The subsoil is about 42 inches thick. The upper part is yellowish brown and light olive brown, firm silt loam and loam; the middle and lower parts are a dark yellowish brown and light olive brown, very firm and brittle loam fragipan. The subsoil is mottled below a depth of about 20 inches. The substratum to a depth of about 60 inches is light olive brown, friable loam glacial till. In some areas bedrock is between depths of 40 and 60 inches. In a few areas, the slopes are less than 2 percent or are 6 to 8 percent.

Included with this soil in mapping are small areas of the somewhat poorly drained Ravenna soils in small depressions and seeps and on toe slopes and of the well drained Riddles soils in positions slightly higher than those of the Canfield soil. Also included are a few small areas of severely eroded soils on knolls; these soils have poor tilth. The included soils make up 10 to 15 percent of most areas.

A perched seasonal high water table is between depths of 18 and 36 inches during extended wet periods. Permeability is moderate above the fragipan and slow in the fragipan. The root zone is mainly restricted to the soil layers above the fragipan. The available water capacity in this zone is low. Tilth is good. Runoff is medium. The subsoil is very strongly acid or strongly acid above the fragipan and very strongly acid to neutral in the fragipan. The content of organic matter is moderately low.

In most areas this soil is used for crops. It is well suited to corn, small grains, and soybeans. Controlling erosion and maintaining tilth are the main concerns in management. Seasonal wetness delays planting in spring. Crop residue left on the surface over winter, meadow crops in the rotation, and winter cover crops help to reduce erosion and to maintain tilth. In addition, no-till and other forms of conservation tillage, which leaves crop residue on the surface, contour tillage, contour stripcropping, and grassed waterways help reduce runoff and erosion. Incorporating crop residue or other organic matter into the surface layer increases water infiltration, improves tilth and fertility, and helps prevent crusting. Subsurface drains are commonly used in areas of the included somewhat poorly drained soils to lower the seasonal high water table.

This soil is well suited to hay and pasture. Because of the limited available water capacity, pasture plants make most of their growth during the early part of the growing season. Reseeding with a cover crop or companion crop, using a mulch, or no-till seeding reduces erosion. Proper stocking rates, pasture rotation, timely deferment of grazing, and weed control help keep the plants and the soil in good condition.

In a few areas this soil is wooded. It is well suited to trees and to plants that provide food and cover for wildlife. Trees make good growth if competing vegetation is controlled by spraying, mowing, or disking.

This soil is moderately well suited to building site development and poorly suited to use as septic tank absorption fields because of its seasonal wetness and slow permeability. Open ditches and subsurface drains are used to lower the seasonal high water table. Diversions and drainage ditches help divert runoff from higher adjacent soils. Water moves downslope along the top of the fragipan and can cause wetness in basements and around foundations. Drains at the base of footings can remove the excess water around foundations and basement walls. Exterior coating on basement walls also helps prevent wet basements. Building sites should be landscaped so that surface runoff drains away from foundations. Perimeter drains around a septic tank absorption field help lower the seasonal high water table. Placing the distribution lines of an absorption field across the slope reduces lateral seepage of effluent to the surface. In constructing local roads and streets, artificial drainage and a suitable base material reduce damage caused by frost action. Wherever possible, buildings and septic tank absorption fields should be located on the included better drained soils.

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

CdC—Canfield silt loam, 6 to 12 percent slopes. This is a deep, sloping, moderately well drained soil on side slopes of small natural drainageways and in complex rolling areas on uplands. A fragipan at a depth of 15 to 30 inches restricts root growth. The areas are mainly oblong to irregular in shape and range from 2 to 15 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. The upper part is yellowish brown and light olive brown, firm silt loam and loam; the middle and lower parts are a dark yellowish brown and light olive brown, very firm and brittle loam fragipan. The subsoil is mottled below a depth of about 20 inches. The substratum to a depth of about 60 inches is light olive brown, friable, loam glacial till. In some areas bedrock is between depths of 40 and 60 inches. In some eroded spots, yellowish brown subsoil material is mixed into the surface layer.

Included with this soil in mapping are small areas of the somewhat poorly drained Ravenna soils in shallow drainageways and on the lower part of slopes and the well drained Riddles soils in the more rolling areas. Also included are narrow strips of Orrville soils on flood plains. The included soils make up 5 to 15 percent of most areas.

A perched seasonal high water table is between depths of 18 and 36 inches during extended wet periods. Permeability is moderate above the fragipan and slow in the fragipan. The root zone is restricted by the fragipan at a depth between 15 and 30 inches. The available water capacity in this zone is low. Tilth is good. Runoff is rapid. The subsoil is very strongly acid or strongly acid above the fragipan and very strongly acid to neutral in the fragipan. The content of organic matter is moderate.

This soil is used for crops. It is moderately well suited to corn, small grains, and soybeans. Erosion and surface crusting are the main concerns in management. Because erosion is a severe hazard, soybeans should not be grown in successive years on this soil. No-till and other forms of conservation tillage, which leaves crop residue on the surface, rotations that include grasses and legumes, and grassed waterways help reduce runoff and erosion. In areas that have smooth, uniform slopes, this soil is well suited to such erosion control practices as contour stripcropping and contour cultivation. These practices are difficult to use on complex slopes. Leaving crop residue on the surface in the fall and not plowing until spring also protect the soil against erosion. Crop residue or other organic matter incorporated into the surface layer and cover crops increase water infiltration, improve tilth and fertility, and reduce crusting. Random subsurface drains can lower the seasonal high water table in the included somewhat poorly drained soils.

In some areas this soil is used as pasture. It is well suited to hay and pasture. If the soil is plowed for seedbed preparation or the pasture is overgrazed, erosion is a severe hazard. Reseeding with a cover or companion crop, using a mulch, and no-till seeding reduce the risk of erosion. Proper stocking rates, pasture rotation, timely deferment of grazing, and weed control help keep the plants and the soil in good condition.

In some areas this soil is used as woodland. It is well suited to trees and to other plants that provide food and cover for wildlife. Spraying, shallow tillage, and mowing help control plant competition.

This soil is moderately well suited as a site for buildings and poorly suited to use as septic tank absorption fields because of its slope, seasonal wetness, and slow permeability. Water moves downslope along the top of the fragipan and can cause wetness problems in basements and around foundations. Drains at the base of footings and exterior coating on basement walls help prevent wet basements. Effluent from septic tank absorption fields can seep along the top of the fragipan and come to the surface downslope. Placing distribution lines across the slope reduces seepage to the surface. Perimeter drains around an absorption field help lower the seasonal high water table. Diversions or surface drains that carry away runoff from higher adjacent soils help reduce seasonal wetness and erosion. In constructing local roads and streets, artificial drainage and a suitable base material reduce damage by frost action.

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

CdC2—Canfield silt loam, 6 to 12 percent slopes, eroded. This is a deep, sloping, moderately well drained soil in complex rolling areas and on side slopes along small natural drainageways on uplands. A fragipan at a depth between 15 and 28 inches restricts rooting depth. Erosion has removed part of the original surface layer. The present surface layer is a mixture of the original surface layer and the subsoil material. The areas are mainly irregular in shape and 2 to 20 acres in size.

Typically, the surface layer is mixed dark grayish brown and yellowish brown, friable silt loam about 8 inches thick. The subsoil is about 42 inches thick. The upper part is yellowish brown and light olive brown, firm silt loam and loam; the middle and lower parts are a dark yellowish brown and light olive brown, very firm and brittle loam fragipan. The subsoil is mottled below a depth of about 20 inches. The substratum to a depth of about 60 inches is light olive brown, friable loam glacial till. In some areas bedrock is between depths of 40 and 60 inches.

Included with this soil in mapping are small areas of the somewhat poorly drained Ravenna soils in small drainageways and the well drained Riddles soils on the steeper slopes. Also included are narrow strips of Melvin and Orrville soils on flood plains and a few small areas of severely eroded soils on knolls; these severely eroded soils have poor tilth. The included soils make up 5 to 15 percent of most areas.

A perched seasonal high water table is between depths of 18 and 36 inches during extended wet periods. Permeability is moderate above the fragipan and slow in the fragipan. Root penetration is mainly restricted to the zone above the fragipan. The available water capacity in this zone is low. Tilth is good. Runoff is rapid. The subsoil is very strongly acid or strongly acid above the fragipan and very strongly acid to neutral in the fragipan. The content of organic matter is moderately low.

This soil is used for crops. It is moderately well suited to corn and small grains and poorly suited to soybeans. Controlling erosion, especially if soybeans are grown, and reducing crusting are the main concerns in management. Erosion is a severe hazard. Conservation tillage, which leaves crop residue on the surface, contour stripcropping, winter cover crops, and grassed waterways help reduce erosion. Crop rotations that include a high percentage of hay and pasture and regular applications of barnyard manure and other organic material also reduce erosion and surface crusting. Areas of this soil on side slopes along drainageways can be easily adapted to contour stripcropping. Artificial drainage may be needed in areas of the included soils that are less well drained.

In some areas this soil is used for hay and pasture. It is well suited to grasses and legumes for pasture and hay. If the soil is plowed to prepare a seedbed or the pasture is overgrazed, erosion is a severe hazard. Reseeding with a cover crop or companion crop, using a mulch, or no-till seeding reduces the hazard of erosion. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the plants and the soil in good condition.

In some areas this soil is used as woodland. It is well suited to trees and to other plants that provide food and cover for openland and woodland wildlife. Spraying, shallow tillage, or mowing help control plant competition.

This soil is moderately well suited as a site for buildings and poorly suited to septic tank absorption fields. The slope, seasonal wetness, and the slow permeability limit these uses. Water moves downslope along the top of the fragipan and can cause wetness in basements and around foundations. Drains at the base of footings and exterior coating on basement walls help prevent wet basements. Effluent from septic tank absorption fields may seep along the top of the fragipan and come to the surface downslope. Placing the distribution lines across the slope reduces seepage to the surface. Perimeter drains around an absorption field help lower the seasonal high water table. Surface runoff from higher adjacent soils can be intercepted by diversions or surface drains to reduce seasonal wetness and erosion. In constructing local roads and streets, artificial drainage and a suitable base material reduce damage by frost action. Maintaining plant cover on a construction site helps prevent further erosion.

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

CfB—Canfield-Urban land complex, 2 to 6 percent slopes. This complex consists of a deep, gently sloping, moderately well drained Canfield soil and areas of Urban land on slightly convex knolls. In the Canfield soil, a fragipan at a depth of 15 to 30 inches restricts root growth. Most areas are about 50 percent Canfield silt loam and 35 percent Urban land. The areas of Canfield soil and of Urban land are so intricately mixed or so small in size that it was not practical to separate them in mapping. The mapped areas typically are irregular in shape and range up to 250 acres in size.

Typically, the Canfield soil has a dark grayish brown, friable silt loam surface layer about 10 inches thick. The subsoil is about 45 inches thick. The upper part is yellowish brown and light olive brown, firm silt loam and loam; the middle and lower parts are a dark yellowish brown and light olive brown, very firm and brittle loam fragipan. The subsoil is mottled below a depth of about 20 inches. The substratum to a depth of about 72 inches is light olive brown, friable loam glacial till. In some places the soil has been radically altered. Some low areas have been filled or leveled during construction; other small areas have been cut, built up, or smoothed. In a few areas bedrock is at a depth between 40 and 60 inches.

The Urban land part of the complex is covered by streets, parking lots, buildings, and other structures that obscure or alter the soils, making identification of the soils impracticable.

Included with this complex in mapping and making up about 15 percent of most areas are small areas of the somewhat poorly drained Ravenna soils in depressions and shallow drainageways and the well drained Riddles soils on the higher knolls.

Most areas of this complex are artificially drained by sewer systems, gutters, and subsurface drains and to a lesser extent by surface ditches. In areas that are not drained, the Canfield soil has a perched seasonal high water table between depths of 18 and 36 inches in extended wet periods. Permeability in the Canfield soil is moderate above the fragipan and slow in the fragipan. The root zone is mainly restricted by the fragipan at a depth of 15 to 30 inches. The available water capacity in the root zone is low. Tilth is good. Runoff is medium. The subsoil is very strongly acid or strongly acid above the fragipan and very strongly acid to neutral in the fragipan. The content of organic matter is moderate.

The Canfield soil is in the parks, open spaces, lawns, and gardens. It is suited to grasses, flowers, vegetables, trees, and shrubs, but the rooting depth for trees and shrubs is limited by the fragipan. Artificial drainage can lower the seasonal high water table. Onsite investigation is needed to determine the best drainage methods for a particular site. Soil erosion generally is not a major problem unless the plant cover is removed and the soil is left bare for a considerable time or is used as a watercourse. This soil tends to be droughty in extended dry periods. In some areas, the soil has been radically altered and is not so suitable for lawns and gardens. The subsoil material that is exposed in these areas has very poor tilth. It is sticky when wet and hard when dry.

The Canfield soil is moderately well suited as a site for buildings and poorly suited to septic tank absorption fields because of the seasonal wetness and the slow permeability. Water moves downslope along the top of the fragipan and can cause wetness in basements and around foundations. Drains at the base of footings are used to remove the excess water around foundations and basement walls. Exterior coating on basement walls helps prevent wet basements. Building sites should be landscaped to allow runoff to drain away from foundations. Perimeter drains around a septic tank absorption field help lower the seasonal high water table. Placing the distribution lines of a septic tank absorption field across the slope reduces lateral seepage of effluent to the surface. Sanitary facilities should be connected to central sewers and treatment facilities wherever possible. In constructing local roads and streets, artificial drainage and the use of a suitable base material reduce damage caused by frost action. Maintaining a plant cover during construction and using water control practices help reduce erosion.

The Canfield soil is in capability subclass IIe. It is not assigned to a woodland suitability subclass.

CgB—Cardington silt loam, 2 to 6 percent slopes. This is a deep, gently sloping, moderately well drained soil on slightly convex knolls and on side slopes along drainageways on uplands. The areas are mainly rounded to irregular in shape and range from 2 to 20 acres in size. A few areas are on ridgetops and have long, uniform slopes. These areas range from 5 to 200 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 8 inches thick. The subsoil is yellowish brown and dark yellowish brown and is about 32 inches thick. The upper part is firm silt loam, the middle part is mottled, firm clay loam, and the lower part is mottled, firm silty clay loam. The substratum to a depth of about 60 inches is dark yellowish brown, firm, calcareous silty clay loam glacial till. In a few eroded areas, the surface layer is lighter in color.

Included with this soil in mapping are small areas of the somewhat poorly drained Bennington soils on the gentler slopes and the poorly drained Condit soils in depressions. The included soils make up 10 to 15 percent of most areas.

A perched seasonal high water table is between depths of 24 and 42 inches in extended wet periods. Permeability is moderately slow. The root zone is mainly restricted to the moderately deep zone above the compact glacial till. The available water capacity is moderate. Tilth is good. Runoff is medium. The subsoil is very strongly acid to medium acid in the upper part and medium acid to neutral in the lower part. The content of organic matter is moderate.

In many areas this soil is used for crops. It is well suited to corn, soybeans, and small grains. Controlling erosion and maintaining tilth are the main concerns in management. This soil remains wet later in spring than adjacent well drained soils. No-till and other forms of conservation tillage, which leaves crop residue on the surface, contour tillage, contour stripcropping, cover crops, rotations that include grasses and legumes, and grassed waterways help reduce runoff and erosion. Leaving crop residue on the surface in the fall and not plowing until spring also protect the soil against erosion. The surface layer crusts after hard rains. Incorporating crop residue or other organic matter into the surface layer increases water intake, improves tilth and fertility, and reduces crusting. Random subsurface drains are commonly used to drain seep spots and areas of the included, less well drained soils.

In some areas this soil is used as pasture. It is well suited to grasses and legumes for hay and pasture. If the soil is plowed to prepare a seedbed or the pasture is overgrazed, erosion is a moderate hazard. Reseeding with a cover crop or companion crop, using a mulch, or no-till seeding reduces the risk of erosion.

In some areas this soil is used as woodland. It is well suited to trees and to plants that provide food and cover for openland and woodland wildlife. Plant competition can be reduced by spraying, mowing, or disking.

This soil is moderately well suited as a site for buildings and septic tank absorption fields. Its seasonal wetness, moderate shrink-swell potential, and moderately slow permeability limit these uses. Building sites should be landscaped to permit surface runoff to drain away from foundations. Subsurface drains help reduce wetness. Drains at the base of footings and exterior wall coatings help prevent wet basements. Backfilling along basement walls with material that has a low shrink-swell potential reduces damage caused by the shrinking and swelling of the soil. Enlarging a septic tank absorption field increases the absorption of effluent. Perimeter drains around the absorption field help reduce seasonal wetness. Diversions and surface drains that intercept runoff from higher adjacent soils help reduce seasonal wetness and erosion. Installing artificial drainage and strengthening or replacing the base material of local roads and streets help to reduce damage caused by frost action and low soil strength. Good pond sites are available in most areas.

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

CgB2—Cardington silt loam, 2 to 6 percent slopes, eroded. This is a deep, gently sloping, moderately well drained soil on slightly convex knolls and on side slopes along drainageways on uplands. Erosion has removed part of the original surface layer. The present surface layer is a mixture of the original surface layer and the subsoil material. The areas are mainly rounded or irregular in shape and range from 2 to 20 acres in size.

Typically, the surface layer is brown, friable silt loam about 8 inches thick. The subsoil is yellowish brown and dark yellowish brown, firm clay loam and silty clay loam about 30 inches thick. It is mottled in the middle and lower parts. The substratum to a depth of about 60 inches is dark yellowish brown, firm, calcareous silty clay loam glacial till. In some areas the surface layer is thicker and darker.

Included with this soil in mapping are small areas of the somewhat poorly drained Bennington soils on the gentler slopes and the poorly drained Condit soils in depressions. Also included are small areas of severely eroded soils that have a surface layer consisting almost entirely of subsoil material. The included soils make up 10 to 15 percent of most areas.

A perched seasonal high water table is between depths of 24 and 42 inches in extended wet periods. Permeability is moderately slow. Root development is mainly restricted to the moderately deep zone above the compact glacial till. The available water capacity is moderate, and tilth is good. Runoff is medium. The subsoil is very strongly acid to medium acid in the upper part and medium acid to neutral in the lower part. The content of organic matter is moderately low.

This soil is used mainly for crops. It is well suited to corn, soybeans, and small grains. Controlling erosion, reducing crusting, and improving fertility and the content of organic matter are the main management concerns. The surface layer crusts after hard rains. Meadow crops of grasses and legumes in the rotation and winter cover crops help reduce erosion. No-till and other forms of conservation tillage, which leaves crop residue on the surface, contour tillage, contour stripcropping, and grassed waterways also help reduce erosion. These practices also increase water infiltration, improve tilth and fertility, and reduce crusting. Random subsurface drains are used in areas of the included wetter soils.

This soil is well suited to grasses and legumes for hay and pasture. Controlling erosion and maintaining an optimum stand of the desirable plant species are the main concerns in management. Reseeding with a cover crop or companion crop, using a mulch, or no-till seeding help reduce erosion. Proper stocking rates, pasture rotation, timely deferment of grazing, and weed control help keep the pasture and soil in good condition.

In a few areas this soil is used as woodland. It is well suited to trees and to plants that provide food and cover for openland and woodland wildlife. Plant competition can be reduced by spraying, mowing, or disking.

This soil is moderately well suited as a site for buildings and septic tank absorption fields. Its seasonal wetness, moderate shrink-swell potential, and moderately slow permeability limit these uses. Building sites should be landscaped so that surface runoff drains away from foundations. Subsurface drains are used to reduce wetness. Drains at the base of footings and exterior wall coatings are commonly used to help prevent wet basements. Backfilling along basement walls with material that has a low shrink-swell potential reduces damage caused by the shrinking and swelling of the soil. Maintaining plant cover during construction and using water control practices reduce runoff and erosion. Enlarging a septic tank absorption field increases the absorption of effluent. Perimeter drains around the absorption field help reduce seasonal wetness. Diversions or surface drains that intercept runoff from higher adjacent soils help reduce seasonal wetness and erosion. In constructing local roads and streets, installing artificial drainage and strengthening or replacing the base material help to prevent the damage caused by frost action and low soil strength. Good pond sites are available in most areas.

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

CgC—Cardington silt loam, 6 to 12 percent slopes. This is a deep, sloping, moderately well drained soil on knolls and on side slopes along drainageways on uplands. The areas are mainly rounded or irregular in shape and range from 2 to 20 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 8 inches thick. The subsoil is yellowish brown and dark yellowish brown and is about 32 inches thick. The upper part is firm silt loam, and the middle and lower parts are mottled, firm clay loam and silty clay loam. The substratum to a depth of about 60 inches is dark yellowish brown, firm, calcareous silty clay loam glacial till. In a few eroded areas, the surface layer is lighter in color.

Included with this soil in mapping are small areas of the somewhat poorly drained Bennington soils on toe slopes and in depressions. Also included are a few narrow strips of the somewhat poorly drained Orrville soils along streams. The included soils make up 5 to 15 percent of most areas.

A perched seasonal high water table is between depths of 24 and 42 inches in extended wet periods. Permeability is moderately slow. The root zone is mainly restricted to the moderately deep zone above the compact glacial till. The available water capacity is moderate. Tilth is good. Runoff is rapid. The subsoil is very strongly acid to medium acid in the upper part and medium acid to neutral in the lower part. The content of organic matter is moderate.

In many areas this soil is used for crops. It is moderately well suited to corn, soybeans, and small grains, but erosion is a severe hazard. Conservation tillage, which leaves crop residue on the surface, contour stripcropping, cover crops, rotations that include grasses and legumes, and grassed waterways help reduce runoff and erosion. However, such practices as contour stripcropping are difficult to use on complex slopes. Leaving crop residue on the surface in the fall and not plowing until spring also protect the soil against erosion. Random subsurface drains are used to lower the seasonal high water table in areas of the included somewhat poorly drained soils.

In some areas this soil is used as pasture. It is well suited to grasses and legumes for hay and pasture. If the soil is plowed for seedbed preparation or the pasture is overgrazed, erosion is a severe hazard. Reseeding with a cover or companion crop, using a mulch, or no-till seeding reduces the risk of erosion.

In some areas this soil is used as woodland. It is well suited to trees and to use as habitat for openland and woodland wildlife. Plant competition can be reduced by spraying, mowing, or disking.

This soil is moderately well suited to building sites and septic tank absorption fields. Its seasonal wetness, moderately slow permeability, slope, and moderate shrink-swell potential limit these uses. Drains at the base of footings and exterior wall coatings help prevent wet basements. Backfilling along basement walls with material that has a low shrink-swell potential reduces damage caused by the shrinking and swelling of the soil. Maintaining plant cover during construction and using other water control practices help reduce erosion. Effluent from a septic tank absorption field can seep horizontally and come to the surface downslope. Placing distribution lines across the slope reduces seepage to the surface. Perimeter drains around the absorption field help lower the seasonal high water table. Diversions or surface drains that intercept runoff from higher adjacent soils help reduce seasonal wetness and erosion. In constructing local roads and streets, artificial drainage and a suitable road base material reduce damage caused by frost action and low soil strength.

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

CgC2—Cardington silt loam, 6 to 12 percent slopes, eroded. This is a deep, sloping, moderately well drained soil on low knolls and on side slopes along drainageways on uplands. The areas on knolls are rounded or irregular in shape and have short, uneven slopes; the areas on the side slopes of drainageways are long and narrow and have short, smooth slopes. Erosion has removed part of the original surface layer. The present surface layer is a mixture of the original surface layer and the subsoil material. The areas mainly range from 2 to 20 acres in size.

Typically, the surface layer is brown, friable silt loam about 8 inches thick. The subsoil is yellowish brown and dark yellowish brown, firm clay loam and silty clay loam about 28 inches thick. It is mottled in the middle and lower parts. The substratum to a depth of about 60 inches is dark yellowish brown, firm, calcareous silty clay loam glacial till. In some uneroded areas, the surface layer is thicker and darker.

Included with this soil in mapping are small areas of the somewhat poorly drained Bennington soils on toe slopes and in depressions. Also included are some small areas of severely eroded soils that have a silty clay loam surface layer. The included soils make up 5 to 15 percent of most areas.

A perched seasonal high water table is between depths of 24 and 42 inches in extended wet periods. Permeability is moderately slow. Root growth is mainly restricted to the moderately deep zone above the compact glacial till. The available water capacity is moderate, and tilth is good. Runoff is rapid. The subsoil is very strongly acid to medium acid in the upper part and medium acid to neutral in the lower part. The content of organic matter is moderately low.

In many areas this soil is used for crops. It is moderately well suited to corn and small grains and poorly suited to soybeans. Controlling erosion, especially if soybeans are grown, and reducing crusting are the main concerns in management. Erosion is a severe hazard. No-till and other forms of conservation tillage, which leaves crop residue on the surface, contour stripcropping, winter cover crops, and grassed waterways help reduce erosion. Rotations that include a high percentage of hay or pasture and regular applications of barnyard manure and other organic material also reduce erosion and surface crusting. The areas of this soil on side slopes can be easily adapted to contour stripcropping. Artificial drainage is needed in areas of the included, less well drained soils.

This soil is well suited to grasses and legumes for pasture and hay. If the soil is plowed for seedbed preparation or the pasture is overgrazed, erosion is a severe hazard. Reseeding with a cover crop or companion crop, using a mulch, or no-till seeding reduces the hazard of erosion. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the plants and the soil in good condition.

In some areas this soil is used as woodland. It is well suited to trees and to use as habitat for openland and woodland wildlife. Plant competition can be reduced by spraying, mowing, or disking.

This soil is moderately well suited to building sites and septic tank absorption fields. Its seasonal wetness, moderately slow permeability, slope, and moderate shrink-swell potential limit these uses. Drains at the base of footings and exterior wall coatings help prevent wet basements. Backfilling along basement walls with material that has a low shrink-swell potential reduces damage caused by the shrinking and swelling of the soil. Maintaining plant cover during construction and using water control practices help reduce erosion. Effluent from a septic tank absorption field can seep horizontally and come to the surface downslope. Placing distribution lines across the slope reduces seepage to the surface. Perimeter drains around the absorption field help lower the seasonally high water table. Diversions or surface drains that intercept runoff from higher adjacent soils help reduce seasonal wetness and erosion. In constructing local roads and streets, artificial drainage and a suitable road base material reduce damage caused by frost action and low soil strength.

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

Ch—Carlisle muck. This is a deep, level, very poorly drained soil in bogs and depressions on lake plains, outwash terraces, flood plains, and till plains. It is subject to frequent flooding and ponding. The slope is less than 2 percent. The areas are mainly rounded or irregular in shape and range from 3 to 200 acres in size.

Typically, the surface layer is black, friable muck about 7 inches thick. Below the surface layer, to a depth of about 60 inches, there are layers of black and dark yellowish brown, friable and nonsticky muck. In some areas there is a thin surface layer of silt loam. Many areas on lake plains, outwash terraces, and till plains are not subject to frequent flooding. In some areas there is mineral material between depths of 16 and 51 inches.

Included with this soil in mapping are small areas of Wallkill soils, which have light-colored alluvium overlying the muck. These included soils typically form a narrow rim around the edge of the Carlisle soil. They make up 5 to 15 percent of most areas.

The seasonal high water table is near or above the surface for long periods. Permeability is moderately slow to moderately rapid. The root zone is deep. The available water capacity is very high, and tilth is good. Runoff is very slow or is ponded. The root zone is very strongly acid to neutral. The content of organic matter is very high.

In drained areas this soil is used for corn and soybeans. It is moderately well suited to these crops. Special crops, such as potatoes and sod, are grown in some areas. This soil is generally not suited to small grains because of flooding and ponding. Undrained areas are too wet for cultivated crops. Commonly, subsurface drains and open ditches are used to drain an area. The banks of open ditches are unstable and subject to sloughing. Subsidence or soil shrinkage takes place as the organic material dries out and becomes oxidized; consequently, subsurface drains may eventually shift out of alignment. Controlled drainage, by which the water table can be raised or lowered as needed, reduces the shrinkage. This soil is subject to wind erosion, but soil blowing generally can be controlled by planting cover crops and using shrub and tree windbreaks.

In some undrained areas this soil is used as pasture. It is moderately well suited to grass but poorly suited to legumes. Pastures on this soil are productive even in long dry periods. The soil is very soft early in spring, and grazing at that time can cause considerable damage to plants and reduce air and water movement through the soil.

Most undrained areas are used as natural habitat for wetland wildlife. This soil is poorly suited to use as woodland because of wetness. It is well suited to use as habitat for wetland wildlife. Selecting only those trees for planting that are tolerant of prolonged wetness helps reduce seedling mortality. Windthrow is a hazard, but it can be reduced by planting deep-rooted species.

Flooding, ponding, the moderately slow permeability, and low strength make this soil generally not suitable as a site for buildings and septic tank absorption fields.

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

Ck—Carlisle muck, ponded. This is a deep, level, very poorly drained soil in basinlike swampy areas. It is subject to frequent flooding and generally is ponded by surface runoff from surrounding areas. The slope is less than 2 percent. The areas are mainly irregular in shape and range from 10 to 150 acres in size.

Typically, the surface layer is black, friable muck about 7 inches thick. Below the surface layer, to a depth of about 60 inches, there are layers of black and dark yellowish brown, friable and nonsticky muck. In a few places there is mineral material between depths of 16 and 51 inches. Many areas are not subject to frequent flooding.

Included with this soil in mapping and making up 5 to 10 percent of most areas are small areas of the poorly drained Melvin soils, which formed in recent alluvium. Melvin soils and the Carlisle soil are in similar positions on the landscape.

The seasonal high water table is near or above the surface most of the year, and the soil is ponded. Permeability is moderately slow to moderately rapid. The root zone is deep. The available water capacity is very high, and tilth is good. The root zone is very strongly acid to neutral. The content of organic matter is very high.

This soil is used as natural habitat for wetland wildlife. It is well suited to this use. The areas support water-tolerant trees and cattails, reeds, and sedges. This soil generally is not suited to cultivated crops, hay, pasture, woodland, building sites, and septic tank absorption fields because of flooding, ponding, and its moderately slow permeability and low strength. The fluctuating water level limits the survival of most trees.

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

CnA—Chili loam, 0 to 2 percent slopes. This is a deep, nearly level, well drained soil on outwash plains and stream terraces. The areas are mainly irregular in shape and range from 3 to 20 acres in size.

Typically, the surface layer is dark brown, friable loam about 10 inches thick. The subsoil is about 40 inches thick. The upper part is brown and dark yellowish brown, friable clay loam and gravelly clay loam; the middle part is stratified, dark yellowish brown, friable sandy clay loam and brown, friable fine sandy loam; and the lower part is brown, firm gravelly clay loam and friable sandy loam. The substratum to a depth of about 60 inches is brown, loose gravelly loamy sand. In some areas the surface layer and the upper part of the subsoil are silt loam. In a few places the surface layer is sandy loam, gravelly sandy loam, or gravelly loam. In a few areas the subsoil has more silt and less gravel. In some areas the soil is moderately well drained and has gray mottles in the lower part of the subsoil.

Included with this soil in mapping and making up 5 to 15 percent of most areas are small areas of the somewhat poorly drained Jimtown soils in depressions and shallow drainageways.

Permeability is moderately rapid. The root zone is deep. The available water capacity is moderate, and tilth is good. Runoff is slow. The subsoil is strongly acid to slightly acid. The content of organic matter is moderate.

This soil is used for crops. It is well suited to corn, soybeans, and small grains and to use as orchards and nurseries. This soil can be tilled early in spring. The surface layer can be worked within a fairly wide range of moisture content. Droughtiness is a hazard. Incorporating crop residue or other organic material into the surface layer increases water infiltration and improves the capacity of this soil for holding water. The natural drainage is adequate for crops. This soil is suited to irrigation. Because nutrients are moderately rapidly leached, crops generally respond better to small but frequent and timely applications of fertilizer than to one large application.

This soil is well suited to grasses and legumes for hay and pasture, especially deep-rooted plants such as alfalfa. The natural drainage permits grazing early in spring. Shallow-rooted grasses and legumes make poor growth during the dry part of the summer.

In a few areas this soil is in trees. It is well suited to use as woodland and as habitat for openland and woodland wildlife. Plant competition can be reduced by spraying, mowing, or disking.

This soil is well suited as a site for buildings and septic tank absorption fields. Building sites should be landscaped so that surface runoff drains away from foundations. Because permeability in the substratum is rapid, underground water supplies can become contaminated if this soil is used for septic tank absorption fields. Placing septic tank absorption fields in suitable fill material reduces this hazard. In constructing local roads and streets, strengthening or replacing the base material helps to reduce damage caused by frost action. Sloughing is a hazard if this soil is excavated. Special safety precautions are needed in digging basements or trenches. Because this soil tends to be droughty, lawn seeding should be done early in spring. If lawns are seeded in dry periods, they need to be mulched and watered. This soil is a good source of roadfill and a probable source of sand and gravel.

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

CnB—Chili loam, 2 to 6 percent slopes. This is a deep, gently sloping, well drained soil on broad outwash plains and on stream terraces and low kames. The smaller areas are rounded, and the larger areas generally are long and narrow. The areas range from 3 to 40 acres in size.

Typically, the surface layer is dark brown, friable loam about 9 inches thick. The subsoil is about 45 inches thick. The upper part is brown and dark yellowish brown, friable clay loam and gravelly clay loam; the middle part is stratified, dark yellowish brown, friable sandy clay loam and brown, friable fine sandy loam; and the lower part is brown, firm gravelly clay loam and friable sandy loam. The substratum to a depth of about 60 inches is brown, loose very gravelly loamy sand. In some places, the surface layer is silt loam, gravelly loam, sandy loam, or gravelly sandy loam. In some small eroded spots, subsoil material is mixed into the surface layer. In some areas the soil is moderately well drained and has gray mottles in the lower part of the subsoil.

Included with this soil in mapping and making up 5 to 15 percent of most areas are small areas of the somewhat poorly drained Jimtown soils in depressions and shallow drainageways.

Permeability is moderately rapid. The root zone is deep. The available water capacity is moderate, and tilth is good. Runoff is medium. The subsoil is strongly acid to slightly acid. The content of organic matter is moderate.

This soil is used for crops. It is well suited to corn, soybeans, and small grains and to use as orchards and nurseries. Erosion and slight droughtiness are the main concerns in management. This soil can be tilled early in spring. The surface layer can be worked within a fairly wide range of moisture content. This soil is suited to no-till. Contour tillage, cover crops, rotations that include grasses and legumes, grassed waterways, and conservation tillage, which leaves crop residue on the surface, all help reduce runoff and erosion. In many areas, this soil is not adapted to contour stripcropping because the slopes are complex. Leaving crop residue on the surface in the fall and not plowing until spring protect the soil against erosion. Incorporating crop residue or other organic matter into the surface layer increases water infiltration and improves the moisture-holding capacity of the soil. This soil is suited to irrigation. Because nutrients are moderately rapidly leached, crops generally respond better to small but frequent and timely applications of fertilizer than to one large application.

This soil is well suited to grasses and legumes for hay and pasture, especially deep-rooted plants such as alfalfa. The natural drainage permits grazing early in spring. Shallow-rooted grasses and legumes make poor growth during the dry part of the summer. Erosion is a moderate hazard if this soil is plowed to prepare a seedbed or the pasture is overgrazed. Reseeding with a cover crop or companion crop, using a mulch, or no-till seeding reduces the risk of erosion.

In some areas this soil is in trees. It is well suited to use as woodland and to habitat for openland and woodland wildlife. Plant competition can be reduced by spraying, mowing, or disking.

This soil is well suited as a site for buildings and septic tank absorption fields. Sloughing and cave-ins are a hazard if the soil is excavated, and special safety precautions are needed in digging basements or trenches. Because permeability is rapid in the substratum, the underground water supply can become contaminated if this soil is used for septic tank absorption fields. Placing septic tank absorption fields in suitable fill material reduces this hazard. In constructing local roads and streets, strengthening or replacing the base material helps to reduce damage caused by frost action. This soil tends to be droughty; therefore, lawn seeding should be done early in spring. Lawns that are seeded in a dry period need to be mulched and watered. As much plant cover as possible should be maintained on the site during construction to reduce soil loss by erosion. This soil is a good source of roadfill and a probable source of sand and gravel.

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

CnC—Chili loam, 6 to 12 percent slopes. This is a deep, sloping, well drained soil on kames and stream terraces. The areas on kames are rounded and generally range from 3 to 10 acres in size. The areas on terraces are long and narrow and range from 5 to 25 acres in size.

Typically, the surface layer is dark brown, friable loam about 8 inches thick. The subsoil is about 36 inches thick. The upper part is brown and dark yellowish brown, friable clay loam and gravelly clay loam; the middle part is stratified, dark yellowish brown, friable sandy clay and brown, friable fine sandy loam; and the lower part is brown, firm gravelly clay loam and friable sandy loam. The substratum to a depth of about 60 inches is brown, loose gravelly loamy sand. In some places, the surface layer is silt loam, gravelly loam, sandy loam, or gravelly sandy loam. In some small eroded spots subsoil material is mixed into the surface layer. In some places, the subsoil has more gravel. In some areas the soil is moderately well drained and has gray mottles in the lower part of the subsoil.

In a few areas, the surface layer and subsoil have more sand and less clay and the soil is more droughty.

Permeability is moderately rapid. The root zone is deep. The available water capacity is moderate, and tilth is good. Runoff is rapid. The subsoil is strongly acid to slightly acid. The content of organic matter is moderate.

The soil is used for crops. It is moderately well suited to corn, soybeans, and small grains grown in rotation with meadow crops. This soil is well suited to orchards. It can be tilled early in spring. The surface layer can be worked within a fairly wide range of moisture content. Droughtiness and a severe hazard of erosion are the main concerns. Erosion on this soil is excessive if soybeans are grown continuously. This soil is well suited to no-till and other forms of conservation tillage, which keeps crop residue on the surface. Contour stripcropping, cover crops, rotations that include grasses and legumes, and grassed waterways help reduce runoff and erosion. The areas of this soil that have simple slopes are well suited to such erosion control practices as contour stripcropping, but these practices are not adapted to the shorter, more complex slopes. Leaving crop residue on the surface in the fall and not plowing until spring also protect the soil against erosion. Incorporating crop residue or other organic material into the surface layer increases water infiltration and improves the moisture-holding capacity of the soil. Because nutrients are moderately rapidly leached from this soil, crops generally respond better to small but timely and frequent applications of fertilizer than to one large application. Air drainage in valleys is not favorable for commercial fruit production.

In a few areas, this soil is used as pasture. It is well suited to grasses and legumes for hay and pasture, especially deep-rooted plants such as alfalfa. The natural drainage permits grazing early in spring. Shallow-rooted plants make poor growth during the dry part of the summer. If this soil is plowed for seedbed preparation or the pasture is overgrazed, erosion is a severe hazard. Reseeding with a cover crop or companion crop, using a mulch, or no-till seeding reduces the risk of erosion.

In a few areas this soil is used as woodland. It is suited to trees and to use as habitat for openland and woodland wildlife. Plant competition can be reduced by spraying, mowing, or disking.

This soil is moderately well suited as a site for buildings and septic tank absorption fields. Buildings should be designed to conform to the natural shape of the land. Erosion and sedimentation during construction can be reduced by using plant cover and other water-control measures. There is a hazard of sloughing or cave-ins if this soil is excavated. Special safety precautions are needed in digging basements or trenches. Effluent from septic tank absorption fields can pollute the underground water supply. Placing the absorption fields in suitable fill material reduces this hazard. In constructing local roads and streets, strengthening or replacing the base material helps reduce damage caused by frost action. Because this soil is droughty, lawn seeding should be done early in spring. Lawns that are seeded in a dry period need to be mulched and watered.

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

CoD2—Chili gravelly loam, 12 to 25 percent slopes, eroded. This is a deep, moderately steep and steep, well drained soil on kames and stream terraces. Erosion has removed part of the original surface layer. The present surface layer is a mixture of the original surface layer and the subsoil material. The areas generally are rounded or long and narrow and are 3 to 15 acres in size.

Typically, the surface layer is dark brown, friable gravelly loam about 7 inches thick. The subsoil is about 36 inches thick. The upper part is dark yellowish brown, friable gravelly loam, and the middle and lower parts are brown, friable gravelly sandy loam and firm gravelly clay loam. The substratum to a depth of about 60 inches is brown, loose gravelly loamy sand. In some areas the surface layer is sandy or gravelly sandy loam. In a few areas the subsoil has more sand and less clay.

Included with this soil in mapping are small areas of more droughty, severely eroded soils; the surface layer of these soils consists almost entirely of subsoil material. Also included are some seeps and springs. The included areas make up 5 to 15 percent of most mapped areas.

Permeability is moderately rapid. The root zone is deep. The available water capacity is low or moderate, and tilth is good. Runoff is rapid. The subsoil is strongly acid to slightly acid. The content of organic matter is moderately low.

This soil is poorly suited to corn and small grains and generally is not suited to soybeans because of the slope, the very severe hazard of erosion, and droughtiness. Row crops can be grown occasionally if erosion is controlled and the soil is otherwise well managed. The slope causes some difficulty in the use of machinery and the installation of erosion control practices. Because of the slope, much of the rainfall is lost as runoff. Grassed waterways are needed in drainageways to reduce gullying. No-till and other forms of conservation tillage, which leaves crop residue on the surface, contour stripcropping, planting cover crops, and rotations that include a high percentage of meadow crops help reduce runoff and erosion. Such practices as contour stripcropping are not adapted to the shorter, more complex slopes. Leaving crop residue on the surface over winter helps protect the soil against erosion. Because nutrients are moderately rapidly leached, crops generally respond better to small but frequent and timely applications of fertilizer than to one large application.

This soil is used as pasture. It is moderately well suited to grasses and legumes for hay and pasture, especially deep-rooted plants such as alfalfa. Shallow-rooted plants make poor growth during the dry part of summer. The natural drainage permits grazing early in spring. If this soil is plowed for seedbed preparation or the pasture is overgrazed, erosion is a very severe hazard. Reseeding with a cover crop or companion crop, using a mulch, or no-till seeding reduces the risk of erosion.

This soil is used as woodland and as natural habitat for wildlife. It is well suited to trees and to use as habitat for woodland wildlife. Trees that withstand some droughtiness should be selected for planting. Erosion can be reduced by locating skid trails and logging roads on the contour and by using water bars and other erosion control practices.

This soil is poorly suited as a site for buildings and septic tank absorption fields because of the moderately steep and steep slopes. Buildings should be designed to conform to the natural shape of the land. Altering building sites on this soil can create areas of unstable fill that has steeper slopes and is subject to hillside slippage. Runoff and erosion increase during construction, but they can be reduced by using plant cover and other water-control measures. There is a hazard of sloughing or cave-ins if the soil is excavated, and special safety precautions are needed in digging basements or trenches. Placing leach lines on the contour reduces lateral seepage of effluent to the surface. Effluent from septic tank absorption fields can pollute the underground water supply, but placing good filtering material below the leach lines reduces the risk of pollution. In constructing local roads, strengthening or replacing the base material helps prevent damage caused by frost action. This soil is a good source of sand and gravel.

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

CoF—Chili gravelly loam, 25 to 70 percent slopes. This is a deep, very steep, well drained soil on the side slopes of deeply entrenched drainageways on stream terraces and on slope breaks between terraces and flood plains. Most areas are long and narrow and range from 5 to 50 acres in size.

Typically, the surface layer is dark grayish brown, friable gravelly loam about 6 inches thick. The subsoil is about 36 inches thick. The upper part is dark yellowish brown, friable gravelly loam, and the middle and lower parts are brown, friable gravelly sandy loam and firm gravelly clay loam. The substratum to a depth of about 60 inches is brown, loose gravelly loamy sand. In some places the surface layer is silt loam, loam, sandy loam, or gravelly sandy loam. In some areas there is more sand or silty material and less clay and gravel in the subsoil. In a few small eroded spots, yellowish brown subsoil material is mixed into the surface layer.

Included with this soil in mapping and making up 5 to 15 percent of most areas are small seeps and springs.

Permeability is moderately rapid. The available water capacity is low or moderate, and tilth is good. Runoff is very rapid. The content of organic matter is moderately low. The subsoil is very strongly acid to slightly acid.

This soil is not suited to cultivated crops because of the very steep slopes and droughtiness.

The soil is poorly suited to hay and pasture. The very steep slopes limit the use of machinery for improvement of pastures and harvesting of hay. Natural drainage permits grazing early in spring. Erosion is a very severe hazard if the plant cover is removed. No-till seeding reduces the risk of erosion.

This soil is used as woodland and natural areas for wildlife. It is well suited to trees and to use as habitat for woodland wildlife. Species that withstand some droughtiness should be selected for planting. The very steep slopes limit intensive practices for woodland improvement and make logging difficult. Erosion can be reduced by placing roads and skid trails on the contour and by using water bars and other runoff-control practices.

This soil generally is not suitable as a site for buildings and septic tank absorption fields because of the very steep slopes. It is a probable source of sand and gravel.

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

CrB—Chili-Urban land complex, 2 to 6 percent slopes. This complex consists of a deep, gently sloping, well drained Chili soil and areas of Urban land on slightly convex knolls. Most areas are about 55 percent Chili loam and 35 percent Urban land. The areas of Chili soil and of Urban land are so intricately mixed or so small in size that it was not practical to separate them in mapping. Most areas of the complex are irregular in shape and range from 5 to 100 acres in size.

Typically, the Chili soil has a dark brown, friable loam surface layer about 9 inches thick. The subsoil is about 45 inches thick. The upper part is brown and dark yellowish brown, friable clay loam and gravelly clay loam; the middle part is stratified dark yellowish brown, friable sandy clay loam and brown, friable fine sandy loam; and the lower part is brown, firm gravelly clay loam and friable sandy loam. The substratum to a depth of about 60 inches is brown, loose gravelly loamy sand. In some places the surface layer is silt loam, gravelly loam, sandy loam, or gravelly sandy loam. In some places, the soil has been radically altered. Some low areas have been filled or leveled during construction; other small areas have been cut, built up, or smoothed. In some areas the soil is moderately well drained and has gray mottles in the lower part of the subsoil.

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

Included with this complex in mapping and making up about 10 percent of most areas are small areas of the somewhat poorly drained Jimtown soils in shallow drainageways.

Permeability is moderately rapid in the Chili soil. The root zone is deep, the available water capacity is moderate, tilth is good, and runoff is medium. The content of organic matter is moderate. The subsoil is strongly acid to slightly acid.

The Chili soil is in the parks, open spaces, lawns, and gardens. It is well suited to grasses, flowers, vegetables, trees, and shrubs. Soil erosion generally is not a major problem unless the plant cover is removed. In some areas, the soil has been radically altered and is not so suitable for lawns and gardens. The subsoil material that is exposed in these areas has poor tilth. It is commonly sticky when wet and hard when dry.

The Chili soil is well suited as a site for buildings and septic tank absorption fields. There is a hazard of sloughing and cave-ins if this soil is excavated. Special safety precautions are needed in digging basements or trenches. If this soil is used for septic tank absorption fields, the underground water supply may become contaminated because permeability in the substratum is rapid. Placing septic tank absorption fields in suitable fill material reduces this hazard. Sanitary facilities should be connected to central sewers and treatment facilities wherever possible. Because of droughtiness, lawn seeding should be done early in spring. Lawns that are seeded in a dry period should be mulched and watered. In constructing local roads and streets, strengthening or replacing the base material helps prevent damage by frost action.

The Chili soil is in capability subclass IIe. It is not assigned to a woodland suitability subclass.

Cs—Condit silt loam. This is a deep, nearly level, poorly drained soil in depressions and natural drainageways on uplands. It is subject to ponding by runoff from surrounding higher lying soils. The slopes are 0 to 2 percent. The areas are mainly rounded to oblong and range from 2 to 25 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about l0 inches thick. The subsoil is about 36 inches thick. The upper part is dark gray and gray, mottled, firm silty clay loam; the middle part is dark gray, mottled, firm silty clay; and the lower part is gray, mottled, firm silty clay loam and clay loam. The substratum to a depth of about 60 inches is olive brown, mottled, firm, calcareous clay loam glacial till. In some places the surface layer is thicker, and in other places it is silty clay loam and is darker in color.

Included with this soil in mapping and making up 5 to 10 percent of most areas are small areas of the somewhat poorly drained Bennington soils on low knolls.

The water table is near or above the surface for long periods unless the soil is artificially drained. Permeability

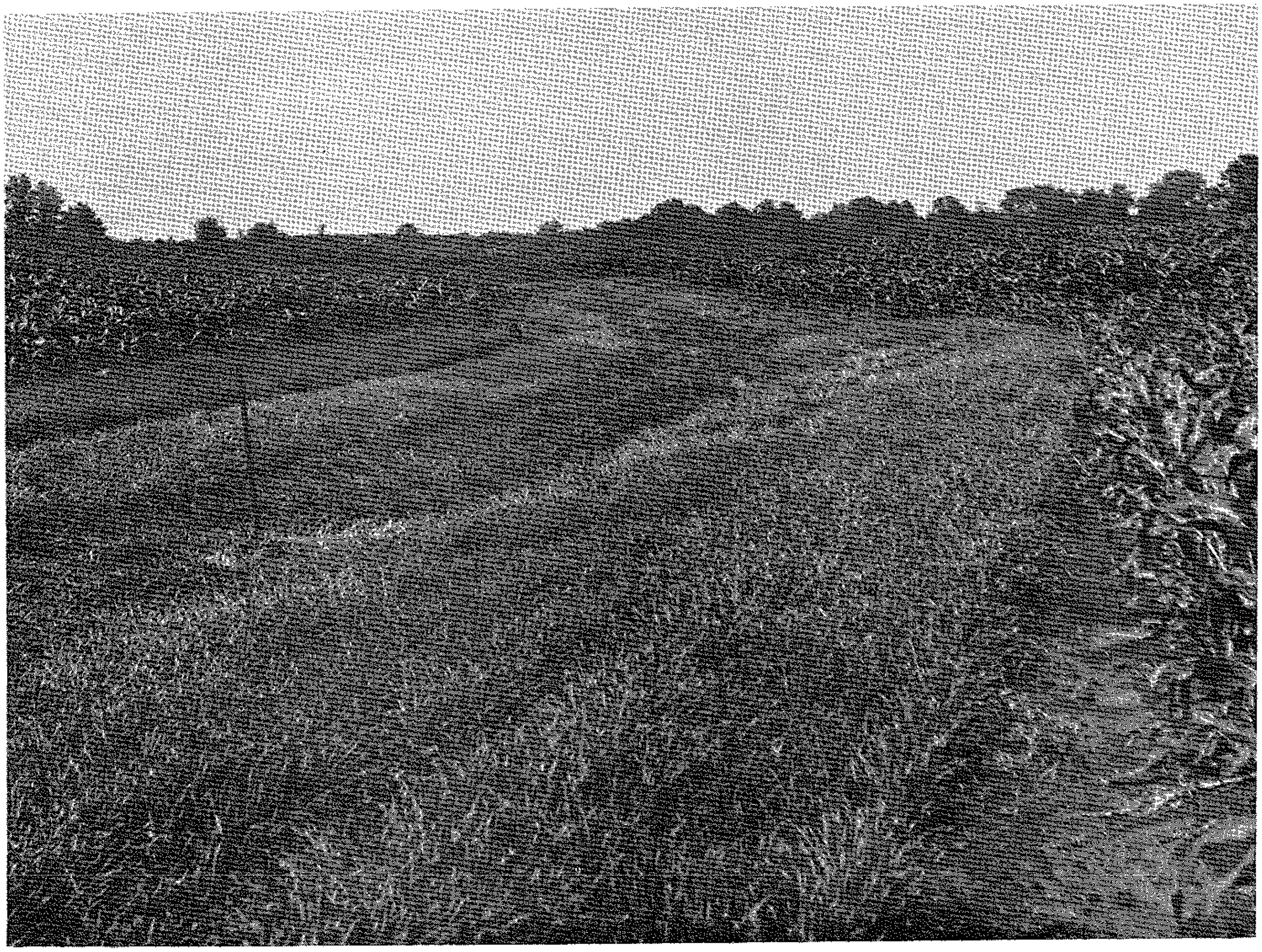

Figure 4.—This grassed waterway, constructed in a natural drainageway on Condit silt loam, was designed to take care of the runoff from a 160-acre watershed.

is slow. The root zone typically is deep. The available water capacity is moderate, and tilth is good. Runoff is very slow or is ponded. The subsoil is strongly acid to slightly acid in the upper part and medium acid to mildly alkaline in the lower part. The content of organic matter is moderate.

In drained areas, this soil is used for crops. It is moderately well suited to corn and soybeans if it is drained. It is poorly suited to small grains because of ponding. Undrained areas are too wet for cultivated crops. Wetness is the main concern in management. Surface and subsurface drains are used to lower the seasonal high water table, but an adequate drainage system is difficult to construct and maintain. In some areas, outlets for drainage systems are difficult to install. In some places, diversion ditches or grassed waterways can reduce erosion caused by runoff from higher lying soils (fig. 4).

In undrained areas, this soil is used as pasture. It is moderately well suited to water-tolerant grasses and legumes for hay and pasture, but it is poorly suited to grazing early in spring. Pasture plants generally grow well during the dry part of the summer. Grazing when this soil is wet and soft causes compaction and poor tilth and damages the plants.

Wetness limits the use of this soil as woodland. The soil is well suited to trees adapted to wet sites. Logging can be done during the drier part of the year. In some undrained areas this soil is used as natural habitat for wildlife. It is suited to use as habitat for wetland wildlife. Good pond sites are available in most areas.

This soil is not suitable as a site for buildings and septic tank absorption fields because of ponding and the slow permeability. Artificial drainage and suitable base material can be used in constructing local roads and streets to reduce damage caused by ponding, frost action, and low soil strength.

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

CtC—Coshocton silt loam, 6 to 12 percent slopes. This is a deep, sloping, moderately well drained soil. It is mainly on side slopes, but some areas are on ridgetops. The areas generally are oval or slightly crescent-shaped and range from about 5 to 80 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 7 inches thick. The subsoil is about 26 inches deep. The upper part is yellowish brown, friable silt loam; the middle part is dark yellowish brown, mottled, firm clay loam; and the lower part is grayish brown and dark grayish brown, mottled, very firm clay loam and firm shaly loam. The substratum is dark gray, mottled, very firm very shaly loam. Soft shale is at a depth of about 48 inches. In some areas the lower part of the soil is not so acid. "Coal blossoms" are common in the subsoil in some areas. In some areas glacial till is in the upper part of the soil.

Included with this soil in mapping are small areas of the well drained Riddles and Wooster soils and the moderately well drained Canfield soils, which are randomly scattered or are near the edge of mapped areas. Also included are areas of somewhat poorly drained soils in seeps. The included soils make up about 10 percent of most areas.

A perched seasonal high water table is between depths of 18 and 42 inches during extended wet periods. Permeability is moderately slow or slow. The root zone is deep. The available water capacity is moderate, and tilth is good. Runoff is rapid. The subsoil is medium acid to very strongly acid. The content of organic matter is moderate.

Most of the acreage is used for crops. This soil is moderately well suited to corn, small grains, and soybeans. Erosion is a severe hazard in cultivated areas, especially after fall plowing. No-till, tillage that leaves the surface rough and partly covered with crop residue, and other practices that increase rainfall infiltration help reduce erosion. Grassed waterways in areas where runoff concentrates help to reduce gullying. Including grasses and legumes in the cropping system helps control erosion. Random subsurface drains are needed in the included areas of somewhat poorly drained soils in seeps.

In many areas this soil is used as pasture. It is well suited to grasses and legumes for hay and pasture. Grazing when the soil is wet causes compaction and increased runoff and reduces yields. The trash-mulch method of pasture renovation reduces the hazard of erosion during reseeding.

This soil is well suited to trees. Plant competition can be reduced by spraying, mowing, or disking.

This soil is moderately well suited as a site for buildings and poorly suited to septic tank absorption fields. The slope, seasonal wetness, and the moderately slow or slow permeability are limitations for these uses. Buildings should be designed to conform to the natural shape of the land. Land shaping is needed in many areas. The underlying soft shale bedrock is rippable with excavation equipment. Drains at the base of footings and exterior coating on basement walls help prevent wet basements. Backfilling along foundations with material that has a low shrink-swell potential reduces damage caused by the shrinking and swelling of the soil. Installing the distribution lines of septic tank absorption fields on the contour reduces lateral seepage of effluent to the surface. Enlarging the absorption field increases the absorption of effluent. Diversions that intercept surface runoff from higher adjacent soils help reduce wetness. In constructing local roads and streets, replacing the upper layer of this soil with suitable base material reduces damage resulting from low soil strength and frost action.

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

DkD—Dekalb channery loam, 12 to 18 percent slopes. This is a moderately deep, moderately steep, well drained soil on side slopes and knobs on uplands. The areas generally are long and narrow and are less than 15 acres in size.

Typically, the surface layer is very dark grayish brown, friable channery loam about 3 inches thick. The subsurface layer is brown, friable channery very fine sandy loam about 5 inches thick. The subsoil is yellowish brown, friable channery very fine sandy loam and very channery sandy loam. It is about 22 inches thick. Sandstone bedrock is at a depth of about 30 inches. In places bedrock is between depths of 10 and 20 inches or 40 and 60 inches. In some areas stones are on the surface, and in a few areas there is more silt and less sand in the subsoil. In a few areas the slopes are 8 to 12 percent.

Included with this soil in mapping are small areas of Loudonville soils, which have fewer coarse fragments in the subsoil. Also included are a few seep spots and springs on the lower part of slopes. The included areas make up 10 to 20 percent of most mapped areas.

Permeability is rapid. The root zone is moderately deep. The available water capacity is very low, and tilth is good. Runoff is rapid. The subsoil is extremely acid to strongly acid. The content of organic matter is moderate.

This soil is poorly suited to corn and small grains and is not suited to soybeans because of the slope, droughtiness, and the severe hazard of erosion. Small stones in the surface layer interfere with cultivation, planting, and seed germination. Corn can be grown occasionally if erosion is controlled by such practices as contour stripcropping or no-till. The slopes interfere with the use of machinery. In some areas, the slopes are too short to use stripcropping with modern farm machinery. Because the available water capacity is very low, early-maturing crops are better suited to this soil than late-season crops. Conservation tillage, which leaves crop residue on the surface, cover crops, rotations that include grasses and legumes, and grassed waterways help reduce runoff and erosion. The areas of this soil that have long, smooth slopes are well suited to erosion control practices. Incorporating crop residue or other organic matter into the surface layer increases water infiltration and improves tilth and fertility.

In some areas this soil is used for pasture and hay. It is moderately well suited to pasture and hay. Pastures can be grazed early in spring. This soil is droughty during dry periods. If the soil is plowed to prepare a seedbed or the pasture is overgrazed, erosion is a severe hazard. Reseeding with a cover crop or companion crop, using a mulch, or no-till seeding reduces the risk of erosion.

In many areas this soil is used as woodland. This soil is moderately well suited to trees and to use as habitat for woodland wildlife. Selecting drought-tolerant species for planting reduces seedling mortality. Spraying, shallow tillage, and mowing help reduce plant competition.

This soil is poorly suited as a site for buildings and is not suited to septic tank absorption fields. The slope and the moderate depth to bedrock limit excavation for basements and utility lines. Blasting is sometimes necessary. Buildings should be designed to conform to the natural shape of the land. Altering building sites on this soil commonly creates fill areas that have steeper slopes; the soil in these areas is unstable and subject to slippage. Special building and landscape design may be needed to prevent the fill material from slipping downhill. Runoff and erosion generally increase during construction, but they can be reduced by maintaining plant cover wherever possible and by using other water control practices.

This soil is in capability subclass IVe and in woodland suitability subclass 4f.

DkE—Dekalb channery loam, 18 to 25 percent slopes. This is a moderately deep, steep, well drained soil on knobs and the upper part of side slopes on uplands. The areas generally are long and narrow and are less than 25 acres in size.

Typically, the surface layer is very dark grayish brown, friable channery loam about 3 inches thick. The subsurface layer is brown, friable channery very fine sandy loam about 5 inches thick. The subsoil is yellowish brown, friable channery very fine sandy loam and very channery sandy loam. It is about 22 inches thick. Sandstone bedrock is at a depth of about 30 inches. In places, bedrock is between depths of 10 and 20 inches or 40 and 60 inches. In places, there are stones on the surface. In a few areas the subsoil has more silt and less sand.

Included with this soil in mapping are small areas of Loudonville soils, which have fewer coarse fragments in the subsoil. Also included are a few springs or seep spots on the lower part of slopes and bedrock outcroppings on shoulder slopes. Also included are narrow strips of soils that have slopes of 25 to 40 percent. The included areas make up 10 to 20 percent of most mapped areas.

Permeability is rapid. The root zone is moderately deep. The available water capacity is very low, and tilth is good. Runoff is very rapid. The subsoil is extremely acid to strongly acid. The content of organic matter is moderate.

Because of the steep slopes, the very severe hazard of erosion, and the very low available water capacity, this soil is poorly suited to row crops, small grains, hay, and pasture. Pastures can be grazed early in spring, but because the soil is droughty, plants do not make much growth during the dry part of some summers. If the soil is plowed for seedbed preparation or the pasture is overgrazed, erosion is a very severe hazard. No-till seeding helps reduce runoff and erosion.

This soil is used mainly as woodland and is moderately well suited to trees. The steep slopes hinder the use of equipment for planting, mowing, and disking. Plant competition can be reduced by spraying. Constructing logging roads and skid trails on the contour wherever possible helps to reduce erosion. To reduce seedling mortality, only those trees should be selected for planting that are tolerant of a very low available water capacity and a large amount of rock fragments in the subsoil.

This soil is not suitable as a site for buildings and septic tank absorption fields because of the steep slopes and the moderate depth to bedrock.

This soil is in capability subclass IVe and in woodland suitability subclass 4f.

EuA—Euclid silt loam, occasionally flooded. This is a deep, nearly level, somewhat poorly drained soil on low stream terraces. This soil is subject to occasional flooding for very brief periods in winter and spring. The slope is 0 to 2 percent. The areas are mainly irregular in shape and range from 10 to 500 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 11 inches thick. The subsurface layer is also dark brown, friable silt loam and is about 5 inches thick. The subsoil is about 38 inches thick. The upper part is yellowish brown, mottled, friable silt loam; the middle part is dark yellowish brown and gray, mottled, firm silty clay loam; and the lower part is dark brown, mottled, firm clay loam. The substratum to a depth of about 60 inches

Figure 5.—This field in an area of Euclid silt loam, occasionally flooded, has been prepared for sowing. This soil is well suited to warm-season crops.

is strong brown, mottled, friable silt loam. In a few places the surface layer is loam or sandy loam.

Included with this soil in mapping are small areas of the poorly drained Sebring soils in slight depressions. Also included are small areas of the somewhat poorly drained Orrville soils and the poorly drained Melvin soils on flood plains. The included soils make up 10 to 15 percent of most areas.

The seasonal high water table is between depths of 12 and 30 inches during extended wet periods. Permeability is moderately slow. The root zone is deep. The available water capacity is high, and tilth is good. Runoff is slow. The subsoil ranges from very strongly acid to neutral. The content of organic matter is moderate.

This soil is used mainly for crops (fig. 5). It is well suited to corn and soybeans, but it is poorly suited to small grains because of damage caused by winter and spring flooding. Spring planting is delayed in some years because of flooding. However, flooding is very rare during the growing season, and such crops as corn and soybeans generally tolerate flooding of short duration. Subsurface drains are commonly used to lower the seasonal high water table. In some areas, drainage outlets are difficult to install because of the low position of the soil on the landscape. The surface layer crusts after hard rains, reducing the infiltration of water.

This soil is well suited to grasses and legumes for hay and pasture, but it is poorly suited to grazing early in spring. Floodwater sometimes leaves sediment on hayland and pasture, making the crop unfit for hay. Seeding only those species that are tolerant of seasonal wetness produces the best growth. Grazing when this soil is wet and soft causes soil compaction and impaired tilth, damages plants, and restricts the movement of air and water in the soil. Controlled grazing is needed.

This soil is well suited to trees and to use as habitat for openland and woodland wildlife. Trees and shrubs that are tolerant of some seasonal wetness and flooding are suitable for new plantings. Plant competition can be reduced by spraying, mowing, or disking.

This soil is not suited as a site for buildings and septic tank absorption fields because of flooding, seasonal wetness, and the moderately slow permeability. In constructing local roads, strengthening or replacing the base material and providing artificial drainage help prevent damage resulting from frost action and low soil strength. Fill can be used to elevate local roads above the flood level. This soil is a good source of topsoil.

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

FaB—Fairpoint silty clay loam, 2 to 12 percent slopes. This is a deep, gently sloping and sloping, well drained soil on top of mine-spoil ridges and benches in areas that have been surface mined for coal. This soil is a mixture of rock fragments and partly weathered fine-earth material that was in or below the profile of the original soil. In most places, the soil has been graded and the larger stones are buried. Most areas are irregular in shape and range from 2 to 20 acres in size.

Typically, the surface layer is dark grayish brown and gray friable silty clay loam about 5 inches thick. The substratum to a depth of about 60 inches is multicolored, firm very shaly silty clay loam and extremely shaly silty clay loam. In some areas the surface layer is shaly silty clay loam or stony silty clay loam. In a few areas the slopes are 0 to 2 percent or 12 to 18 percent.

Included with this soil in mapping are small areas of extremely acid or toxic coal material and long, narrow, very steep areas of ungraded spoil material. Also included are some reclaimed areas where the surface layer consists of natural soil material 6 to 18 inches thick. In these areas, the soil has a higher available water capacity and is more productive. The included areas make up 5 to 25 percent of most mapped areas.

Permeability is moderately slow. The depth of the root zone varies. The available water capacity is low because of the high percentage of coarse fragments and the compactness of the material. Tilth is poor, and runoff is medium or rapid. Reaction in the substratum is typically medium acid to neutral. The content of organic matter is low.

This soil generally is not suited to cultivated crops because of the variable depth of the root zone and its low available water capacity and poor tilth.

Most of the acreage of this soil is in grasses and, in some places, legumes and is used as pasture or for hay. This soil is poorly suited to these uses because of its low fertility, low available water capacity, variable depth of the root zone, and poor tilth. Liming is generally not needed, except in the included acid spots. Maintaining a plant cover and a surface mulch conserves moisture and reduces runoff and erosion. Tall grasses and legumes that are shallow-rooted grow best on this soil. Limited grazing in winter and other wet periods helps to prevent compaction. Overgrazed pastures recover very slowly in dry weather. Proper stocking rates and rotation grazing are needed. This soil commonly has favorable sites for livestock watering ponds.

This soil is moderately well suited to trees, but growth generally is slow because of droughtiness, the low content of organic matter, and the variable depth of the root zone. Adapted grasses can be used to provide ground cover while trees are being established, particularly in the more sloping areas.

Once this soil has settled, it is well suited as a site for buildings but poorly suited to use as septic tank absorption fields. Onsite investigation is needed to determine the hazards and limitations. The shrink-swell potential, depth to bedrock, hazards related to soil stability and settlement, bearing strength, and water disposal are important considerations. Placing septic tank absorption fields in suitable fill material increases the absorption of effluent. Stones in the substratum hinder excavation. Corrosion of uncoated steel and concrete is a severe problem in the included areas of extremely acid or toxic coal material.

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

FcA—Fitchville silt loam, 0 to 2 percent slopes. This is a deep, nearly level, somewhat poorly drained soil on terraces along streams and on lake plains. The areas are mainly rounded or irregular in shape and range from 5 to 500 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 9 inches thick. The subsoil is about 43 inches thick. The upper part is yellowish brown, mottled, friable silt loam; the middle part is yellowish brown and dark yellowish brown, mottled, firm and very firm silty clay loam; and the lower part is olive brown, mottled, very firm silty clay loam. The substratum to a depth of about 60 inches is dark yellowish brown, firm silty clay loam. In some areas the soil is underlain by glacial till or outwash sandy and gravelly material below a depth of 4 feet. In a few areas the soil has more sand and gravel throughout.

Included with this soil in mapping are small areas of the poorly drained Sebring soils in shallow drainageways and the very poorly drained Luray soils in depressions. The included soils make up 10 to 15 percent of most areas.

A perched seasonal high water table is between depths of 12 and 30 inches during extended wet periods. Permeability is moderately slow. The root zone is deep. The available water capacity is high, and tilth is good. Runoff is slow. The subsoil is very strongly acid to medium acid in the upper part and medium acid to neutral in the lower part. The content of organic matter is moderate.

This soil is used mainly for crops. In drained areas it is well suited to corn, soybeans, and small grains. If undrained, it is poorly suited to these crops. Seasonal wetness and surface crusting are the main concerns in management. Subsurface drains are commonly used to lower the seasonal high water table. In some areas, drainage outlets are difficult to install because this soil is in a low position on the landscape. Incorporating crop residue or other organic matter into the surface layer helps reduce crusting.

In some areas this soil is used as pasture. It is well suited to grasses and legumes for hay and pasture. Species that are tolerant of seasonal wetness should be selected for planting. Pastures should not be grazed early in spring. Grazing when this soil is wet and soft causes soil compaction and poor tilth, damages plants, and reduces air and water movement in the soil.

In some areas this soil is used as woodland. It is well suited to trees and to use as habitat for openland and woodland wildlife. Trees and shrubs that tolerate some seasonal wetness are most suitable for plantings. Plant competition can be reduced by spraying, mowing, or disking.

This soil is poorly suited as a site for buildings and septic tank absorption fields because of seasonal wetness and the moderately slow permeability. Building sites should be landscaped so that surface runoff drains away from foundations. Drains at the base of footings and other subsurface drains are used to remove the excess water around foundations and basement walls and to lower the seasonal high water table. Exterior coating on basement walls helps prevent wet basements. Enlarging septic tank absorption fields increases the absorption of effluent. Perimeter drains around the absorption field help lower the seasonal high water table. Intercepting the surface runoff from higher adjacent soils by diversions and other surface drains also helps reduce wetness. In constructing local roads and streets, providing artificial drainage and strengthening or replacing the base material help prevent damage resulting from frost action and low soil strength.

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

FcB—Fitchville silt loam, 2 to 6 percent slopes. This is a deep, gently sloping, somewhat poorly drained soil on terraces along streams and on lake plains. The areas generally are long and narrow or irregular in shape and range from 5 to 30 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 9 inches thick. The subsoil is about 43 inches thick. The upper part is yellowish brown, mottled, friable silt loam; the middle part is yellowish brown and dark yellowish brown, mottled, firm silty clay loam; and the lower part is olive brown, mottled, very firm silty clay loam. The substratum to a depth of about 60 inches is dark yellowish brown, firm silty clay loam. In some small eroded areas, yellowish brown subsoil material is mixed into the surface layer. In some places the soil is underlain by glacial till or outwash sandy and gravelly material below a depth of 4 feet.

Included with this soil in mapping and making up 10 to 15 percent of most areas are small areas of the moderately well drained Glenford soils on convex parts of knolls and the poorly drained Sebring soils in depressions.

A perched seasonal high water table is between depths of 12 and 30 inches during extended wet periods. Permeability is moderately slow. The root zone is deep. The available water capacity is high, and tilth is good. Runoff is medium. The subsoil is very strongly acid to medium acid in the upper part and medium acid to neutral in the lower part. The content of organic matter is moderate.

This soil is used mainly for crops. It is well suited to corn, soybeans, and small grains. Seasonal wetness, surface crusting, and a moderate hazard of erosion are the main concerns in management. Conservation tillage, which leaves crop residue on the surface, contour tillage, rotations that include grasses and legumes, and grassed waterways help reduce erosion. Subsurface drains are used to lower the seasonal high water table. Crop residue or other organic matter incorporated into the surface layer reduces surface crusting and erosion.

In some areas this soil is used as pasture. It is well suited to grasses and legumes for hay and pasture. However, pastures should not be grazed early in spring. Grazing when this soil is wet and soft causes soil compaction and poor tilth, damages the plants, and reduces air and water movement in the soil. Pasture species that tolerate seasonal wetness should be selected for planting. If the soil is plowed for seedbed preparation or the pasture is overgrazed, erosion is a moderate hazard. Reseeding with a cover crop or companion crop, using a mulch, or no-till seeding reduces the risk of erosion.

In some areas this soil is used as woodland. It is well suited to trees and to use as habitat for openland and woodland wildlife. Trees and shrubs that are tolerant of some wetness are suitable for planting. Plant competition can be reduced by spraying, mowing, or disking.

This soil is poorly suited as a site for buildings and septic tank absorption fields because of its seasonal wetness and moderately slow permeability. Building sites should be landscaped so that surface runoff drains away from foundations. Drains at the base of footings and other subsurface drains remove the excess water from around foundations and basement walls and lower the seasonal high water table. Exterior coating on basement walls helps prevent wet basements. Enlarging septic tank absorption fields increases the absorption of effluent. Perimeter drains around the absorption field help lower the seasonal high water table. In constructing local roads and streets, installing artificial drainage and strengthening or replacing the base material help to prevent damage caused by frost action and low soil strength. Erosion and sedimentation commonly increase during building site preparation, but they can be reduced by using plant cover and other water control practices.

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

FfA—Fitchville-Urban land complex, 0 to 2 percent slopes. This complex consists of a deep, nearly level, somewhat poorly drained Fitchville soil and areas of Urban land on flat terraces along streams. Most areas are about 55 percent Fitchville silt loam and 35 percent Urban land. The areas of Fitchville soil and of Urban land are so intricately mixed or so small in size that it was not practical to separate them in mapping. The areas commonly are irregular in shape and range from 2 to 100 acres in size.

Typically, the Fitchville soil has a dark grayish brown, friable silt loam surface layer about 9 inches thick. The subsoil is about 43 inches thick. The upper part is yellowish brown, mottled, friable silt loam; the middle part is yellowish brown and dark yellowish brown, mottled, firm silty clay loam; and the lower part is olive brown, mottled, very firm silty clay loam. The substratum to a depth of about 60 inches is dark yellowish brown, firm silty clay loam. In some areas there is outwash sandy or gravelly material below a depth of 4 feet. In some places, the soil has been radically altered. Some low areas have been filled or leveled during construction, and other small areas have been cut, built up, or smoothed.

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

Included with this complex in mapping are small areas of the poorly drained Sebring soils in shallow drainageways and depressions and the moderately well drained Glenford soils on slight rises. Also included are areas in the city of Orrville that are subject to flooding. The included areas make up about 10 percent of most mapped areas.

Most areas of this complex are artificially drained by sewer systems, gutters, and drainage tiles and to a lesser extent by surface ditches. The Fitchville soil, in areas that are not drained, has a perched seasonal water table between depths of 12 and 30 inches during extended wet periods. Permeability is moderately slow in the Fitchville soil. The root zone is deep. The available water capacity is high, and tilth is good. Runoff is slow. The subsoil is very strongly acid to medium acid in the upper part and medium acid to neutral in the lower part. The content of organic matter is moderate.

The Fitchville soil is in the parks, open spaces, lawns, and gardens. It is well suited to grasses, flowers, vegetables, trees, and shrubs. Soil erosion generally is not a major problem. The surface layer crusts after hard rains. Returning plant residue and other organic material to the soil reduces crusting and soil loss by erosion. In some areas, the soil has been radically altered and is not suitable for lawns and gardens. The subsoil material that is exposed in these areas has very poor tilth. It is sticky when wet and hard when dry.

The Fitchville soil is poorly suited as a site for buildings and septic tank absorption fields because of the seasonal wetness and the moderately slow permeability. Building sites should be landscaped so that surface runoff drains away from foundations. Drains at the base of footings and other subsurface drains help to remove the excess water around foundations and basement walls and to lower the seasonal high water table. Exterior coating on basement walls helps prevent wet basements. Sanitary facilities should be connected to central sewers and treatment facilities wherever possible. Perimeter drains around an absorption field help lower the seasonal high water table. Enlarging septic tank absorption fields increases the absorption of effluent. In constructing local roads and streets, installing artificial drainage and strengthening or replacing the base material help to prevent damage resulting from frost action and low soil strength.

The Fitchville soil is in capability subclass IIw. It is not assigned to a woodland suitability subclass.

GfA—Glenford silt loam, 0 to 2 percent slopes. This is a deep, nearly level, moderately well drained soil on terraces along streams on lake plains. The areas are mainly irregular in shape and range from 3 to 15 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 10 inches thick. The subsoil is about 42 inches thick. The upper part is yellowish brown, firm silt loam, and the middle and lower parts are yellowish brown and dark yellowish brown, mottled, firm silty clay loam. The substratum to a depth of about 60 inches is dark yellowish brown, mottled, firm silt loam. In a few places there are layers of stratified sand and gravel below a depth of about 40 inches.

Included with this soil in mapping and making up 5 to 15 percent of most areas are small areas of the somewhat poorly drained Fitchville soils in depressions and shallow drainageways.

A perched seasonal high water table is between depths of 24 and 42 inches during extended wet periods. Permeability is moderately slow. The root zone is deep. The available water capacity is moderate or high; tilth is good; and runoff is slow. The subsoil is very strongly acid to medium acid in the upper part and medium acid to neutral in the lower part. The content of organic matter is moderate.

This soil is used mainly for crops. It is well suited to corn, soybeans, and small grains. The surface layer crusts after hard rains. Maintaining fertility and the content of organic matter and reducing crusting are the main concerns in management. Leaving crop residue on the surface in the fall and not plowing until spring help protect the soil against erosion. The natural drainage generally is adequate for farming, but random-spaced subsurface drains are needed in areas of the included somewhat poorly drained soils.

In some areas this soil is used as pasture; normally, the pasture is in a rotation with cultivated crops. This soil is well suited to grasses and legumes for hay and pasture. Deep-rooted legumes such as alfalfa grow well. With good management, this soil can be pastured intensively and good plant growth can be expected.

This soil is not extensively used as woodland, even though it is well suited to this use. Plant competition can be reduced by mowing, spraying, or shallow tillage. This soil is suited to use as habitat for openland and woodland wildlife.

This soil is moderately well suited as a site for buildings and septic tank absorption fields even though seasonal wetness, a moderate shrink-swell potential, and the moderately slow permeability are limitations. Building sites should be landscaped so that surface runoff drains away from the foundation. Subsurface drains help reduce wetness. Drains at the base of footings and exterior coating on walls help prevent wet basements. Backfilling along the basement wall with material that has a low shrink-swell potential reduces damage caused by the shrinking and swelling of the soil. Enlarging the septic tank absorption field increases the absorption capacity. Perimeter drains around an absorption field help reduce seasonal wetness. Diversions and other surface drains that intercept runoff from higher adjacent soils help reduce seasonal wetness and erosion. In constructing local roads and streets, installing artificial drainage and strengthening or replacing the base material help to reduce damage resulting from frost action and low soil strength.

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

GfB—Glenford silt loam, 2 to 6 percent slopes. This is a deep, gently sloping, moderately well drained soil on terraces along streams and on lake plains. The areas generally are irregular in shape and range from 3 to 50 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 9 inches thick. The subsoil is about 43 inches thick. The upper part is yellowish brown, firm silt loam, and the middle and lower parts are yellowish brown and dark yellowish brown, mottled, firm silty clay loam. The substratum to a depth of about 60 inches is dark yellowish brown, mottled, firm silt loam. In a few places there are layers of stratified sand and gravel below a depth of about 40 inches. In some areas there is glacial till in the upper part of the soil. In some small eroded spots, yellowish brown subsoil material is mixed into the surface layer.

Included with this soil in mapping and making up 5 to 15 percent of most areas are small areas of the somewhat poorly drained Fitchville soils in shallow drainageways and the poorly drained Sebring soils in depressions.

A perched seasonal high water table is between depths of 24 and 42 inches during extended wet periods. Permeability is moderately slow. The root zone is deep. The available water capacity is moderate or high, and tilth is good. Runoff is medium. The subsoil is very strongly acid to medium acid in the upper part and medium acid to neutral in the lower part. The content of organic matter is moderate.

This soil is used for crops. It is well suited to corn, soybeans, and small grains. Erosion is a moderate hazard, and the surface layer of this soil crusts after hard rains. Therefore, erosion and crusting are the main concerns in management. Conservation tillage, which leaves crop residue on the surface, contour tillage, cover crops, rotations that include grasses and legumes, and grassed waterways help reduce runoff, erosion, and crusting. Leaving crop residue on the surface in the fall and not plowing until spring also protect the soil against erosion. The natural drainage generally is adequate for farming, although random-spaced subsurface drains are needed in the included wet areas.

In some areas this soil is used as pasture. It is well suited to grasses and legumes for hay and pasture. Deep-rooted legumes such as alfalfa grow well. If the soil is plowed for seedbed preparation or the pasture is overgrazed, erosion is a moderate hazard. Reseeding with a cover crop or companion crop, using a mulch, or no-till seeding reduces the risk of erosion. The gentle slopes permit intensive pasture management.

This soil is not extensively used as woodland, even though it is well suited to a wide variety of trees common in the area. Plant competition can be reduced by mowing, spraying, or shallow tillage. This soil is well suited to use as habitat for openland and woodland wildlife.

This soil is moderately well suited as a site for buildings and septic tank absorption fields even though seasonal wetness, the moderate shrink-swell potential, and the moderately slow permeability are limitations. Building sites should be landscaped so that surface runoff drains away from the foundation. Subsurface drains help reduce wetness. Drains at the base of footings and exterior coating on walls help prevent wet basements. Backfilling along the basement wall with material that has a low shrink-swell potential reduces damage caused by the shrinking and swelling of the soil. Enlarging the septic tank absorption field increases the absorption capacity. Perimeter drains around an absorption field help reduce seasonal wetness. Intercepting runoff from higher adjacent soils by diversions and other surface drains helps reduce seasonal wetness and erosion. In constructing local roads and streets, providing artificial drainage and strengthening or replacing the base material help to reduce damage resulting from frost action and low soil strength.

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

GfC—Glenford silt loam, 6 to 12 percent slopes. This is a deep, sloping, moderately well drained soil on side slopes of natural drainageways on terraces along streams and lake plains. The areas mainly vary in shape from rounded to long and narrow and range from 3 to 25 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 8 inches thick. The subsoil is about 40 inches thick. The upper part is yellowish brown, firm silt loam, and the middle and lower parts are yellowish brown and dark yellowish brown, mottled, firm silty clay loam. The substratum to a depth of about 60 inches is dark yellowish brown, mottled, firm silt loam. In a few places the soil is underlain by glacial till or stratified sand and gravel below a depth of 40 inches. In some areas there is glacial till that includes a few stones in the upper part of the soil. In a few small eroded spots, yellowish brown subsoil material is mixed into the surface layer.

Included with this soil in mapping and making up 5 to 10 percent of most areas are small areas of the somewhat poorly drained Fitchville soils in depressions.

A perched seasonal high water table is between depths of 24 and 42 inches during extended wet periods. Permeability is moderately slow. The root zone is deep. The available water capacity is moderate or high, and tilth is good. Runoff is rapid. The subsoil is very strongly acid to medium acid in the upper part and medium acid to neutral in the lower part. The content of organic matter is moderate.

This soil is used for crops. It is moderately well suited to corn, soybeans, and small grains. Erosion is a severe hazard, and this is the main concern in management. The surface layer crusts after hard rains. No-till and other forms of conservation tillage, which leaves crop residue on the surface, contour tillage, contour stripcropping, cover crops, rotations that include grasses and legumes, and grassed waterways help reduce runoff, erosion, and crusting. Such practices as contour stripcropping are difficult to use on complex slopes. Leaving crop residue on the surface in the fall and not plowing until spring protect the soil against erosion. The natural drainage generally is adequate for farming, but random-spaced subsurface drains are needed in areas of the included wetter soils in depresions.

In some areas this soil is used as pasture. It is well suited to grasses and legumes for hay and pasture. Deep-rooted legumes such as alfalfa grow well. If the soil is plowed to prepare a seedbed or the pasture is overgrazed, erosion is a severe hazard. Reseeding with cover crops or companion crops, using a mulch, or no-till seeding reduces the risk of erosion.

In some areas this soil is used as woodland. It is well suited to trees and to use as habitat for openland and woodland wildlife. Plant competition can be reduced by spraying, mowing, or disking.

This soil is moderately well suited as a site for buildings and septic tank absorption fields. Its seasonal wetness, moderately slow permeability, slope, and moderate shrink-swell potential are limitations. Buildings can be designed to conform to the natural shape of the land. Drains at the base of footings and exterior coating on walls help prevent wet basements. Backfilling along basement walls with material that has a low shrink-swell potential reduces damage caused by the shrinking and swelling of the soil. Maintaining plant cover during construction and using other water control practices help reduce erosion. Effluent from septic tank absorption fields may seep horizontally and come to the surface downslope. Placing distribution lines across the slope reduces the seepage of effluent to the surface. Enlarging the absorption field increases the absorption capacity. Perimeter drains around the absorption field help lower the seasonal high water table. Intercepting runoff from higher adjacent soils by diversions or surface drains helps reduce seasonal wetness and erosion. In the construction of local roads and streets, artificial drainage and a suitable base material reduce damage resulting from frost action and low soil strength.

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

GfC2—Glenford silt loam, 6 to 12 percent slopes, eroded. This is a deep, sloping, moderately well drained soil on side slopes of natural drainageways on terraces along streams and lake plains. Erosion has removed part of the original surface layer. The present surface layer is a mixture of the original surface layer and the subsoil material. The areas generally are irregular in shape and range from 3 to 30 acres in size.

Typically, the surface layer is brown, friable silt loam about 8 inches thick. The subsoil is about 38 inches thick. The upper part is yellowish brown, firm silt loam, and the middle and lower parts are yellowish brown and dark yellowish brown, mottled, firm silty clay loam. The substratum to a depth of about 60 inches is dark yellowish brown, mottled, firm silt loam. In a few places, the soil is underlain by glacial till at a depth between 40 and 60 inches, or there is glacial till that contains a few stones in the upper part of the soil.

Included with this soil in mapping and making up 5 to 10 percent of most areas are small areas of the somewhat poorly drained Fitchville soils in depressions and a few areas of severely eroded soils on shoulder slopes. These severely eroded soils have only fair tilth.

A perched seasonal high water table is between depths of 24 and 42 inches during extended wet periods. Permeability is moderately slow. The root zone is deep. The available water capacity is moderate or high, and tilth is good. Runoff is rapid. The subsoil is very strongly acid to medium acid in the upper part and medium acid to neutral in the lower part. The content of organic matter is moderately low.

This soil is used mainly for crops. It is moderately well suited to corn and small grains and poorly suited to soybeans. Erosion is a severe hazard. Controlling erosion, especially where soybeans are grown, and reducing crusting are the main concerns in management. Practices that help to maintain tilth, to increase the infiltration of water, and to reduce crusting, include planting winter cover crops, keeping the soil in grasses and legumes as long as possible, and regularly adding organic matter, such as manure. No-till and other forms of conservation tillage, which leave crop residue on the surface, contour tillage, contour stripcropping, cover crops, rotations that include grasses and legumes, and grassed waterways help reduce runoff and erosion. Such practices as contour stripcropping are difficult to use on complex slopes. Leaving crop residue on the surface over winter also protects the soil against erosion. The natural drainage generally is adequate for farming, but random subsurface drains are needed in wet spots along waterways and in the included wetter soils in depressions.

In a few areas this soil is used as pasture. It is well suited to grasses and legumes for hay and pasture. If the soil is plowed to prepare a seedbed or the pasture is overgrazed, erosion is a severe hazard. Reseeding with a cover crop or companion crop, using a mulch, or no-till seeding reduces the risk of erosion.

This soil is well suited to trees and to use as habitat for openland and woodland wildlife. Plant competition can be reduced by spraying, mowing, or disking.

This soil is moderately well suited as a site for buildings and septic tank absorption fields. Its seasonal wetness, moderately slow permeability, slope, and moderate shrink-swell potential are limitations. Buildings can be designed to conform to the natural shape of the land. Drains at the base of footings and exterior coating on walls help prevent wet basements. Backfilling along the basement wall with material that has a low shrink-swell potential reduces damage caused by the shrinking and swelling of the soil. Maintaining plant cover during construction and using other water control practices help control erosion. Effluent from septic tank absorption fields may seep horizontally and come to the surface downslope. Placing distribution lines across the slope reduces seepage to the surface. Enlarging the absorption field increases the absorption capacity. Perimeter drains around the absorption field help lower the seasonal high water table. Intercepting surface runoff from higher adjacent soils by means of diversions or surface drains helps reduce the seasonal wetness and erosion. In constructing local roads and streets, providing artificial drainage and using a suitable base material reduce damage resulting from frost action and low soil strength.

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

GfD—Glenford silt loam, 12 to 18 percent slopes. This is a deep, moderately steep, moderately well drained soil on terraces along streams and, in some areas, at the head of drainageways on lake plains. The areas generally are long and narrow and range from 5 to 20 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 8 inches thick. The subsoil is about 42 inches thick. The upper part is yellowish brown, firm silt loam; the middle and lower parts are yellowish brown and dark yellowish brown, mottled, firm silty clay loam. The substratum to a depth of about 60 inches is dark yellowish brown, mottled, firm silt loam. In some small eroded areas, yellowish brown subsoil material is mixed into the surface layer.

Included with this soil in mapping are small areas of the well drained Chili soils on the top of ridges and the somewhat poorly drained Fitchville soils in seeps and drainageways. The included soils make up 10 to 15 percent of most areas.

A perched seasonal high water table is between depths of 24 and 42 inches during extended wet periods. Permeability is moderately slow. The root zone is deep. The available water capacity is moderate or high, and tilth is good. Runoff is very rapid. The subsoil is very strongly acid to medium acid in the upper part and medium acid to neutral in the lower part. The content of organic matter is moderate.

This soil is used for crops. It is poorly suited to corn and small grains and generally is not suited to soybeans. The slope and the very severe hazard of erosion are concerns in management. Row crops can be grown occasionally in a rotation with small grains and meadow crops. The slope causes some problems in using machinery and in installing erosion control practices. It also causes much of the rainfall to be lost as runoff. Water from adjoining soils collects in drainageways, where gullies can form if grassed waterways are not used. No-till and other forms of conservation tillage, which leave crop residue on the surface, contour tillage, and cover crops reduce runoff and erosion. In some areas the soil is suited to stripcropping, but in most areas it is not suitable because the slopes are short and uneven. Leaving crop residue on the surface over winter helps protect the soil against erosion.

This soil is used as pasture and hayland. It is moderately well suited to grasses and legumes for hay and pasture. If the soil is plowed to prepare a seedbed or the pasture is overgrazed, erosion is a very severe hazard. Reseeding with a cover crop or companion crop, using a mulch, or no-till seeding reduces the risk of erosion. Random subsurface drains are commonly used to intercept hillside seeps and springs.

In some areas this soil is used as woodland. It is well suited to trees and to use as habitat for woodland wildlife. Erosion is a hazard. Placing logging roads and skid trails on the contour where possible and seeding disturbed areas with a quick-growing cover crop help reduce runoff and erosion.

This soil is poorly suited as a site for buildings and septic tank absorption fields because of the slope, the moderately slow permeability, and seasonal wetness. The slope and seasonal wetness are limitations in excavating for basements and utility lines. Buildings should be designed to conform to the natural shape of the land. Installing drains at the base of footings and coating the exterior of basement walls help prevent wet basements. Enlarging the septic tank absorption field increases the absorption capacity. Placing distribution lines across the slope reduces lateral seepage of effluent to the surface. Diversions that intercept surface runoff from higher adjacent soils reduce seasonal wetness and erosion. Keeping as much plant cover on the soil as possible during construction reduces erosion. The soil in cut and filled areas is subject to slippage. In constructing local roads and streets, providing artificial drainage and a suitable base material reduces damage resulting from frost action and low soil strength.

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

HdA—Haskins silt loam, 0 to 3 percent slopes. This is a deep, nearly level, somewhat poorly drained soil on outwash plains and stream terraces. The areas generally are irregular in shape and range from 2 to 20 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 22 inches thick. The upper part is yellowish brown, mottled, firm loam; the middle part is brown, mottled, firm clay loam and sandy clay loam; and the lower part is dark brown, mottled, firm silty clay. The substratum to a depth of about 60 inches is dark brown, mottled, very firm silty clay. In some places, the surface layer is loam and the subsoil has more sand and less silt. In some areas the slopes are 3 to 8 percent.

Included with this soil in mapping and making up 5 to 15 percent of most areas are small areas of the moderately well drained Rawson soils on slight rises.

A perched seasonal high water table is between depths of 12 and 30 inches during extended wet periods. Permeability is moderate in the upper and middle parts of the subsoil and slow or very slow in the lower part of the subsoil and in the substratum. The root zone is mainly moderately deep over compact glacial till or lacustrine sediments. The available water capacity is moderate. Tilth is good. Runoff is slow. The subsoil is strongly acid to slightly acid in the upper part and slightly acid or neutral in the lower part. The content of organic matter is moderate.

In most areas this soil is used for crops. It is well suited to corn, soybeans, and small grains. The main limitation is wetness. The surface layer crusts after hard rains. Subsurface drains are commonly used to lower the perched seasonal high water table. The drains are most efficient if placed on or above the slowly or very slowly permeable glacial till or lacustrine sediments in the lower part of the soil. Returning crop residue to the soil, regular additions of other organic material, and cover crops help maintain tilth and reduce crusting.

This soil is well suited to grasses and legumes for pasture and hay. However, pasture should not be grazed early in spring. Controlled grazing in wet periods and the maintenance of a good stand of desirable plants are the main concerns in management. If the pasture is grazed when it is too wet, the soil becomes compacted, reducing water infiltration and impairing plant growth. Drainage is needed for good stands of deep-rooted legumes such as alfalfa. Without artificial drainage, this soil is better suited to grasses than to deep-rooted legumes.

In undrained areas, this soil is well suited to trees and to vegetation that provides food and cover for wildlife. Species that are tolerant of some wetness are suitable for planting. Plant competition can be reduced by spraying, mowing, or disking.

This soil is poorly suited as a site for buildings and septic tank absorption fields because of the seasonal wetness and the slow or very slow permeability in the lower part of the soil. Drains at the base of footings and other subsurface drains help to remove the excess water from around foundations and basement walls and to lower the seasonal high water table. Coating the exterior of basement walls helps prevent wet basements. Sites for buildings and for septic tank absorption fields should be landscaped so that surface runoff drains away from the foundation and from the absorption field. Enlarging the septic tank absorption field increases the absorption capacity. Perimeter drains around an absorption field help lower the seasonal high water table. Diversions help convey runoff from higher adjacent soils away from septic tank absorption fields and building sites. In the construction of local roads and streets, artificial drainage and a suitable base material help reduce damage caused by frost action.

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

JtA—Jimtown loam, 0 to 2 percent slopes. This is a deep, nearly level, somewhat poorly drained soil on stream terraces and outwash plains. The areas generally are oval or irregular in shape and range from 5 to 25 acres in size.

Typically, the surface layer is dark grayish brown, friable loam about 11 inches thick. The subsurface layer is light brownish gray, mottled, friable loam about 11 inches thick. The subsoil is about 33 inches thick. The upper part is yellowish brown, mottled, firm loam; the middle part is dark yellowish brown, mottled, firm gravelly sandy clay loam; and the lower part is dark yellowish brown, mottled, friable gravelly sandy loam. The substratum to a depth of about 60 inches is dark gray, mottled, friable gravelly sandy loam. In a few places the surface layer is gravelly loam or sandy loam. In some places the surface layer and the upper part of the subsoil are silt loam.

Included with this soil in mapping and making up 5 to 10 percent of most areas are small areas of the moderately well drained Bogart soils on low knolls.

The seasonal high water table is between depths of 12 and 30 inches during extended wet periods. Permeability is moderate. The root zone is deep. The available water capacity is moderate or high, and tilth is good. Runoff is slow. The subsoil is strongly acid to slightly acid. The content of organic matter is moderate.

This soil is used for crops. It is well suited to corn, soybeans, and small grains. Seasonal wetness is the main concern in management. The surface layer can be worked within a fairly wide range of moisture content. Subsurface drains are commonly used to lower the seasonal high water table. In some areas, outlets for drainage systems are difficult to install because this soil is in low positions on the landscape. In some places, diversions along the base of slope breaks to uplands can intercept runoff from higher adjacent soils.

This soil is used as pasture. It is well suited to grasses and legumes for hay and pasture. However, pastures on this soil should not be grazed early in spring. Wetness is the main concern in management. Pasture plants that are tolerant of seasonal wetness commonly are selected for seeding. A subsurface drainage system generally is needed for deep-rooted legumes such as alfalfa to grow well on this soil. Grazing when the soil is wet and soft causes soil compaction and poor tilth, damages plants, and reduces air and water movement in the soil.

This soil is used as woodland. It is well suited to trees and to use as habitat for openland and woodland wildlife. Tree species that tolerate some seasonal wetness are suitable for planting. Plant competition can be reduced by spraying, mowing, or disking.

This soil is poorly suited as a site for buildings and septic tank absorption fields because of seasonal wetness. Diversions can be used to convey runoff from higher adjacent soils away from building sites and septic tank absorption fields. Sites for buildings and for septic tank absorption fields should be landscaped so that surface runoff drains away from the foundation and from the absorption field. Drains at the base of footings and other subsurface drains help to remove the excess water around foundations and basement walls and to lower the seasonal high water table. Coating the exterior basement wall helps prevent a wet basement. Perimeter drains around a septic tank absorption field help lower the seasonal high water table. Placing absorption fields in suitable fill material helps reduce the hazard of contaminating the underground water supply. In constructing local roads, providing artificial drainage and strengthening or replacing the base material help to prevent damage caused by frost action. There is a hazard of sloughing or cave-in if this soil is excavated, because the underlying material is gravelly and sandy.

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

JtB—Jimtown loam, 2 to 6 percent slopes. This is a deep, gently sloping, somewhat poorly drained soil on slightly convex rises on stream terraces and outwash plains. The areas generally are irregular in shape and range from 5 to 20 acres in size.

Typically, the surface layer is dark grayish brown, friable loam about 9 inches thick. The subsoil is about 36 inches thick. The upper part is yellowish brown, mottled, firm loam; the middle part is dark yellowish brown, mottled, firm gravelly sandy clay loam; and the lower part is dark yellowish brown, mottled, friable gravelly sandy loam. The substratum to a depth of about 60 inches is dark gray, mottled, friable gravelly sandy loam. In a few places the surface layer is gravelly loam or sandy loam. In some places the surface layer and the upper part of the subsoil are silt loam. In a few places there is glacial till or lacustrine material below a depth of about 40 inches.

Included with this soil in mapping and making up 5 to 10 percent of most areas are small areas of the moderately well drained Bogart soils on the higher knolls.

The seasonal high water table is between depths of 12 and 30 inches during extended wet periods. Permeability is moderate. The root zone is deep. The available water capacity is moderate or high, and tilth is good. Runoff is medium. The subsoil is strongly acid to slightly acid. The content of organic matter is moderate.

This soil is used for crops. It is well suited to corn, soybeans, and small grains. Seasonal wetness and a moderate hazard of erosion are the main management concerns. This soil can be worked within a fairly wide range of moisture content. Conservation tillage, which leaves crop residue on the surface, contour tillage, rotations that include grasses and legumes, and grassed waterways help reduce erosion. Subsurface drains are commonly used to lower the seasonal high water table.

This soil is used as pasture. It is well suited to grasses and legumes for hay and pasture. However, pastures should not be grazed early in spring. Grazing when the soil is wet and soft causes soil compaction and poor tilth, damages plants, and reduces air and water movement in the soil. Species that are tolerant of seasonal wetness are commonly selected for seeding. If the soil is plowed for seedbed preparation or the pasture is overgrazed, erosion is a moderate hazard. Reseeding with a cover crop or companion crop, using a mulch, or no-till seeding reduces the risk of erosion.

This soil is used as woodland. It is well suited to trees and to use as habitat for openland and woodland wildlife. Tree species that are adapted to some seasonal wetness are suitable for plantings. Plant competition can be reduced by spraying, mowing, or disking.

This soil is poorly suited as a site for buildings and septic tank absorption fields because of seasonal wetness. Diversions help convey runoff from higher adjacent soils away from building sites and septic tank absorption fields. Sites for buildings and for septic tank absorption fields should be landscaped so that surface runoff drains away from the foundation and from the absorption field. Drains at the base of footings and other subsurface drains help to remove the excess water around foundations and basement walls and to lower the seasonal high water table. Coating the exterior basement wall helps prevent a wet basement. Perimeter drains around a septic tank absorption field help lower the seasonal high water table. There is a risk that underground water supplies may become contaminated by the effluent from septic tank absorption fields. Placing the field in suitable fill material helps reduce this hazard. In constructing local roads, providing artificial drainage and strengthening or replacing the base material help to prevent damage caused by frost action. There is a hazard of sloughing and cave-in if this soil is excavated, because the underlying material is gravelly and sandy.

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

Kb—Killbuck silt loam, frequently flooded. This is a deep, nearly level, poorly drained soil on flood plains. The slope is 0 to 2 percent. Most areas are irregular in shape and range from 2 to 100 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The upper part of the subsoil is grayish brown and gray, mottled, friable silt loam about 13 inches thick. Below that, there is a buried surface layer that is very dark gray, mottled, firm silty clay about 12 inches thick. The lower part of the subsoil is dark gray and gray, mottled, firm silty clay loam about 18 inches thick. The substratum to a depth of about 60 inches is gray, mottled, firm silty clay loam. In a few areas, the buried surface layer is less than 10 inches thick, or it is lighter in color.

Included with this soil in mapping and making up 10 to 20 percent of most areas are small areas of Melvin soils in similar positions and somewhat poorly drained Orrville soils in slightly higher positions.

A seasonal high water table is near the surface during extended wet periods. Permeability is moderately slow. The root zone is deep. The available water capacity is high, and tilth is good. Runoff is very slow. The root zone is medium acid to neutral in the upper part and medium acid to mildly alkaline in the lower part. The content of organic matter is moderate.

In drained areas, this soil is used for crops. If drained, this soil is moderately well suited to corn and soybeans. It generally is not suited to small grains because flooding can damage the crop. Seasonal wetness and flooding are management concerns. Flooding is less common during the growing season, and such crops as corn and soybeans usually tolerate flooding of short duration. Drainage systems are difficult to construct and maintain on this soil. Subsurface drains or surface ditches, or both, are used to lower the seasonal high water table.

In some undrained areas this soil is used as pasture. It is moderately well suited to water-tolerant grasses and legumes for pasture and hay. However, wetness early in spring limits grazing. Floodwaters often leave sediment on hayfields and pastures, making the crop unfit for hay. Planting species that are tolerant of wetness helps increase yields.

In undrained areas the soil is commonly used as woodland and as natural habitat for wildlife. Wetness and flooding limit the use of this soil as woodland. Where new plantings are made, species that are tolerant of wetness and floodwater grow well if plant competition is reduced by spraying, mowing, or disking. Seasonal wetness severely limits the use of logging equipment. Logging can be done during the drier part of the year.

This soil is not suited as a site for buildings and septic tank absorption fields because of flooding, wetness, and the moderately slow permeability.

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

Ld—Linwood muck. This is a deep, level, very poorly drained soil in bogs and depressions on lake plains, outwash terraces, flood plains, and till plains. It is subject to frequent flooding and is ponded. The slope is less than 2 percent. The areas generally are rounded or irregular in shape and range from 5 to 50 acres in size.

Typically, the surface layer is black, friable muck about 11 inches thick. Below that, to a depth of about 32 inches, there is black, firm muck. The substratum to a depth of about 60 inches is gray, mottled, firm silt loam and silty clay loam. In some small areas there is a thin surface layer of silt loam or mucky silt loam. In some areas, part of the organic deposit is peat. Many areas on lake plains, outwash terraces, and till plains are not subject to frequent flooding. In some areas the organic deposit is thicker.

Included with this soil in mapping and making up 10 to 15 percent of most areas are small areas of Luray and Wallkill soils, which have a mineral surface layer.

The seasonal high water table is near or above the surface for long periods. Permeability is moderately slow to moderately rapid in the organic layer and moderate in the loamy material. The root zone is deep. The available water capacity is very high, and tilth is good. Runoff is very slow or is ponded. The root zone is very strongly acid to neutral. The content of organic matter is very high.

In drained areas, this soil is used for crops. Special crops, such as potatoes and sod, are grown in some areas. If it is adequately drained, this soil is well suited to corn and soybeans. However, this soil is not suited to small grains because of flooding and ponding. Undrained areas are too wet for cultivated crops. Generally, subsurface drains and open ditches are used to drain an area. The banks of open ditches are unstable and subject to sloughing. In some areas, drainage systems need much maintenance because floodwater deposits sediment on the surface. Subsurface drains sometimes lose their effectiveness because the organic material shrinks when it is drained and settles unevenly. In areas where the water table can be raised or lowered, controlled drainage can minimize this settlement. This soil is subject to wind erosion, but the erosion generally can be controlled by planting cover crops and windbreaks of shrubs and trees.

In some undrained areas this soil is used as pasture. It is moderately well suited to water-tolerant grasses but is too wet for most legumes. Pastures on this soil are productive even in long dry periods. The soil is very soft early in spring, and grazing at that time can cause considerable damage to pasture plants and reduce air and water movement in the soil.

In some undrained areas this soil is used as natural habitat for wetland wildlife. It is poorly suited to use as woodland and well suited to use as habitat for wetland wildlife. Species that are tolerant of prolonged wetness should be selected for planting to reduce seedling mortality. Windthrow is a hazard, but it can be reduced by harvesting procedures that do not leave the remaining trees widely spaced.

Flooding, ponding, the moderately slow permeability, and low strength make this soil not suitable as a site for buildings and septic tank absorption fields.

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

Le—Lobdell silt loam, occasionally flooded. This is a deep, nearly level, moderately well drained soil on flood plains. It is occasionally flooded for brief periods in winter and spring. The slope is 0 to 2 percent. The areas generally are long and narrow and range from 3 to 50 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 8 inches thick. The subsoil is dark brown and dark yellowish brown, mottled, friable and very friable silt loam and loam about 28 inches thick. The substratum to a depth of about 60 inches is dark yellowish brown and brown, mottled, very friable and firm fine sandy loam. In some places, the surface layer is loam, gravelly silt loam, or gravelly loam. In a few areas the soil is well drained and the subsoil has fewer gray mottles.

Included with this soil in mapping and making up 10 to 15 percent of most areas are small areas of the somewhat poorly drained Orrville soils and the poorly drained Melvin soils in positions slightly lower than those of the Lobdell soil.

A seasonal high water table is between depths of 24 and 42 inches during extended wet periods. Permeability is moderate. The root zone is deep. The available water capacity is high, and tilth is good. Runoff is slow. The subsoil is strongly acid to neutral in the upper part and medium acid to neutral in the lower part. The content of organic matter is moderate.

This soil is used mainly for crops. It is well suited to corn and soybeans. Flooding is the main concern in management. Winter and spring floods are damaging to small grains. Flooding is less common during the growing season, and such cultivated crops as corn and soybeans usually tolerate brief flooding. Random subsurface drains are used in areas of the included, less well drained soils.

In a few areas, this soil is used as pasture. Some of these areas are dissected by meandering channels, and some are covered with flood debris. This soil is well suited to grasses and legumes for pasture and hay. However, floodwater may leave sediment on hayland and pasture, making the crop unfit for hay.

In a few areas the soil is used as woodland. These areas are mainly irregular in shape and are along streams in narrow valleys. This soil is well suited to trees. Only those species that withstand flooding should be selected for planting. Plant competition can be reduced by spraying, mowing, or disking.

This soil generally is not suitable as a site for buildings and septic tank absorption tank fields because of wetness and the hazard of flooding. It is a good source of topsoil. Fill can be used to elevate local roads above the normal flood level.

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

LnB—Loudonville silt loam, 2 to 6 percent slopes. This is a moderately deep, gently sloping, well drained soil on slightly convex ridgetops on uplands. The areas generally are irregular in shape and range from 3 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 thick. The upper and middle parts are yellowish brown, friable and firm silt loam; the lower part is dark yellowish brown, mottled, firm loam. Sandstone bedrock is at a depth of about 36 inches. In a few places, bedrock is between depths of 10 and 20 inches or 40 and 60 inches. In many places, the underlying bedrock is highly fractured.

Included with this soil in mapping are small areas of the deep Riddles and Wooster soils. Also included are small areas of the somewhat poorly drained Mitiwanga soils in seeps and natural drainageways. The included soils make up 5 to 15 percent of most areas.

Permeability is moderate. The root zone is moderately deep. The available water capacity is low or moderate, depending on the depth to bedrock. Tilth is good. Runoff is medium. The subsoil is very strongly acid to medium acid. The content of organic matter is moderate.

This soil is used for crops. It is well suited to corn, soybeans, and small grains and to use as orchards. This soil warms up early in spring, and it can be tilled earlier than most soils in the county. The hazard of erosion, surface crusting, and the limited root zone are the main concerns in management. No-till and other forms of conservation tillage, which leave crop residue on the surface, contour tillage, cover crops, a cropping system that includes grasses and legumes, and grassed waterways help reduce runoff and erosion. Incorporating crop residue or other organic matter into the surface layer also increases water infiltration, improves tilth and fertility, and reduces crusting.

In some areas this soil is used as pasture. It is well suited to grasses and legumes for hay and pasture. The pastures can be grazed early in spring. Reseeding with a cover crop or companion crop, using a mulch, or no-till seeding reduces the risk of erosion.

In some areas this soil is used as woodland. It is well suited to trees and to use as habitat for openland and woodland wildlife. Most trees common in the area grow well if competing plant growth is controlled by spraying, disking, or mowing.

This soil is well suited as a site for buildings and moderately well suited to septic tank absorption fields. Bedrock between depths of 20 and 40 inches interferes with excavation for basements and utility lines. Backfilling around foundations and basement walls with material that has a low shrink-swell potential reduces damage caused by the shrinking and swelling of the soil. The volume of the soil above the bedrock is not enough to filter adequately the effluent in an absorption field. Furthermore, the effluent can seep rapidly through cracks in the bedrock and pollute nearby water supplies. The filtering capacity can be improved by placing the absorption field on suitable fill material. In constructing local roads and streets, replacing the soil with suitable fill material reduces damage resulting from low soil strength. Maintaining a plant cover and using other water control practices during construction help to reduce erosion.

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

LnC2—Loudonville silt loam, 6 to 12 percent slopes, eroded. This is a moderately deep, sloping, well drained soil on ridgetops and the upper part of side slopes of hills and along drainageways on uplands. Erosion has removed part of the original surface layer. The present surface layer is a mixture of the original surface layer and the subsoil material. The areas generally are long and narrow and range from 3 to 20 acres in size.

Typically, the surface layer is mixed dark grayish brown and brown, friable and firm silt loam about 8 inches thick. The subsoil is about 24 inches thick. The upper part is yellowish brown, firm silt loam, and the lower part is dark yellowish brown, mottled, firm loam. Sandstone bedrock is at a depth of about 32 inches. In some places, bedrock is between depths of 10 and 20 inches or 40 and 60 inches. In many places, the underlying bedrock is highly fractured.

Included with this soil in mapping are small areas of the deep Riddles and Wooster soils and the somewhat poorly drained Mitiwanga soils in seeps and natural drainageways. Also included are small areas of severely eroded soils that have more coarse fragments in the surface layer and have only fair tilth. The included soils make up 5 to 10 percent of most areas.

Permeability is moderate. The root zone is moderately deep. The available water capacity is low or moderate, depending on the depth to bedrock. Tilth is good. Runoff is rapid. The subsoil is very strongly acid to medium acid. The content of organic matter is moderately low.

This soil is used for crops. It is moderately well suited to corn and small grains and poorly suited to soybeans. The risk of erosion, surface crusting, and the limited root zone are the main concerns in management. This soil warms up early in spring, and it can be tilled earlier than most soils in the county. No-till and other forms of conservation tillage, which leaves crop residue on the surface, contour stripcropping, cover crops, a cropping system that includes grasses and legumes, and grassed waterways help reduce runoff and erosion. In areas where this soil has simple slopes, it is well suited to contour stripcropping and contour tillage. These practices are not adapted to complex slopes, especially if large farm machinery is used. Leaving crop residue on the surface in the fall and not plowing until spring also protect the soil against erosion. Incorporating crop residue or other organic matter into the surface layer increases water infiltration, improves tilth and fertility, and reduces crusting.

In some areas this soil is used as pasture. It is well suited to grasses and legumes for pasture. The pastures can be grazed early in spring. Reseeding with a cover crop or companion crop, using a mulch, or no-till seeding reduces the risk of erosion.

In some areas this soil is used as woodland. It is well suited to trees and to use as habitat for openland and woodland wildlife. Plant competition can be reduced by spraying, mowing, or disking.

This soil is moderately well suited as a site for buildings and poorly suited to use as septic tank absorption fields. Buildings should be designed to conform to the natural shape of the land. Bedrock between depths of 20 and 40 inches interferes with excavation for basements and utility lines. Backfilling around foundations and basement walls with material that has a low shrink-swell potential reduces damage caused by the shrinking and swelling of the soil. The shallowness of the soil is a major limitation for septic tank absorption fields. The volume of soil above the bedrock is not enough to filter the effluent adequately. The effluent can seep rapidly through cracks in the underlying bedrock and pollute nearby water supplies. The filtering capacity can be improved by placing absorption fields on suitable fill material. Placing leach lines of the septic tank absorption field on the contour reduces lateral seepage of effluent to the soil surface. In constructing local roads and streets, replacing the soil with suitable fill material reduces damage resulting from low soil strength. Maintaining a plant cover and using other water control practices during construction help to reduce erosion.

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

LnD—Loudonville silt loam, 12 to 18 percent slopes. This is a moderately deep, moderately steep, well drained soil on hillsides on uplands. The areas generally are long and narrow and range from 3 to 20 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 28 inches thick. The upper part is yellowish brown, firm silt loam, and the lower part is dark yellowish brown, firm loam. Sandstone bedrock is at a depth of about 36 inches. In some places, bedrock is between depths of 10 and 20 inches or 40 and 60 inches. In some areas the soil is eroded. In many places, the underlying bedrock is highly fractured.

Included with this soil in mapping are small areas of the deep Riddles and Wooster soils and of the somewhat poorly drained Mitiwanga soils in seeps. The included soils make up 5 to 15 percent of most areas.

Permeability is moderate. The root zone is moderately deep. The available water capacity is low or moderate, depending on the depth to bedrock. Tilth is good. Runoff is very rapid. The subsoil is very strongly acid to medium acid. The content of organic matter is moderate.

In some areas this soil is used for crops. It is poorly suited to corn and small grains and generally is not suited to continuous crops of soybeans. The moderately steep slopes, a very severe hazard of erosion, and bedrock between depths of 20 and 40 inches are major concerns in management. A crop rotation should consist of hay and pasture and an occasional crop of corn or of a small grain; however, the cropping system can include more row crops if no-till is used. Contour stripcropping is not practical on short slopes. Grassed waterways should be used in natural watercourses to help prevent gullying. Cover crops and crop residue left on the surface reduce erosion. This soil is droughty in long dry periods.

In some areas this soil is used for hay and pasture. It is moderately well suited to grasses and legumes for hay and pasture. Pastures on this soil can be grazed early in spring. Reseeding with a cover crop or companion crop, using a mulch, or no-till seeding reduces the risk of erosion. Pasture plants make little growth during the dry part of summer, particularly in areas where the soil is not so deep. Erosion can be severe if the pasture is overgrazed.

In many areas this soil is used as woodland. It is well suited to trees and to use as habitat for openland and woodland wildlife. Most trees common in the county grow well if competing vegetation is controlled by spraying, mowing, or disking. Placing logging roads and skid trails on the contour where possible and seeding disturbed areas with a quick-growing cover crop help reduce runoff and erosion.

This soil is poorly suited as a site for buildings and generally is not suited to use as septic tank absorption fields because of the slope and the moderate depth to bedrock. Buildings should be designed to conform to the natural shape of the land. The underlying bedrock interferes with excavation for basements and utility lines. Local roads and streets should be placed on the contour wherever possible to reduce the steepness of grade. In some areas diversions can be used to intercept runoff from higher adjacent soils. Maintaining a plant cover on a construction site and using other water control practices help reduce erosion.

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

Ly—Luray silty clay loam. This is a deep, nearly level, very poorly drained soil in depressions and on flats in the valleys and in scattered small areas in depressions and along drainageways on the uplands. In most areas this soil is subject to ponding by runoff from adjacent higher soils. The slope is 0 to 2 percent. The areas generally are irregular in shape and range from 3 to 200 acres in size.

Typically, the surface layer is very dark gray, mottled, friable silty clay loam about 6 inches thick. The subsurface layer is very dark gray, firm silty clay loam about 4 inches thick. The subsoil is about 45 inches thick. The upper part is dark gray, mottled, very firm silty clay, and the middle and lower parts are olive gray and gray, mottled, firm silty clay loam. The substratum to a depth of about 60 inches is gray, mottled, very firm silty clay loam. In some areas the surface layer and subsurface layer are thinner. In a few areas there is a thin layer of light-colored alluvium on the surface. In some areas there is more clay in the subsoil. In a few areas there is more sand and gravel in the subsoil and substratum.

Included with this soil in mapping are small areas of the somewhat poorly drained Euclid soils in positions slightly higher than those of the Luray soil. Also included are some small areas where the surface layer is muck and is as much as 16 inches thick. The included areas make up from 5 to 15 percent of most mapped areas.

The seasonal high water table is near or above the surface during wet periods. Permeability is moderately slow. The root zone is deep. The available water capacity is high to very high. This soil has fair tilth. It can be tilled only within a narrow range of moisture content. Runoff is very slow or is ponded. The subsoil is medium acid to mildly alkaline. The content of organic matter is high.

In most areas, this soil is farmed. If drained, it is well suited to corn, soybeans, and small grains. Undrained areas generally are too wet to be farmed. Ponding and a saturated root zone are the main concerns in management. Planting and harvesting are sometimes delayed because of wetness or ponding. In some areas, ponding damages small grains. Surface and subsurface drains are used to remove excess water. In some areas, especially in depressions, drains are difficult to install because outlets are inadequate. Also, correct timing of tillage is very important because this soil becomes compacted and cloddy if it is worked when wet and sticky.

If drained, this soil is well suited to grasses and legumes for pasture and hay. However, the pastures should not be grazed early in spring. Timing of grazing is important to reduce soil compaction. Grasses and legumes that are tolerant of wetness should be selected for planting.

In undrained areas, this soil is in water-tolerant trees, cattails, reeds, and sedges. It is well suited to trees that are tolerant of wetness and to use as habitat for wetland wildlife. Wetness limits the planting and harvesting of trees. Seedlings are difficult to establish because mortality is high and plant competition is severe. Plant competition is controlled by good site preparation and by spraying, girdling, or mowing. Planting only those species that are tolerant of prolonged wetness reduces seedling mortality and windthrow.

Because of ponding and the moderately slow permeability, this soil is not suitable as a site for buildings and septic tank absorption fields. Many areas afford good sites for ponds. Elevating roads on a suitable base material and providing artificial drainage reduce damage resulting from low strength, ponding, and frost action.

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

McB—Mechanicsburg silt loam, 2 to 6 percent slopes. This is a deep, gently sloping, well drained soil on slightly convex slopes and on ridgetops on uplands. Generally, this soil is on long slopes above steeper hillsides. The areas are long and narrow or irregular in shape and range from 3 to 200 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 9 inches thick. The subsoil is about 23 inches thick. The upper part is dark yellowish brown, friable silt loam; the middle part is dark brown, firm silt loam; and the lower part is dark yellowish brown, firm channery loam. The substratum is yellowish brown, friable extremely channery loam. Yellowish brown, fractured siltstone bedrock is at a depth of about 60 inches. In a few areas the underlying bedrock is solid. In some places the surface layer is channery silt loam or loam.

Included with this soil in mapping are small areas of Berks soils, which are more droughty than the Mechanicsburg soil, and Wooster soils, which have a fragipan. Also included are small areas of somewhat poorly drained soils around seep spots. The included soils make up 5 to 15 percent of most areas.

Permeability is moderate. The root zone is deep. The available water capacity is moderate. Tilth is good, and runoff is medium. The subsoil is very strongly acid to medium acid. The content of organic matter is moderate.

This soil is used for crops. It is well suited to corn, soybeans, small grains, and orchards. This soil warms up earlier in spring than many of the other soils in the county, and it can be tilled earlier. Control of erosion and surface crusting are the main concerns in management. This soil is well suited to no-till and other forms of conservation tillage, which leave crop residue on the surface. Stripcropping and contour tillage are easily applied on the longer, more uniform slopes. Grassed waterways, cover crops, and a rotation that includes grasses and legumes help reduce runoff and erosion. In many areas, grassed waterways are needed to reduce gullying. Leaving crop residue on the surface and adding other organic material help reduce surface crusting and increase water infiltration. Most areas have good air drainage.

In some areas, this soil is used as pasture. It is well suited to grasses and legumes for hay and pasture. The pastures can be grazed early in spring. Most pastures are managed in a rotation with cultivated crops.

Reseeding with a cover crop or companion crop, using a mulch, or no-till seeding reduces the risk of erosion.

Some areas are in trees. This soil is suited to trees and to habitat for openland and woodland wildlife. Trees grow well if competing plant growth is controlled by spraying, mowing, or disking.

This soil is well suited as a site for buildings and septic tank absorption fields. The fractured bedrock between depths of 40 and 72 inches is rippable. Backfilling along foundations and basement walls with material that has a low shrink-swell potential reduces damage from the shrinking and swelling of the soil. In some areas, the volume of soil above the bedrock is not enough to filter the effluent adequately in an absorption field. The effluent can seep rapidly through cracks in the bedrock and pollute nearby water supplies. The filtering capacity can be improved by placing absorption fields in suitable fill material. Using a suitable base material for local roads and streets reduces damage resulting from frost action and low soil strength. Maintaining a plant cover and using other water control practices during construction reduce runoff and erosion.

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

McC2—Mechanicsburg silt loam, 6 to 12 percent, eroded. This is a deep, sloping, well drained soil on ridgetops and the upper part of side slopes and along drainageways on uplands. Most areas lie below gently sloping hilltops and above the steeper part of hillsides. Erosion has removed part of the original surface layer. The present surface layer is a mixture of the original surface layer and the subsoil material. The areas are long and narrow or irregular in shape and range from 3 to 100 acres in size.

Typically, the surface layer is brown, friable silt loam about 7 inches thick. The subsoil is about 20 inches thick. The upper part is dark yellowish brown, friable silt loam; the middle part is dark brown, firm silt loam; and the lower part is dark yellowish brown, firm channery loam. The substratum is yellowish brown, friable extremely channery loam. Yellowish brown, fractured siltstone bedrock is at a depth of about 55 inches. In a few areas the underlying bedrock is solid. In some places the surface layer is channery silt loam or loam.

Included with this soil in mapping are small areas of Berks soils, which are more droughty than the Mechanicsburg soil, and Wooster soils, which have a fragipan. Also included are small areas of somewhat poorly drained soils around seep spots. The included soils make up 5 to 15 percent of most areas.

Permeability is moderate. The root zone is deep. The available water capacity is moderate. Tilth is good, and runoff is rapid. The subsoil is very strongly acid to medium acid. The content of organic matter is moderately low.

This soil is used for crops. It is moderately well suited to corn and small grains and poorly suited to soybeans. It is well suited to orchards. Air drainage is good in most areas. Reducing surface crusting and controlling erosion are the main concerns in management, especially if soybeans are grown. Including grasses and legumes in the cropping system, using cover crops, and adding organic matter reduce erosion and crusting. Erosion is severe in cultivated areas that are used for soybeans. However, if no-till is used, an occasional crop of soybeans can be included in the rotation. In most large areas this soil is adapted to stripcropping. Grassed waterways are needed in many areas to reduce gullying. This soil is droughty in extended dry periods. Artificial drainage is needed in the included seep areas.

In some areas this soil is used as pasture. It is well suited to grasses and legumes for hay and pasture. The pastures can be grazed early in spring. Deep-rooted plants such as alfalfa are well adapted to this soil. Most pasture grasses make little growth during the dry part of summer in areas where the soil is not so deep. Reseeding with a cover crop or companion crop, using a mulch, or no-till seeding reduces the risk of erosion.

In some areas this soil is used as woodland. It is well suited to trees and to use as habitat for openland and woodland wildlife. Most trees common in the area grow well if competing vegetation is controlled by spraying, mowing, or disking.

This soil is moderately well suited as a site for buildings and septic tank absorption fields. The fractured bedrock between depths of 40 and 72 inches is rippable. Buildings should be designed to conform to the natural shape of the land. Backfilling along foundations and basement walls with material that has a low shrink-swell potential reduces damage caused by the shrinking and swelling of the soil. The volume of soil above the bedrock is not enough to filter the effluent adequately in some areas. The effluent can seep rapidly through cracks in the underlying bedrock and pollute nearby water supplies. The filtering capacity can be improved by placing the absorption field on suitable fill material. Placing leach lines of septic tank absorption fields on the contour reduces lateral seepage of effluent to the soil surface. In constructing local roads and streets, using a suitable base material reduces damage resulting from frost action and low soil strength. Maintaining a plant cover and using other water control practices during construction reduce runoff and erosion.

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

McD—Mechanicsburg silt loam, 12 to 18 percent slopes. This is a deep, moderately steep, well drained soil on hillsides. It is on shoulder slopes, the steeper part of side slopes, and side slopes of minor drainageways and low knolls. The areas generally are long and narrow and range from 3 to 50 acres in size.

Typically, the surface layer is brown, friable silt loam about 7 inches thick. The subsoil is about 21 inches thick. The upper part is dark yellowish brown, friable silt loam; the middle part is dark brown, firm silt loam; and the lower part is dark yellowish brown, firm channery loam. The substratum is yellowish brown, friable extremely channery loam. Yellowish brown, fractured siltstone bedrock is at a depth of about 55 inches. In a few areas the underlying bedrock is solid. In some places the surface layer is channery silt loam or is loam. In a few eroded areas the surface layer is yellowish brown silt loam.

Included with this soil in mapping are small areas of Berks soils, which are more droughty, and Wooster soils, which have a fragipan. Also included are small areas of somewhat poorly drained soils around seep spots. The included soils make up 5 to 15 percent of most areas.

Permeability is moderate. The root zone is deep. The available water capacity is moderate. Tilth is good, and runoff is very rapid. The subsoil is very strongly acid to medium acid. The content of organic matter is moderate.

In some areas this soil is used for crops. It is poorly suited to continuous crops of corn and small grains, but it is moderately well suited to these crops in a rotation with meadow crops. The slope and the resulting very severe hazard of erosion are the main concerns in management. This soil is well suited to no-till. On short slopes, contour tillage and contour stripcropping with large machinery are not practicable. Cover crops and crop residue left on the surface improve tilth and water infiltration. Grassed waterways are used in natural watercourses to reduce gullying. This soil is droughty during dry periods.

In some areas this soil is used as pasture. It is moderately well suited to grasses and legumes for hay and pasture. The pastures can be grazed early in spring. Deep-rooted grasses and legumes are well adapted to this soil. Reseeding with a cover crop or companion crop, using a mulch, or no-till seeding reduces the risk of erosion. Hay and pasture plants make little growth during the dry part of summer, particularly in areas where the soil is not so deep. Erosion can be severe if the pasture is overgrazed.

In many areas the soil is used as woodland. It is well suited to trees and to use as habitat for openland and woodland wildlife. Most trees common in the area grow well if competing vegetation is controlled by spraying, mowing, or disking. Locating logging roads and skid trails on the contour where possible and seeding disturbed areas with a quick-growing cover crop help reduce runoff and erosion.

This soil is poorly suited as a site for buildings and septic tank absorption fields. The fractured bedrock between depths of 40 and 72 inches is rippable. Buildings should be designed to conform to the natural shape of the land. The volume of soil above the bedrock is not enough to filter the effluent adequately in some areas. The effluent can seep rapidly through cracks in the underlying bedrock and pollute nearby water supplies. Placing leach lines of a septic tank absorption field on the contour reduces lateral seepage of effluent to the soil surface. Locating roads and streets on the contour reduces the steepness of grade. Maintaining a plant cover on a construction site and using other water control practices reduce runoff and erosion. The soil in filled areas is subject to slippage.

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

Md—Melvin silt loam, frequently flooded. This is a deep, nearly level, poorly drained soil on flood plains. It is subject to frequent flooding in winter and spring. The slope is 0 to 2 percent. The areas generally are long and narrow and range from 5 to 100 acres in size.

Typically, the surface layer is dark gray, friable silt loam about 6 inches thick. The subsoil is gray and dark grayish brown, mottled, friable silt loam about 29 inches thick. The substratum to a depth of about 60 inches is multicolored, mottled, firm silty clay loam and silt loam. In places the subsoil has more sand and less silt.

Included with this soil in mapping and making up 5 to 10 percent of most areas are small areas of the very poorly drained Luray soils, the poorly drained Killbuck soils, and the somewhat poorly drained Orrville soils.

The seasonal high water table is near the surface during extended wet periods. Permeability is moderate. The root zone is deep. The available water capacity is moderate or high, and tilth is good. Runoff is very slow. The subsoil is slightly acid or neutral. The content of organic matter is moderate.

In a few areas this soil is drained and is used for crops. In drained areas, it is moderately well suited to corn and soybeans. It generally is not suited to small grains. Undrained areas are too wet for the commonly grown crops. Flooding and wetness are the main concerns in management. They often delay spring planting. Flooding damages small grains. Surface and subsurface drains are used to improve drainage. In many areas, outlets for drainage systems are difficult to install because the soil is in low positions on the landscape. The surface layer crusts after hard rains. Returning crop residue to the soil helps reduce crusting.

In some areas that are not adequately drained or in areas that are irregular in shape and lie along meandering streams, this soil is used as pasture. It is well suited to water-tolerant grasses and legumes for hay and pasture. The sediment left by floodwaters, however, often makes the crop unfit for hay. Pasture plants that are tolerant of seasonal wetness and flooding are suitable for seeding. Grazing when the soil is wet and soft causes soil compaction and poor tilth, damages plants, and reduces the movement of air and water in the soil.

Figure 6.—An area of Melvin silt loam, ponded. This soil is well suited to use as habitat for wetland wildlife.

In some areas this soil is used as woodland and as natural habitat for wetland wildlife. This soil is well suited to tree species that are tolerant of wetness and flooding, and only such trees should be selected for planting to reduce seedling mortality. Wetness severely limits the use of equipment for planting and logging. These operations can be performed during the drier part of the year.

This soil is not suitable as a site for buildings or septic tank absorption fields because of flooding and wetness. Fill can be used to elevate roads above the normal flood level.

This soil is in capability subclass IIIw and in woodland suitability subclass 1w.

Mg—Melvin silt loam, ponded. This is a deep, nearly level, poorly drained soil in basinlike swampy areas on flood plains. This soil is subject to frequent flooding and to ponding by surface runoff from surrounding areas. The slope is 0 to 2 percent. The areas generally are irregular in shape and range from 10 to 150 acres in size.

Typically, the surface layer is dark gray, friable silt loam about 6 inches thick. The subsoil is gray and dark grayish brown, friable silt loam about 24 inches thick. The substratum to a depth of about 60 inches is multicolored, mottled, firm silty clay loam. In some areas the subsoil has more sand and less silt.

Included with this soil in mapping are small areas of Carlisle and Killbuck soils. Also included are a few areas in which the surface layer is organic material. The included soils make up 10 to 15 percent of most mapped areas.

The seasonal high water table is near or above the surface most of the year, and the soil is ponded. Permeability is moderate. The root zone is deep. The available water capacity is moderate or high, and tilth is good. The subsoil is slightly acid or neutral. The content of organic matter is moderate.

This soil generally is not suited to cultivated crops, hay, pasture, building sites, and septic tank absorption fields because of ponding and flooding.

This soil is used as natural habitat for wetland wildlife (fig. 6). It is poorly suited to most trees and well suited to use as habitat for wetland wildlife. The areas of this soil are in water-tolerant trees, cattails, reeds, and sedges. Trees that are tolerant of ponding and flooding should be selected for planting to reduce seedling mortality and windthrow. Tracked vehicles should be used for logging.

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

MtB—Mitiwanga silt loam, 1 to 4 percent slopes. This is a moderately deep, nearly level and gently sloping, somewhat poorly drained soil at the head of drainageways, in slight depressions on ridgetops, and at the base of steeper slopes on uplands. The areas generally are irregular in shape or long and narrow, and they range from 3 to 15 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 10 inches thick. The subsoil is yellowish brown and dark yellowish brown, mottled, friable and firm silty clay loam and clay loam about 21 inches thick. Hard, fine-grained sandstone is at a depth of about 31 inches. In some areas, the depth to bedrock is more than 31 inches.

Included with this soil in mapping and making up 5 to 10 percent of some areas are small areas of the well drained Loudonville and Mechanicsburg soils on side slopes.

A perched seasonal high water table is between depths of 12 and 30 inches during extended wet periods. Permeability is moderate. The root zone is moderately deep. The available water capacity is low, and tilth is good. Runoff is slow or medium. Reaction in the subsoil ranges from very strongly acid to medium acid. The content of organic matter is moderate.

This soil is used for crops. It is well suited to corn, soybeans, and small grains. Seasonal wetness and the hazard of erosion are the main concerns in management. The surface layer crusts after hard rains. Conservation tillage, which leaves crop residue on the surface, contour tillage, rotations that include grasses and legumes, and grassed waterways help reduce soil erosion. Subsurface drains help lower the seasonal high water table. However, bedrock at a moderate depth hinders the installation of subsurface drains. Diversions can be used in many areas to intercept runoff from higher adjacent soils. Returning crop residue to the soil, using winter cover crops, and regularly adding other organic material improve fertility, reduce surface crusting, and increase the infiltration of water.

In some areas this soil is used as pasture. It is well suited to grasses and legumes for pasture and hay. However, the pastures should not be grazed early in spring. Maintenance of an optimum stand of the desirable forage species and controlled grazing during wet periods are the main concerns in management. In establishing new pasture, minimum tillage and no-till seeding help reduce erosion. Grazing should be restricted during wet periods to reduce compaction of the soil. Subsurface drains are needed for deep-rooted legumes, such as alfalfa, to grow well on this soil.

In some areas this soil is used as woodland. Trees that are tolerant of some wetness grow well if competing plant growth is controlled by mowing, spraying, or disking.

This soil is poorly suited as a site for buildings and septic tank absorption fields because of the moderate depth to bedrock and seasonal wetness. The bedrock interferes with excavation for basements and utility lines. Building sites should be landscaped so that surface runoff drains away from foundations. Drains at the base of footings and other subsurface drains remove the excess water around foundations and lower the seasonal high water table. An exterior coating on basement walls also helps prevent wet basements. In some areas, diversions are needed to convey runoff from higher adjacent soils away from buildings and septic tank absorption fields. The volume of soil above the bedrock is not enough to filter the effluent adequately in an absorption field. The filtering capacity can be improved by placing the absorption field on suitable fill material. Perimeter drains around an absorption field help lower the seasonal high water table. In the construction of local roads and streets, artificial drainage and a suitable base material help to reduce damage by frost action.

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

Or—Orrville silt loam, occasionally flooded. This is a nearly level, deep, somewhat poorly drained soil on flood plains. It commonly takes up the entire flood plain along small streams and is also in long, narrow strips along larger streams in wide valleys. This soil is subject to occasional flooding. The slope is 0 to 2 percent. The areas generally range from 5 to 100 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 9 inches thick. The subsoil is about 23 inches thick. The upper part is brown and grayish brown, mottled, friable silt loam, and the lower part is olive gray and gray, friable fine sandy loam and silt loam. The substratum to a depth of about 60 inches is gray, stratified silt loam, coarse sandy loam, and gravelly sandy loam. It has mottles below a depth of about 48 inches. In some areas, the soil is poorly drained and is more gray in the subsoil. In a few areas the surface layer is sandy loam, fine sandy loam, or loam. In some areas bedrock is between depths of 40 and 60 inches.

Included with this soil in mapping are small areas of the moderately well drained Lobdell soils and the well drained Tioga soils adjacent to the stream channel and on slight rises. Also included are small areas of the well drained Chili soils and the moderately well drained Bogart soils on alluvial fans. The included soils make up 10 to 15 percent of most areas.

An apparent seasonal high water table is between depths of 12 and 30 inches during extended wet periods. Permeability is moderate, and the root zone is deep. The available water capacity is moderate to high, and tilth is good. Runoff is slow. Reaction in the subsoil is strongly acid to slightly acid. The content of organic matter is moderate.

This soil is used for farming. It is moderately well suited to corn and soybeans; however, it generally is not suited to small grains because they are subject to damage by flooding. Drainage, flooding, and surface crusting are the main concerns in management. Surface and subsurface drains are used to improve drainage. In some areas, drainage outlets are difficult to install because this soil is in a low landscape position. Controlling flooding is difficult. Preparing a seedbed and planting can be done after the floodwater recedes. Flooding is less common during the growing season, and crops such as corn and soybeans generally tolerate brief flooding. Tilling this soil when it is wet compacts the soil and causes poor tilth.

In some small areas this soil is used as pasture. It is well suited to grasses and legumes for hay and pasture. However, pastures on this soil should not be grazed early in spring. Floodwater leaves sediment on the grasses and legumes, often making the crop unfit for hay. Species that are tolerant of wetness should be selected for planting. Timing of grazing is important to keep the soil from becoming compacted during wet periods. Artificial drainage is needed for deep-rooted legumes such as alfalfa to grow well on this soil.

In some areas this soil is used as woodland. It is well suited to trees. Trees that tolerate wetness grow well if plant competition is controlled by mowing, spraying, or cutting.

This soil generally is not suitable as a site for buildings and for septic tank absorption fields because of the hazard of flooding and the seasonal wetness. Fill can be used to elevate roads above the normal flood level.

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

OtB—Oshtemo sandy loam, 2 to 6 percent slopes. This is a deep, gently sloping, well drained soil on terraces along major stream valleys and on outwash plains. The areas generally are long and narrow and are less than 15 acres in size, but they range to as much as 40 acres.

Typically, the surface layer is dark brown, friable sandy loam about 9 inches thick. The subsoil is dark brown, redddish brown, and dark reddish brown, friable and very friable sandy loam about 35 inches thick. The substratum to a depth of about 60 inches is yellowish brown, loose sand. In some places, the surface layer is loamy sand or gravelly sandy loam.

Included with this soil in mapping and making up 5 to 15 percent of most areas are small areas of the moderately well drained Bogart soils and the somewhat poorly drained Jimtown soils in slight depressions and on flats.

Permeability is moderately rapid in the subsoil and very rapid in the substratum. The root zone is deep. The available water capacity is low or moderate. Tilth is good, and runoff is slow. The subsoil is strongly acid to slightly acid. The content of organic matter is moderately low.

In most areas this soil is used for crops. It is moderately well suited to corn, small grains, and soybeans. Droughtiness and wind and water erosion are the main concerns in management. This soil warms up earlier in spring and can be worked earlier than most soils in the county. Shallow-rooted plants can be damaged by droughtiness in extended dry periods. This soil is better suited to early-maturing crops than to crops that mature in late summer. It is well suited to vegetables and other specialized crops if it is irrigated. However, irrigation needs to be done with caution to prevent excessive erosion. Nutrients are easily leached from this soil; therefore, crops respond better to small but frequent and timely applications of fertilizer and lime than to one large application. Using conservation tillage and returning crop residue to the soil help to conserve moisture and to reduce erosion.

This soil is moderately well suited to hay and pasture. The pastures can be grazed early in spring. Summer pasture yields are lower because of droughtiness. Deep-rooted plants such as alfalfa do better than shallow-rooted plants. Overgrazing causes erosion.

This soil is well suited to trees and shrubs. Seedlings generally are difficult to establish during dry periods in summer, unless irrigation is used. This soil is suited to nursery stock, especially if it is irrigated. Because of the good natural drainage and the sandy loam texture, the digging and balling of nursery stock can be done easily.

This soil is well suited as a site for buildings and to septic tank absorption fields. There is a hazard of sloughing or cave-in during excavation because the underlying material is sandy and gravelly. Special safety precautions are needed in digging basements or trenches. If this soil is used for septic tank absorption fields, there is a risk that the underground water supply can become contaminated, because the permeability is very rapid in the substratum. Placing the lines of septic tank absorption fields in suitable fill material helps reduce this hazard. Maintaining a plant cover on a construction site and using other water control practices help to reduce erosion. This soil is a good source of roadfill and a probable source of sand and gravel.

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

Pg—Pits, gravel. This map unit consists of areas from which sand and gravel have been removed for use in construction. The areas are on outwash plains, stream terraces, and kames, mainly adjacent to areas of Bogart, Chili, Fitchville, Glenford, and Jimtown soils. Most gravel pits are irregular in shape and range from 5 to 100 acres in size. Actively mined gravel pits are continually being enlarged.

Typically, the pits have nearly vertical sides and gently sloping bottoms. The sides consist of layers of gravel and sand that vary in fragment size, orientation, thickness, and mixture. The bottom of the pits is either loamy material or sand and gravel. Some pits contain water.

The areas generally are not suited to good plant growth. Extensive reclamation is necessary before seeding. Cutting back sidewalls, covering with topsoil, and proper control of excess runoff help in establishing plants. Blanketing the areas with a layer of good soil material improves the available water capacity. Fertilization may be needed. Establishing a stand of drought-resistant grasses is important in controlling erosion.

Abandoned gravel pits have potential for recreation uses. The pits can be graded and seeded for use as parks, playgrounds, or picnic areas. Pits that have been excavated to or below the level of the water table can be developed as habitat for wetland wildlife.

This map unit was not assigned to a capability subclass or to a woodland suitability subclass.

Pr—Pits, quarry. This map unit consists of areas from which limestone or shale has been removed for use in construction. The areas commonly are on uplands. Most quarries have a high wall on one or more sides, are irregular in shape, and range from 15 to 200 acres in size. Actively mined quarries are continually being enlarged.

Before the limestone or shale is quarried, the overburden generally is scalped and stockpiled. This material commonly is acid and has poor physical properties. The content of organic matter is very low, and the available water capacity varies.

The overburden and the mined areas generally are not suited to good plant growth. Extensive reclamation needs to be done before seeding takes place. The rocky sidewalls may be difficult to cut back. Some sidewalls can be covered if enough spoil material is available. Leveling the spoil material, covering it with topsoil, and adding fertilizer and, if needed, lime improve plant growth. Establishing a stand of grasses or legumes is important in controlling erosion.

This map unit was not assigned to a capability subclass or to a woodland suitability subclass.

ReA—Ravenna silt loam, 0 to 2 percent slopes. This is a deep, nearly level, somewhat poorly drained soil on broad, flat plains and in small depressions and drainageways on uplands. The areas are irregular in shape and range from 5 to 100 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 9 inches thick. The subsurface layer is light yellowish brown, mottled, friable silt loam about 2 inches thick. The subsoil is about 44 inches thick. The upper part is yellowish brown and dark yellowish brown, mottled, friable silt loam and firm loam; the middle part is a dark yellowish brown, mottled, firm and very firm, brittle loam fragipan; and the lower part is brown, very firm loam. The substratum to a depth of about 90 inches is yellowish brown, firm loam glacial till.

Included with this soil in mapping are small areas of the poorly drained Sebring soils in drainageways and depressions. Also included are small areas of the moderately well drained Canfield soils on the crest of small knolls and ridges and on side slopes along small drainageways. The included soils make up 5 to 15 percent of most areas.

A perched seasonal high water table is between depths of 6 and 24 inches during extended wet periods. Permeability is moderate above the fragipan and slow in the fragipan. The root zone is restricted by the fragipan, which is at a depth of 14 to 30 inches. The available water capacity in the root zone is low. Tilth is good. Runoff is slow. The subsoil is strongly acid or medium acid above the fragipan and very strongly acid to slightly acid in the fragipan. The content of organic matter is moderate.

This soil is used for crops. It is well suited to corn, soybeans, and small grains. Wetness and the restricted rooting depth are the main concerns in management. The surface layer crusts after hard rains. Subsurface drains can lower the seasonal high water table. Surface drainage is also needed in some areas. In some places, outlets for drainage systems are difficult to install. Maintaining fertility and maintaining the organic matter content are also concerns in management. Returning crop residue to the soil, planting winter cover crops, and regularly adding other organic material improve fertility, reduce surface crusting, and increase water intake.

In some areas this soil is used as pasture. It is well suited to grasses and legumes for hay and pasture. Most pastures have little or no artificial drainage. In undrained areas, the soil is better suited to grasses than to deep-rooted legumes. Subsurface drainage is needed for deep-rooted legumes such as alfalfa. Timing of grazing on this soil is critical in preventing soil compaction during wet periods. Compaction reduces air and water movement in the soil and inhibits plant growth.

In some areas this soil is in trees. It is well suited to use as woodland and as habitat for openland and woodland wildlife. Trees that are adapted to some wetness and to a root-restricting layer in the subsoil should be selected for planting.

This soil is poorly suited as a site for buildings and septic tank absorption fields because of seasonal wetness and the slowly permeable fragipan. Building sites should be landscaped so that surface runoff drains away from foundations. Drains at the base of footings and other subsurface drains help to remove the excess water around foundations and to lower the seasonal high water table. An exterior coating on basement walls also helps prevent wet basements. Enlarging the septic tank absorption field increases the absorption capacity. Perimeter drains around an absorption field help lower the seasonal high water table. Diversions help convey runoff from higher adjacent soils away from septic tank absorption fields and building sites. In the construction of local roads and streets, artificial drainage and a suitable base material help reduce damage resulting from frost action and wetness.

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

ReB—Ravenna silt loam, 2 to 6 percent slopes. This is a deep, gently sloping, somewhat poorly drained soil that is mainly on crests and side slopes of low knolls and ridges on broad, gently undulating uplands. The slopes commonly are long and uniform, and the areas range in size from 5 to 100 acres. This soil is also at the base of steeper slopes, in small drainageways, and at the head of drainageways on gently rolling to hilly parts of till plains. These areas are irregular in shape and range from 3 to 20 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 10 inches thick. The subsoil is about 43 inches thick. The upper part is yellowish brown and dark yellowish brown, mottled, friable silt loam and firm loam; the middle part is a dark yellowish brown, mottled, very firm and brittle loam fragipan; and the lower part is brown, very firm loam. The substratum to a depth of about 60 inches is yellowish brown, firm loam glacial till.

Included with this soil in mapping are small areas of the moderately well drained Canfield soils on the crest of some knolls and ridges and on side slopes along some drainageways and the poorly drained Sebring soils in depressions and some drainageways. The included soils make up 10 to 15 percent of most areas.

A perched seasonal high water table is between depths of 6 and 24 inches during extended wet periods. Permeability is moderate above the fragipan and slow in the fragipan. The root zone is restricted by the fragipan, which is at a depth of 14 to 30 inches. The available water capacity in the root zone is low. Tilth is good. Runoff is medium. The subsoil is strongly acid or medium acid above the fragipan and very strongly acid to slightly acid in the fragipan. The content of organic matter is moderate.

This soil is used for crops. It is well suited to corn, soybeans, and small grains. Wetness, the restricted rooting depth, and the control of erosion are the main concerns in management. The surface layer crusts after hard rains. Conservation tillage, which leaves crop residue on the surface, stripcropping, contour tillage, rotations that include grasses and legumes, and grassed waterways help reduce erosion and are easily adapted to most areas of this soil. Subsurface drains help lower the seasonal high water table. There are suitable drainage outlets in most areas. Maintaining fertility and the content of organic matter are also important.

In some areas this soil is used as pasture. It is well suited to grasses and legumes for hay and pasture. Control of erosion, maintenance of an optimum stand of the desirable plant species, and controlled grazing during wet periods are the main concerns in management. Conservation tillage, which leaves crop residue on the surface, and no-till seeding help reduce erosion. Timing of grazing on this soil is critical to prevent soil compaction during wet periods. Subsurface drains are needed for deep-rooted legumes such as alfalfa. In undrained areas this soil is better suited to grasses than to deep-rooted legumes.

This soil is well suited to use as woodland and as habitat for openland and woodland wildlife. Trees that are adapted to some wetness and to a root-restricting layer in the subsoil grow well if competing plant growth is controlled or removed by spraying, mowing, or disking.

This soil is poorly suited as a site for buildings and to septic tank absorption fields because of seasonal wetness and the slowly permeable fragipan. Building sites should be landscaped so that surface runoff drains away from foundations. Drains at the base of footings and other subsurface drains help to remove excess water around foundations and basement walls and to lower the seasonal high water table. Coating the exterior of basement walls also helps prevent wet basements. Enlarging a septic tank absorption field increases the absorption capacity. Perimeter drains around an absorption field help lower the seasonal high water table. Diversions help convey runoff from higher adjacent soils away from septic tank absorption fields and building sites. In the construction of local roads and streets, artificial drainage and a suitable base material help reduce damage resulting from frost action and wetness. Maintaining a plant cover on a construction site and using other water control practices reduce erosion.

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

RgB—Rawson silt loam, 2 to 6 percent slopes. This is a deep, gently sloping, moderately well drained soil on outwash plains and stream terraces. The areas generally are irregular in shape and range from 2 to 20 acres in size.

Typically, the surface layer is dark brown and dark yellowish brown, friable silt loam about 12 inches thick. The subsoil is about 33 inches thick. The upper part is yellowish brown, firm loam; the middle part is yellowish brown and dark yellowish brown, mottled, firm gravelly clay loam; and the lower part is dark brown, mottled, very firm silty clay. The substratum to a depth of about 60 inches is dark brown, mottled, very firm silty clay. In some places, the surface layer is loam or sandy loam.

Included with this soil in mapping are small areas of the somewhat poorly drained Haskins soils on foot slopes and flats. Also included are small areas where the underlying lacustrine sediment or glacial till is at a depth of 10 to 22 inches or 40 to 50 inches. The included areas make up 5 to 15 percent of most mapped areas.

This soil has a perched seasonal high water table between depths of 30 and 48 inches during extended wet periods. Permeability is moderate in the upper and middle parts of the subsoil and slow or very slow in the lower part of the subsoil and in the substratum. The root zone is mainly moderately deep or deep to compact glacial till or lacustrine sediment. The available water capacity is moderate. Tilth is good, and runoff is medium. The subsoil ranges from strongly acid in the upper part to neutral in the lower part. The content of organic matter is moderate.

In most areas, this soil is used for crops. It is well suited to corn, soybeans, and small grains. Erosion is the main hazard. The surface layer crusts after hard rains. Because the areas are small, they commonly are managed together with areas of the surrounding soils. Returning crop residue to the soil, conservation tillage, which leaves crop residue on the surface, and including meadow crops in the cropping sequence help reduce erosion, improve tilth, and increase water infiltration. In some drainageways, grassed waterways are needed to reduce erosion and gullying. Random subsurface drains can be used in areas of the included less well drained soils and to drain seep spots.

This soil is well suited to grasses and legumes for pasture and hay. Reseeding with a cover crop or companion crop, using a mulch, or no-till seeding reduces the risk of erosion.

This soil is well suited to trees and to other vegetation that provides food and cover for wildlife. Most trees common in the area grow well if competing vegetation is controlled by spraying, mowing, or disking.

This soil is moderately well suited as a site for buildings, but it is poorly suited to septic tank absorption fields because of the seasonal wetness, the moderate shrink-swell potential in the lower part of the soil, and the slow or very slow permeability. Water moves downslope above the very firm and dense lower part of the soil and can cause wetness around foundations and in basements. Drains at the base of footings and exterior coating on basement walls help prevent wet basements. Backfilling along foundations and basement walls with material that has a low shrink-swell potential helps reduce damage caused by the shrinking and swelling of the soil. Building sites and septic tank absorption fields should be landscaped so that surface runoff drains away from foundations and absorption fields. Enlarging absorption fields increases the absorption of effluent. Perimeter drains around an absorption field help lower the seasonal high water table. Placing the distribution lines of a septic tank absorption field across the slope reduces lateral seepage of effluent to the surface. Using artificial drainage and a suitable base material for local roads and streets reduces damage caused by frost action. Maintaining a plant cover on a construction site and using other water control practices help reduce erosion.

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

RhB—Riddles silt loam, 2 to 6 percent slopes. This is a deep, gently sloping, well drained soil on slightly convex slopes and on ridgetops on uplands. Slopes range from long and uniform to short and complex. The areas generally are irregular in shape and range from 5 to 100 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 9 inches thick. The subsoil is about 36 inches thick. The upper part is yellowish brown, friable silt loam; the middle and lower parts are dark brown and dark yellowish brown, friable silty clay loam and firm clay loam. The subsoil is mottled from a depth of 26 to 37 inches. The substratum to a depth of about 60 inches is dark brown, firm loam. In some places, the subsoil has more sand or the subsoil or substratum is more acid. In some areas the soil is moderately well drained and has gray mottles in the upper part of the subsoil.

Included with this soil in mapping and making up 5 to 15 percent of some areas are small areas of the moderately well drained Glenford soils in shallow drainageways and at the base of some slopes and the somewhat poorly drained Bennington soils in drainageways and slight depressions.

Permeability is moderate. The root zone is deep, and the available water capacity is moderate or high. Tilth is good. Runoff is medium. The subsoil is strongly acid or medium acid in the upper part and strongly acid to slightly acid in the lower part. The content of organic matter is moderate.

This soil is used for farming. It is well suited to corn, soybeans, and small grains. The surface layer crusts after hard rains. Erosion is a moderate hazard in cultivated areas. Contour stripcropping and contour tillage are well suited to the long, uniform slopes. No-till and other forms of conservation tillage, which leave crop residue on the surface, grassed waterways, and rotations that include grasses and legumes help reduce crusting, runoff, and erosion. This soil can be tilled earlier in spring than many soils in the county. Random subsurface drains are needed on the included wetter soils.

This soil is well suited to deep-rooted grasses and legumes for hay and pasture. If the soil is plowed to prepare a seedbed or the pasture is overgrazed, erosion is a moderate hazard. Pastures can be grazed early in spring.

In a few areas this soil is used as woodland. It is well suited to trees and to use as habitat for openland and woodland wildlife. Plant competition can be reduced by spraying, mowing, or disking.

This soil is well suited as a site for buildings and to septic tank absorption fields. Backfilling along basement walls with material that has a low shrink-swell potential reduces damage caused by the shrinking and swelling of the soil. Enlarging septic tank absorption fields increases the absorption of effluent. Maintaining a plant cover and using water control structures where needed help reduce erosion and sedimentation. In constructing local roads and streets, replacing the top layers of the soil with a suitable base material reduces damage resulting from frost action and low soil strength.

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

RhC—Riddles silt loam, 6 to 12 percent slopes. This is a deep, sloping, well drained soil on convex slopes on ridges and knolls and along drainageways on uplands. Slopes are long and uniform or short and complex. The areas are mainly irregular in shape and range from 3 to 30 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 8 inches thick. The subsoil is about 46 inches thick. The upper part is dark yellowish brown, friable silt loam, and the middle and lower parts are yellowish brown and dark yellowish brown, firm loam and clay loam. The substratum to a depth of about 60 inches is olive brown, firm loam glacial till. In some places, the subsoil has more sand, or the subsoil or substratum is more acid. In places, bedrock is between depths of 40 and 60 inches. In some areas the soil is moderately well drained and has gray mottles in the upper part of the subsoil.

Included with this soil in mapping and making up 5 to 15 percent of some areas are small areas of the moderately well drained Glenford soils near major drainageways and the somewhat poorly drained Bennington soils in watercourses and slight depressions.

Permeability is moderate. The root zone is deep, and the available water capacity is moderate or high. Tilth is good. Runoff is rapid. The subsoil is strongly acid or medium acid in the upper part and strongly acid to neutral in the lower part. The content of organic matter is moderate.

This soil is used for farming. It is moderately well suited to corn and small grains. The hazard of erosion and surface crusting are the main concerns in management. Contour stripcropping and contour tillage are suited to the longer, uniform slopes. Also, conservation tillage, which leaves crop residue on the surface, grassed waterways, and rotations that include grasses and legumes help reduce runoff, crusting, and soil loss by erosion. In areas that have short or complex slopes, a rotation that includes more years of hay or pasture helps to reduce erosion. No-till is suited to this soil and is an excellent way to reduce erosion, especially on complex slopes where contour stripcropping is not practical. This soil can be tilled earlier than many soils in the county. However, random subsurface drains are needed in areas of the included, less well drained soils.

This soil is well suited to deep-rooted grasses and legumes for hay and pasture. If the soil is plowed to prepare a seedbed or the pasture is overgrazed, erosion is a severe hazard. Pastures on this soil can be grazed early in spring.

In some areas this soil is used as woodland. It is well suited to trees and to use as habitat for openland and woodland wildlife. Plant competition can be reduced by spraying, mowing, or disking.

This soil is moderately well suited as a site for buildings and to septic tank absorption fields. The slope, the moderate permeability, and the moderate shrink-swell potential are limitations for these uses. Buildings should be designed to conform to the natural shape of the land. Backfilling along basement walls with material that has a low shrink-swell potential reduces damage caused by the shrinking and swelling of the soil. Maintaining a plant cover and using water control practices where needed during construction help reduce erosion and sedimentation. Septic tank effluent can seep horizontally and surface downslope. Placing leach lines on the contour reduces seepage of effluent to the surface. Using a suitable base material in constructing local roads and streets reduces damage resulting from frost action and low soil strength.

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

RhD2—Riddles silt loam, 12 to 18 percent slopes, eroded. This is a deep, moderately steep, well drained soil on convex slopes of high knolls and along drainageways on uplands. Erosion has removed part of the original surface layer. The present surface layer is a mixture of the original surface layer and the subsoil material. The areas are mainly irregular in shape and range from 3 to 20 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 6 inches thick. The subsoil is about 43 inches thick. The upper part is dark yellowish brown, friable silt loam, and the middle and lower parts are yellowish brown and dark yellowish brown, firm loam and clay loam. The substratum to a depth of about 60 inches is olive brown, firm loam glacial till. In some areas, bedrock is between depths of 20 and 60 inches. In places, the subsoil has more sand, or the subsoil or substratum is more acid.

Included with this soil in mapping and making up 5 to 10 percent of some areas are small areas of Berks soils, which have bedrock between depths of 20 and 40 inches.

Permeability is moderate. The root zone is deep, and the available water capacity is moderate or high. Tilth is good. Runoff is very rapid. The subsoil is strongly acid or medium acid in the upper part and strongly acid to neutral in the lower part. The content of organic matter is moderately low.

In some areas this soil is used for crops. It is poorly suited to continuous crops of corn, soybeans, and small grains. However, it is moderately well suited to these crops in rotation with meadow crops. The slope and the very severe hazard of erosion are the main concerns in management. This soil is suited to no-till. In some places stripcropping can be used, but in most places the soil is not suited to this practice because the slopes are short and some areas are dissected by stream channels. Establishing grassed waterways in natural channels reduces gullying. Conservation tillage, which leaves crop residue on the surface, helps reduce soil loss by erosion.

This soil is moderately well suited to grasses and legumes for pasture and hay. If it is plowed to prepare a seedbed or the pasture is overgrazed, there is a severe hazard of further erosion. Reseeding with a cover crop or companion crop, using mulch, or no-till seeding reduces the risk of erosion. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the soil and plants in good condition.

In many areas this soil is used as woodland. It is well suited to trees and to use as habitat for openland and woodland wildlife. Locating logging roads and skid trails on the contour wherever possible helps reduce soil loss by erosion. Plant competition can be reduced by spraying, mowing, or disking.

This soil is poorly suited as a site for buildings and septic tank absorption fields because of the slope. Buildings should be designed to conform to the natural shape of the land. Backfilling along basement walls with material that has a low shrink-swell potential reduces damage caused by the shrinking and swelling of the soil. In filled areas, the soil is subject to slippage. Placing leach lines of septic tank absorption fields on the contour reduces lateral seepage of effluent to the surface. Maintaining a plant cover and using water control structures during construction help reduce erosion. In constructing local roads and streets, using a suitable base material reduces damage resulting from frost action and low soil strength.

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

RhE—Riddles silt loam, 18 to 25 percent slopes. This is a deep, steep, well drained soil on convex slopes along drainageways and on side slopes of knolls and ridges. The slopes are mainly uniform. The areas generally range from 5 to 20 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 2 inches thick. The subsurface layer is brown, friable silt loam about 4 inches thick. The subsoil is about 42 inches thick. The upper part is dark yellowish brown, friable silt loam, and the middle and lower parts are yellowish brown and dark yellowish brown, firm loam and clay loam. The substratum to a depth of about 60 inches is olive brown, firm loam glacial till.

Included with this soil in mapping and making up 5 to 20 percent of some areas are small areas of the moderately deep Berks soils, rock outcroppings on shoulder slopes, and narrow strips of the somewhat poorly drained Orrville soils on flood plains.

Permeability is moderate. The root zone is deep, and the available water capacity is moderate or high. Runoff is very rapid. The subsoil is strongly acid or medium acid in the upper part and strongly acid to neutral in the lower part. The content of organic matter is moderately low.

This soil generally is not suited to crops because of the steep slopes and the very severe hazard of erosion.

In a few areas this soil is used as pasture. It is moderately well or poorly suited to this use. The pastures can be grazed early in spring. If the soil is plowed for seedbed preparation or the pasture is overgrazed, erosion is a severe hazard. No-till seeding reduces the hazard of erosion.

This soil is used mainly for trees and as habitat for woodland wildlife. It is well suited to these uses. Locating logging roads and skid trails on the contour reduces the hazard of erosion.

This soil generally is not suitable as a site for buildings and septic tank absorption fields because of the steep slopes.

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

RsB—Rittman silt loam, 2 to 6 percent slopes. This is a deep, gently sloping, moderately well drained soil in broad, slightly convex areas, on side slopes along drainageways, and on small knolls on uplands. The areas are mainly irregular in shape and range from about 5 to 100 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 44 inches thick. The upper part is yellowish brown and dark yellowish brown, friable silt loam and firm silty clay loam and is mottled below a depth of about 13 inches; the middle part is a dark yellowish brown, mottled, very firm and brittle clay loam fragipan; and the lower part is dark yellowish brown, mottled, very firm clay loam. The substratum to a depth of about 60 inches is dark yellowish brown, very firm clay loam. In some small areas the surface layer is eroded and is about 10 to 15 percent gravel. In some areas the soil is well drained and does not have mottles in the upper and middle parts of the subsoil. In a few areas bedrock is between depths of 40 and 60 inches.

Included with this soil in mapping and making up 5 to 15 percent of most areas are small areas of the somewhat poorly drained Wadsworth soils in small drainageways and shallow depressions and on the concave part of slopes.

A perched seasonal high water table is between depths of 18 and 36 inches during extended wet periods. Permeability is moderate above the fragipan and slow in the fragipan. The root zone is mainly restricted by the fragipan to a depth of 18 to 32 inches. The available water capacity in this zone is low. Tilth is good. Runoff is medium. Reaction in the subsoil above the fragipan ranges from medium acid to very strongly acid. The content of organic matter is moderate.

This soil is used for crops. It is well suited to corn, soybeans, and small grains. In a few areas it is used for potatoes. A moderate hazard of erosion, surface crusting, and the restricted rooting depth are the main concerns in management. No-till and other forms of conservation tillage, which leaves crop residue on the surface, cover crops, contour tillage, contour stripcropping, rotations that include grasses and legumes, and grassed waterways reduce runoff and erosion. In most large areas this soil is well suited to contour stripcropping. Incorporating crop residue or other organic matter into the surface layer increases water intake, maintains tilth and fertility, and reduces crusting. Random subsurface drains are used to drain seep spots and the included less well drained soils. In some places subsurface drains are used to lower the seasonal high water table.

In some areas this soil is used as pasture. It is well suited to grasses and legumes for hay and pasture. Maintaining an optimum stand of the desirable species and controlling grazing during wet periods are the main concerns in management. Reseeding with a cover crop or companion crop, mulching, or no-till seeding helps to reduce the risk of erosion.

In some areas this soil is used as woodland. It is well suited to trees and to use as habitat for openland and woodland wildlife. A wide variety of trees common in the area can grow well if competing vegetation is controlled by spraying, mowing, or disking.

This soil is moderately well suited as a site for buildings and poorly suited to septic tank absorption fields because of the seasonal wetness and the slow permeability. Open ditches and subsurface drains are sometimes used near building sites to lower the seasonal high water table. Water moves downslope along the top of the fragipan and can cause wetness around foundations and in basements. Drains at the base of footings can remove the excess water around foundations and basement walls. Coated exterior walls also help prevent wet basements. Building sites and septic tank absorption fields should be landscaped so that surface runoff drains away from the foundation and the absorption field. Perimeter drains around an absorption field help lower the seasonal high water table. Placing the distribution lines of absorption fields across the slope reduces lateral seepage of effluent to the surface. Using artificial drainage and a suitable base material for local roads and streets reduces damage caused by frost action.

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

RsB2—Rittman silt loam, 2 to 6 percent slopes, eroded. This is a deep, gently sloping, moderately well drained soil on short side slopes along drainageways, broad hillsides, and knolls. Erosion has removed part of the original surface layer. The present surface layer is a mixture of the original surface layer and subsoil material. Most areas are irregular in shape and range from about 3 to 20 acres in size.

Typically, the surface layer is brown, friable silt loam about 7 inches thick. The subsoil is about 40 inches thick. The upper part is yellowish brown, firm silty clay loam and dark yellowish brown, firm clay loam; the middle part is a dark yellowish brown, mottled, very firm and brittle clay loam fragipan; and the lower part is dark yellowish brown, mottled, firm clay loam. The substratum to a depth of about 60 inches is dark yellowish brown, very firm clay loam glacial till. In some areas, the soil is well drained and does not have mottles in the upper and middle parts of the subsoil. In a few areas bedrock is between depths of 40 and 60 inches.

Included with this soil in mapping and making up 5 to 15 percent of most areas are small areas of the somewhat poorly drained Wadsworth soils in small drainageways and shallow depressions and on the less sloping or concave part of slopes.

A perched seasonal high water table is between depths of 18 and 36 inches during extended wet periods. Permeability is moderate above the fragipan and slow in the fragipan. The root zone is mainly restricted by the fragipan to a depth of 18 to 32 inches. The available water capacity in this zone is low. Tilth is good. Runoff is medium. Reaction in the subsoil above the fragipan ranges from medium acid to very strongly acid. The content of organic matter is moderately low.

In most areas this soil is used for crops. It is well suited to corn, soybeans, and small grains. A moderate hazard of erosion, surface crusting, and the restricted rooting depth are the main concerns in management. Crop rotations that include meadow crops and winter cover crops help reduce erosion. No-till and other forms of conservation tillage, which leaves crop residue on the surface, stripcropping, and grassed waterways help reduce loss of soil by erosion. Incorporating crop residue or other organic matter in the surface layer increases water infiltration, improves tilth and fertility, and reduces crusting. Random subsurface drains are used in areas of the included soils, which are not so well drained. In some areas subsurface drains are needed to lower the seasonal high water table.

This soil is well suited to grasses and legumes for hay and pasture. Controlling erosion and maintaining an optimum stand of the desirable plant species are the main concerns in management. Reseeding with a cover crop or companion crop, mulching, or no-till seeding helps reduce erosion. Because the available water capacity is low, pasture plants make most of their growth during the early part of the growing season. Proper stocking rates, pasture rotation, timely deferment of grazing, and weed control help keep the pasture and the soil in good condition.

In a few areas this soil is used as woodland. It is well suited to trees and to vegetation that provides food and cover for wildlife. Plant competition can be reduced by spraying, mowing, or disking.

This soil is moderately well suited as a site for buildings and poorly suited to septic tank absorption fields because of the seasonal wetness and the slow permeability. In some areas, open ditches and subsurface drains are used near building sites to lower the seasonal high water table. Water moves downslope along the top of the fragipan and can cause wetness around foundations and in basements. Drains at the base of footings remove the excess water from along foundations and basement walls. Coating the exterior wall also helps prevent wet basements. Building sites and septic tank absorption fields should be landscaped so that surface runoff drains away from the foundation and the absorption field. Perimeter drains around an absorption field help lower the seasonal high water table. Placing the distribution lines of absorption fields across the slope reduces lateral seepage of effluent to the surface. In the construction of local roads and streets, artificial drainage and a suitable base material reduce damage resulting from frost action. Maintaining as much plant cover on the site as possible during construction helps reduce erosion.

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

RsC—Rittman silt loam, 6 to 12 percent slopes. This is a deep, sloping, moderately well drained soil on side slopes of hills and ridges and along drainageways on uplands. The areas generally are long and narrow and range from 3 to 20 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 42 inches thick. The upper part is yellowish brown and dark yellowish brown friable silt loam and firm silty clay loam; the middle part is a dark yellowish brown, very firm and brittle clay loam fragipan; and the lower part is dark yellowish brown, very firm clay loam. The substratum to a depth of about 60 inches is dark yellowish brown, very firm clay loam glacial till. In a few eroded areas the surface layer is lighter in color. In some areas bedrock is between depths of 40 and 60 inches. In some areas the soil is well drained and does not have mottles in the upper and middle parts of the subsoil.

Included with this soil in mapping are small areas of the somewhat poorly drained Wadsworth soils in small drainageways, at the head of drainageways, and on slightly concave slopes. Also included are areas, along drainageways, of soils that have slopes of 15 to 25 percent. The included soils make up 5 to 15 percent of most mapped areas.

A perched seasonal high water table is between depths of 18 and 36 inches during extended wet periods. Permeability is moderate above the fragipan and slow in the fragipan. The root zone is mainly restricted by the fragipan to a depth of 18 to 32 inches. The available water capacity in this zone is low. Tilth is good. Runoff is rapid. Reaction in the subsoil above the fragipan ranges from medium acid to very strongly acid. The content of organic matter is moderate.

In many areas this soil is used for row crops and small grains. It is moderately well suited to corn, soybeans, and small grains. The hazard of erosion and surface crusting are the main concerns in management. No-till and other forms of conservation tillage, which leaves crop residue on the surface, contour stripcropping, meadow crops in the rotation, and grassed waterways help reduce erosion and surface crusting. Regularly applying barnyard manure and other organic material also helps reduce soil erosion and surface crusting and improves water infiltration and fertility. Areas of this soil on side slopes of hills and ridges can be easily adapted to contour stripcropping. Artificial drainage is needed on the included wetter soils.

In some areas the soil is used as pasture and for hay. It is well suited to grasses and legumes for pasture and hay. Erosion is a severe hazard if this soil is plowed for seeding or if the pasture is overgrazed. Reseeding with a cover crop or companion crop, using a mulch, or no-till seeding reduces the hazard of erosion. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the plants and the soil in good condition.

In some areas this soil is used as woodland. It is well suited to trees and to other vegetation that provides food and cover for wildlife. Seedlings grow well if plant competition is controlled by spraying, mowing, or disking.

This soil is moderately well suited as a site for buildings and poorly suited to septic tank absorption fields because of the slope, seasonal wetness, and the slow permeability. Water moves downslope along the top of the fragipan and can cause wetness in basements and around foundations. Drains at the base of footings and exterior coating on basement walls help prevent wet basements. Buildings can be designed to conform to the natural slope of the land. Effluent from a septic tank absorption field can seep along the top of the fragipan and reach the surface downslope. Placing distribution lines across the slope reduces seepage to the surface. Perimeter drains around the absorption field help lower the seasonal high water table. Intercepting surface runoff from higher adjacent soils by diversions or surface drains helps reduce the seasonal wetness and erosion. Keeping as much plant cover as possible on the surface during construction also reduces soil loss by erosion. In constructing local roads and streets, artificial drainage and the use of a suitable base material help reduce damage resulting from frost action.

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

RsC2—Rittman silt loam, 6 to 12 percent slopes, eroded. This is a deep, sloping, moderately well drained soil on side slopes of hills and along drainageways on uplands. Erosion has removed part of the original surface layer, and the present surface layer is a mixture of the original surface layer and the subsoil material. The areas generally are long and narrow and range from 3 to 20 acres in size.

Typically, the surface layer is brown, friable silt loam about 7 inches thick. The subsoil is about 40 inches thick. The upper part is yellowish brown and dark yellowish brown, firm silty clay loam and clay loam. The middle part is a dark yellowish brown, mottled, very firm and brittle clay loam fragipan, and the lower part is dark yellowish brown, mottled, firm clay loam. The substratum to a depth of about 60 inches is dark yellowish brown, firm clay loam glacial till. In some areas, the soil is well drained and does not have mottles in the upper and middle parts of the subsoil. In a few areas, bedrock is between depths of 40 and 60 inches.

Included with this soil in mapping and making up 5 to 10 percent of most areas are small areas of the somewhat poorly drained Wadsworth soils in small drainageways, at the head of drainageways, and in some slightly concave areas.

A perched seasonal high water table is between depths of 18 and 36 inches during extended wet periods. Permeability is moderate above the fragipan and slow in the fragipan. The root zone is mainly restricted by the fragipan to a depth of 18 to 32 inches. The available water capacity in this zone is low. Tilth is good. Runoff is rapid. Reaction in the subsoil above the fragipan ranges from medium acid to very strongly acid. The content of organic matter is moderately low.

This soil is used for row crops and small grains. It is moderately well suited to corn and small grains and poorly suited to soybeans. Controlling erosion, especially in areas where soybeans are grown, and reducing crusting are the main concerns in management. Erosion is a severe hazard. No-till and other forms of conservation tillage, which leaves crop residue on the surface, contour stripcropping, winter cover crops, and grassed waterways help reduce erosion. Crop rotations that have a high percentage of hay and pasture and regular applications of barnyard manure and other organic material also reduce erosion and surface crusting. Areas of this soil on side slopes of hills can be easily adapted to contour stripcropping. Artificial drainage may be needed in areas of the included less well drained soils.

In some areas this soil is used for pasture and hay. It is well suited to grasses and legumes for pasture and hay. If the soil is plowed for seeding or the pasture is overgrazed, erosion is a severe hazard. Reseeding with a cover crop or companion crop, using a mulch, or no-till seeding reduces the hazard of erosion. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the plants and the soil in good condition.

In some areas this soil is used as woodland. It is well suited to trees and to vegetation that provides food and cover for wildlife. Seedlings grow well if plant competition is controlled by spraying, mowing, or disking.

This soil is moderately well suited as a site for buildings and poorly suited to septic tank absorption fields because of the slope, seasonal wetness, and the slow permeability. Water moves downslope along the top of the fragipan and can cause wetness in basements and around foundations. Drains at the base of footings and exterior coating on basement walls help prevent wet basements. Buildings should be designed to conform to the natural slope of the land. Effluent from septic tank absorption fields can seep along the top of the fragipan and come to the surface downslope. Placing distribution lines across the slope reduces seepage to the surface. Perimeter drains around the absorption field help lower the seasonal high water table. Intercepting surface runoff from higher adjacent soils by diversions or surface drains helps reduce the seasonal wetness and erosion. Keeping as much plant cover as possible on the surface during construction also reduces soil loss by erosion. In the construction of local roads and streets, artificial drainage and the use of a suitable road base material reduce damage caused by frost action.

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

RsD2—Rittman silt loam, 12 to 18 percent slopes, eroded. This is a deep, moderately steep, moderately well drained soil on hillsides and along drainageways on uplands. Erosion has removed part of the original surface layer. The present surface layer is a mixture of the original surface layer and the subsoil material. This soil generally has short slopes that are less than 125 feet in length. The areas generally are long and narrow and range from 3 to 20 acres in size.

Typically, the surface layer is brown, friable silt loam about 6 inches thick. The subsoil is about 38 inches thick. The upper part is yellowish brown and dark yellowish brown, firm silty clay loam and clay loam; the middle part is a dark yellowish brown, mottled, very firm and brittle clay loam fragipan; and the lower part is dark brown, mottled, firm clay loam. The substratum to a depth of about 60 inches is dark yellowish brown, firm clay loam glacial till. In some eroded areas that are in woods or pasture, the surface layer is darker. In some areas the soil is well drained and does not have mottles in the upper and middle parts of the subsoil. In a few areas bedrock is between depths of 40 and 60 inches.

Included with this soil in mapping and making up 5 to 15 percent of many areas are small areas of the somewhat poorly drained Wadsworth and Orrville soils. Wadsworth soils are in slightly concave areas, on the lower part of some slopes, and around springs and seeps. Orrville soils are on narrow flood plains.

A perched seasonal high water table is between depths of 18 and 36 inches during extended wet periods. Permeability is moderate above the fragipan and slow in the fragipan. The root zone is mainly restricted by the fragipan to a depth of 18 to 32 inches. The available water capacity in this zone is low. Tilth is good. Reaction in the subsoil above the fragipan ranges from medium acid to very strongly acid. The content of organic matter is moderately low.

In some areas this soil is used for crops. It is poorly suited to continuous crops of corn and small grains and generally is not suited to continuous crops of soybeans. It is moderately well suited to corn and small grains grown in a rotation with meadow crops. The slope and the very severe hazard of erosion are the main concerns in management. Stripcropping can be used in some areas, but most areas along drainageways are not suited to this practice because the slopes are too short. This soil is well suited to no-till and conservation tillage, which leaves crop residue on the surface. Grassed waterways are used in natural drainageways to reduce gullying.

In many areas this soil is used as pasture. It is moderately well suited to grasses and legumes for pasture and hay. If the soil is plowed to prepare a seedbed or the pasture is overgrazed, erosion is a severe hazard. Reseeding with a cover crop or companion crop, using a mulch, or no-till seeding reduces the hazard of erosion. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the soil and the plants in good condition.

In many areas this soil is used as woodland. It is well suited to trees and to use as habitat for woodland wildlife. However, further erosion is a hazard if this soil is disturbed, and special care is needed when trees are harvested. Locating logging roads and skid trails on the contour reduces soil loss by erosion. Seeding disturbed areas with a quick-growing cover crop also helps reduce erosion.

This soil is poorly suited as a site for buildings and generally is not suited to septic tank absorption fields because of the slope, seasonal wetness, and the slow permeability. Buildings should be designed to conform to the natural shape of the land. Drains at the base of footings and exterior coating on basement walls help prevent wet basements. Local roads and streets should be placed on the contour wherever possible. In constructing local roads and streets, artificial drainage and the use of a suitable base material can reduce damage caused by frost action. Maintaining a plant cover on the construction site and using other water control practices help reduce erosion.

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

RtB—Rittman-Urban land complex, 2 to 6 percent slopes. This complex consists of deep, gently sloping, moderately well drained Rittman soil and areas of Urban land on complex slopes on uplands. Most areas are about 65 percent Rittman silt loam and 25 percent Urban land. The areas of Rittman soil and of Urban land are so intricately mixed or so small in size that it was not practical to separate them in mapping. Most areas of this complex range from 10 to 100 acres in size.

Typically, the Rittman soil has a dark grayish brown, friable silt loam surface layer about 8 inches thick. The subsoil is about 44 inches thick. The upper part is yellowish brown, friable silt loam and dark yellowish brown, firm silty clay loam that has mottles below a depth of about 13 inches; the middle part is a dark yellowish brown, very firm and brittle clay loam fragipan; and the lower part is dark yellowish brown, very firm clay loam glacial till. The substratum to a depth of about 60 inches is dark yellowish brown, very firm clay loam. In some areas the slopes are 8 to 15 percent. In a few areas, bedrock is at a depth between 40 and 60 inches. In some places the soil has been radically altered. Some low areas have been filled or leveled during construction, and other small areas have been cut, built up, or smoothed.

The Urban land part of the complex is covered by buildings, streets, parking lots, driveways, and other structures that obscure or alter the soils, making identification of the soils not feasible.

Included with this complex in mapping and making up about 10 percent of most areas are small areas of somewhat poorly drained Wadsworth soils in the lower positions in drainageways and in slightly concave areas.

In the Rittman soil, a perched seasonal high water table is between depths of 18 and 36 inches during extended wet periods. Permeability is moderate above the fragipan and slow in the fragipan. The root zone is restricted by the fragipan, which is at a depth of 18 to 32 inches. The available water capacity in this zone is low. Tilth is good. Runoff is medium. Reaction in the subsoil above the fragipan ranges from medium acid to very strongly acid. The content of organic matter is moderate.

The Rittman soil is in the parks, open spaces, lawns, and gardens. It is well suited to gardens, lawns, shrubs, and trees; however, the rooting depth of shrubs and trees is restricted by the fragipan. Artificial drainage can lower the seasonal high water table. The best way to drain a particular site should be determined by onsite investigation. Soil erosion generally is not a major problem unless the plant cover is removed and the soil is left bare for a considerable time. In some areas the soil has been radically altered and is not so well suited to lawns and gardens. The exposed subsoil material in these areas has very poor tilth. It is sticky when wet and hard when dry.

The Rittman soil is moderately well suited as a site for buildings and poorly suited to septic tank absorption fields because of its seasonal wetness and slow permeability. In some places, open ditches and subsurface drains are used near building sites to lower the seasonal high water table. Water moves downslope along the top of the fragipan and can cause wetness around foundations and in basements. Drains at the base of footings help remove excess water around foundations and basement walls. Exterior coating on walls also helps prevent wet basements. Building sites and septic tank absorption fields should be landscaped so that surface runoff drains away from foundations and absorption fields. Perimeter drains around a septic tank absorption field help lower the seasonal high water table. Placing the distribution lines of absorption fields across the slope reduces lateral seepage of effluent to the surface. Wherever possible, sanitary facilities should be connected to central sewers and treatment facilities. In constructing local roads and streets, artificial drainage and the use of suitable base material reduce damage caused by frost action.

The Rittman soil is in capability subclass IIe. It is not assigned to a woodland suitability subclass.

Sb—Sebring silt loam. This is a deep, nearly level, poorly drained soil on flats and in depressions on glacial lake plains. The slope is 0 to 2 percent. This soil is subject to ponding by runoff from surrounding higher lying soils. The areas generally are irregular in shape and range from about 3 to 60 acres in size.

Typically, the surface layer is dark gray, friable silt loam about 8 inches thick. The subsurface layer is dark grayish brown, mottled, friable silt loam about 4 inches thick. The subsoil is gray and yellowish brown, mottled, friable and firm silt loam and silty clay loam about 26 inches thick. The substratum to a depth of about 60 inches is yellowish brown, gray and olive brown, firm silty clay loam and very friable very fine sandy loam. In places the surface layer is very dark grayish brown or very dark gray, and in some areas it is silty clay loam. In a few places glacial till is at a depth of 50 to 60 inches.

Included with this soil in mapping and making up 5 to 15 percent of most areas are small areas of the somewhat poorly drained Fitchville soils on slight rises.

An apparent seasonal high water table is near or above the soil surface during extended wet periods. Permeability is moderately slow, and the root zone is deep. The available water capacity is high, and tilth is good. Runoff is very slow or is ponded. Reaction in the subsoil ranges from very strongly acid to medium acid in the upper part and from medium acid to neutral in the lower part. The content of organic matter is moderate.

This soil is used for crops. This soil is moderately well suited to corn and soybeans where it is adequately drained. It is poorly suited to small grains because these crops are easily damaged by ponding. Surface and subsurface drains are used in most areas to improve drainage. However, in many areas, good natural outlets for subsurface drains are not available. In some places diversions and waterways can intercept surface runoff from adjacent higher lying soils and thus reduce ponding.

In some areas this soil is used as pasture. It is well suited to water-tolerant grasses and legumes for hay and pasture. However, pastures on this soil should not be grazed early in spring. Grazing when the soil is wet and soft causes compaction and poor tilth and damages the plants. Artificial drainage is needed for deep-rooted legumes such as alfalfa to grow well.

In some undrained areas this soil is used as woodland. It is well suited to woodland and well suited to use as habitat for wetland wildlife. Wetness limits the use of equipment for planting and harvesting trees. Planting and logging can be done during the drier part of the year. Tree species that are tolerant of wetness should be selected for planting.

This soil generally is not suitable as a site for buildings and for septic tank absorption fields because of ponding and the moderately slow permeability. Artificial drainage and the use of suitable base material for local roads can reduce damage resulting from ponding, frost action, and low soil strength. Some areas are suited to aquifer-fed excavated ponds.

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

Tg—Tioga silt loam, occasionally flooded. This is a deep, nearly level, well drained soil on flood plains. It is occasionally flooded by overflow from the adjacent streams. The slope is 0 to 2 percent. The areas generally are long and narrow or irregular in shape and range from 5 to 200 acres in size.

Typically, the surface layer is dark grayish brown and dark brown, friable silt loam about 9 inches thick. The subsoil is about 39 inches thick. It is yellowish brown and dark yellowish brown, friable loam and is mottled below a depth of about 34 inches. The substratum to a depth of about 60 inches is yellowish brown and dark grayish brown, mottled, firm, stratified silt loam and fine sandy loam. In some areas the surface layer is loam or sandy loam. In a few areas the subsoil has more clay.

The seasonal high water table is between depths of 36 and 72 inches during extended wet periods. Permeability is moderate or moderately rapid. The root zone is deep. The available water capacity is moderate, and tilth is good. Runoff is slow. The subsoil is medium acid to neutral. The content of organic matter is moderate.

This soil is used mainly for crops. It is well suited to corn and soybeans. Flooding is the main concern in management. Winter and spring floods damage small grains. Flooding is less common during the growing season, and corn and soybeans generally tolerate brief flooding. This soil drains faster after a flood and can be tilled earlier than other soils on bottom lands.

In a few areas this soil is used as pasture. Some areas that are dissected by meander channels or are covered by flood debris are used as pasture. This soil is well suited to grasses and legumes for hay and pasture. The pastures can be grazed early in spring. However, sediment left by floodwater can make the crop unfit for hay.

In a few areas this soil is used as woodland. Some of these areas are in narrow stream valleys or are irregular in shape. This soil is well suited to trees and to use as habitat for openland and woodland wildlife. Plant competition can be controlled by spraying, mowing, or disking. Only those species able to withstand flooding should be selected for planting.

The hazard of flooding makes this soil generally unsuitable as a site for buildings and for septic tank absorption fields. Diking to control flooding is difficult. Elevating roads on fill above the normal flood level helps reduce damage. Fill for roads should not block the flow of floodwater. This soil is a good source of topsoil.

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

TrA—Tiro silt loam, 0 to 2 percent slopes. This is a deep, nearly level, somewhat poorly drained soil on flats that have a few shallow depressions and very low knolls. The areas generally are irregular in shape and range from 3 to 400 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 32 inches thick. The upper and middle parts are grayish brown and yellowish brown, mottled, friable silt loam, and the lower part is dark yellowish brown, mottled, friable gravelly loam. The substratum to a depth of about 60 inches is dark yellowish brown, mottled, firm loam. In some areas the upper part of the subsoil has more sand and clay.

Included with this soil in mapping are small areas of the poorly drained Condit and Sebring soils in shallow depressions and small drainageways. Also included are Bennington soils, which have more clay in the subsoil, on some low knolls. The included soils make up 5 to 20 percent of most areas.

A perched seasonal high water table is between depths of 12 and 30 inches during extended wet periods. Permeability is moderate in the subsoil and slow or moderately slow in the substratum. Root growth is mainly restricted to the moderately deep or deep zone above the compact glacial till. The available water capacity is moderate or high, and tilth is good. Runoff is slow. Reaction in the subsoil ranges from very strongly acid to medium acid in the upper part and from medium acid to mildly alkaline in the lower part. The content of organic matter is moderate.

This soil is used for crops. It is well suited to corn, soybeans, and small grains. Wetness and crusting are concerns in management. Subsurface drains are commonly used to lower the seasonal high water table. However, some areas do not have good drainage outlets. Returning crop residue to the soil, planting winter cover crops, and regularly adding other organic material improve fertility and tilth, reduce crusting, and increase the infiltration of water.

In some areas this soil is used as pasture. It is well suited to grasses and legumes for hay and pasture. In undrained areas it is better suited to grasses than to deep-rooted legumes. Maintaining an optimum stand of the desirable plant species and controlling grazing during wet periods are the main concerns in management. Controlled grazing helps prevent soil compaction. Subsurface drains are needed for deep-rooted legumes, such as alfalfa.

In some areas this soil is used as woodland. Trees that are tolerant of some wetness grow well if competing vegetation is controlled by spraying, mowing, or disking.

This soil is poorly suited as a site for buildings and to septic tank absorption fields because of the seasonal wetness and the slow or moderately slow permeability. Building sites should be landscaped so that surface runoff drains away from foundations. Drains at the base of footings and other subsurface drains can remove the excess water around foundations and lower the seasonal high water table. Exterior coating on basement walls also helps prevent wet basements. Enlarging septic tank absorption fields increases the absorption of effluent. Perimeter drains around an absorption field help lower the seasonal high water table. Diversions help convey runoff from higher adjacent soils away from septic tank absorption fields and building sites. Artificial drainage and the use of a suitable base material for local roads and streets help reduce damage resulting from frost action and low soil strength.

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

Ud—Udorthents, loamy. These soils are in areas that have been cut or filled. They are mainly in construction areas and small pits from which material other than gravel or bedrock has been removed. The slope ranges from 0 to 12 percent. The areas are mainly irregular in shape and range from 5 to 100 acres in size.

In areas where soil material has been removed, the remaining material typically is similar to the subsoil or substratum of adjacent soils. In fill or disposal areas, the characteristics of the soil material are more varied; this soil material generally originated as the subsoil and substratum of nearby soils.

Typically, the upper 60 inches is silty clay loam, clay loam, silt loam, or loam. The available water capacity varies, but it is dominantly low or very low in the root zone. Permeability generally is slow. Tilth is poor. Where there is little or no plant cover, hard rains tend to seal the surface. This sealing or crusting slows the infiltration of water and inhibits the emergence and growth of seedlings. A seasonal high water table is evident in some areas, particularly in graded areas that are depressed or bowl-shaped. The root zone ranges from very strongly acid to neutral.

Erosion on cut slopes and filled banks is the major problem in soil management in most areas of this map unit. Crownvetch and grass are commonly planted to control erosion. In some areas, surface and subsurface drains and sediment basins are needed to control runoff.

The suitability of these soils for building site development and sanitary facilities varies considerably. Onsite investigation is needed to determine hazards or limitations for any proposed use.

This map unit was not assigned to a capability class or to a woodland suitability subclass.

WaA—Wadsworth silt loam, 0 to 2 percent slopes. This is a deep, nearly level, somewhat poorly drained soil on broad flats that have a few shallow depressions and low knolls on uplands. The areas generally are irregular in shape and range from 5 to 200 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 11 inches thick. The subsoil is about 43 inches thick. The upper part is yellowish brown and grayish brown, mottled, friable silty clay loam, and the lower part is a dark yellowish brown and dark brown, mottled, very firm and brittle clay loam fragipan. The substratum to a depth of about 60 inches is dark yellowish brown, firm loam. In some places the substratum has more silt and less sand and coarse fragments.

Included with this soil in mapping are small areas of the poorly drained Sebring soils in depressions and at the head of small waterways and Fitchville soils at the edge of mapped areas. The included soils make up 5 to 15 percent of most areas.

A perched seasonal high water table is between depths of 12 and 24 inches during extended wet periods. Permeability is moderate or moderately slow above the fragipan and slow or very slow in the fragipan. The root zone is mainly restricted by the fragipan at a depth of 18 to 30 inches. The available water capacity in this zone is low. Tilth is good. Runoff is slow. Reaction in the subsoil above the fragipan ranges from extremely acid to medium acid. The content of organic matter is moderate.

This soil is used for crops. This soil is well suited to corn, soybeans, and small grains if it is adequately drained. Wetness, the restricted rooting depth, and surface crusting are management concerns. This soil is difficult to drain. Subsurface drains are generally needed to lower the seasonal high water table; however, outlets are difficult to install in some areas. For good drainage, subsurface drains must be more closely spaced than in most of the other soils in the county. Surface drainage is also needed in some places. In many places, diversions that intercept runoff from higher adjacent soils can be installed to reduce wetness. Maintaining fertility and the content of organic matter is also important. Returning crop residue to the soil, planting winter cover crops, and regularly adding other organic material improve fertility, reduce surface crusting, and increase the infiltration of water.

In some areas this soil is used as pasture. It is well suited to grasses and legumes for hay and pasture. Maintaining an optimum stand of the desirable plant species and controlling grazing during wet periods are the main management concerns. Grazing during wet periods should be avoided to reduce compaction. Most pastures have little or no artificial drainage. In undrained areas this soil is better suited to grasses than to deep-rooted legumes. Subsurface drainage is needed for deep-rooted legumes, such as alfalfa.

In some areas this soil is used as woodland. It is well suited to trees and to use as habitat for woodland and openland wildlife. Trees that are tolerant of some wetness and of a root-restricting layer in the subsoil grow well if competing plant growth is controlled by mowing, spraying, or disking.

This soil is poorly suited as a site for buildings and septic tank absorption fields because of seasonal wetness and the slow or very slow permeability in the fragipan. Building sites should be landscaped so that surface runoff drains away from the foundation. Drains at the base of footings and other subsurface drains can remove the excess water around the foundation and lower the seasonal high water table. Coating the exterior basement walls helps prevent a wet basement. Enlarging the septic tank absorption field increases the absorption capacity. Perimeter drains around an absorption field help lower the seasonal high water table. Diversions intercept runoff from higher adjacent soils and divert it from septic tank absorption fields and building sites. Artificial drainage and the use of a suitable base material for local roads and streets help reduce damage caused by frost action.

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

WaB—Wadsworth silt loam, 2 to 6 percent slopes. This is a deep, gently sloping, somewhat poorly drained soil at the head of drainageways and on low convex knolls and ridges on uplands. The areas generally are irregular in shape and range from 5 to 200 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 11 inches thick. The subsoil is about 41 inches thick. The upper part is yellowish brown, mottled, friable and firm silty clay loam; the middle part is a dark brown, mottled, very firm and brittle clay loam fragipan; and the lower part is dark yellowish brown, mottled, firm clay loam. The substratum to a depth of about 60 inches is dark yellowish brown, firm loam. In some places the soil has more silt, less sand, and fewer coarse fragments in the subsoil and the substratum or in the substratum alone.

Included with this soil in mapping are small areas of the moderately well drained Rittman soils on the crest of knolls and in some slightly steeper areas and the poorly drained Sebring soils in drainageways and depressions and along the edge of mapped areas. The included soils make up 5 to 15 percent of most areas.

A perched seasonal high water table is between depths of 12 and 24 inches during extended wet periods. Permeability is moderate or moderately slow above the fragipan and slow or very slow in the fragipan. The root zone is mainly restricted by the fragipan at a depth of 18 to 30 inches. The available water capacity in this zone is low. Tilth is good. Runoff is medium. Reaction in the subsoil above the fragipan ranges from extremely acid to medium acid. The content of organic matter is moderate.

This soil is used for crops. It is well suited to corn, soybeans, and small grains. The hazard of erosion, wetness, the restricted rooting depth, and surface crusting are concerns in management. Conservation tillage, which leaves crop residue on the surface, contour stripcropping where practical, contour tillage, rotations that include grasses and legumes, and grassed waterways help reduce erosion. Subsurface drains can lower the seasonal high water table. This soil is difficult to drain. For good drainage, subsurface drains must be more closely spaced than in most other soils in the county. Returning crop residue to the soil, planting winter cover crops, and regularly adding other organic material improve fertility, reduce surface crusting and erosion, and increase the infiltration of water.

In some areas this soil is used as pasture. It is well suited to grasses and legumes for hay and pasture. Control of erosion, maintenance of an optimum stand of the desirable plant species, and controlled grazing during wet periods are the main concerns in management. A companion crop or cover crop or no-till seeding reduces erosion. Grazing should be avoided during wet periods to reduce compaction. In undrained areas, this soil is better suited to grasses than to deep-rooted legumes. Subsurface drainage is needed for deep-rooted legumes.

In some areas this soil is used as woodland. It is well suited to trees and to use as habitat for woodland and openland wildlife. Trees that are tolerant of some wetness and of a root-restricting layer in the subsoil grow well if competing plant growth is controlled by mowing, disking, or spraying.

This soil is poorly suited as a site for buildings and septic tank absorption fields because of the seasonal wetness and the slow or very slow permeability in the fragipan. Building sites should be landscaped so that surface runoff drains away from the foundation. Drains at the base of footings and other subsurface drains can remove the excess water around foundations and lower the seasonal high water table. Exterior coating on basement walls also helps prevent wet basements. Enlarging the septic tank absorption field increases the absorption capacity. Perimeter drains around an absorption field help lower the seasonal high water table. Diversions intercept runoff from higher adjacent soils and divert it from septic tank absorption fields and building sites. Artificial drainage and the use of a suitable base material for local roads and streets help reduce damage caused by frost action. Maintaining a plant cover and using other water control practices during construction reduce erosion.

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

Wc—Wallkill silt loam. This is a level, very poorly drained soil in small, closed depressions on uplands and on flats on flood plains. It is subject to frequent flooding. The slope is less than 2 percent. The areas generally are circular or oval and range from 3 to 15 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 10 inches thick. The subsoil is grayish brown, mottled, friable silt loam about 10 inches thick. The next layer is a buried surface layer of black and grayish brown, mottled, friable silt loam about 4 inches thick over a black and very dark grayish brown, friable and firm muck layer about 28 inches thick. The substratum to a depth of about 60 inches is greenish gray, firm silt loam. In some places the layers of mineral material in the upper part of the soil are thin or are not present. Many areas on uplands are ponded and are not frequently flooded.

Included with this soil in mapping are small areas of the poorly drained Melvin soils on flood plains. Also included are small areas of soils that have a clayey substratum that has slow or very slow permeability. The included soils make up about 15 percent of most areas.

A seasonal high water table is near the surface for much of the year. Permeability is moderate above the muck layer and moderately rapid or rapid in the organic material. The root zone is deep. The available water capacity is very high, and tilth is good. Runoff is very slow. Reaction is strongly acid to neutral in the root zone. The content of organic matter is moderate or high.

In drained areas, this soil is used for crops. If drained, it is moderately well suited to corn and soybeans. Flooding and prolonged wetness are the main concerns in management. This soil generally is not suited to small grains. Flooding is difficult to control. Surface ditches and subsurface drains commonly are needed to drain this soil for crops. In some areas it is difficult or impractical to install outlets for drainage systems. The organic material subsides when it is drained; consequently, subsurface drains may lose grade and become ineffective. Ditchbanks are unstable where the organic layer is thick. Seedbed preparation and planting generally are delayed by flooding and wetness. Tilling this soil when it is wet destroys tilth. The surface layer crusts after hard rains.

In a few areas this soil is used as pasture in summer. This soil is moderately well suited to water-tolerant grasses for hay and pasture. Floodwaters leave sediment on the grasses, however, and in many places the crop is unfit for hay. Timing of grazing on this soil is critical. Overgrazing or grazing when the soil is wet and soft causes surface compaction and poor tilth and reduces air and water movement in the soil. Proper stocking rates and timely deferment of grazing during wet periods help keep the pasture and the soil in good condition.

This soil is poorly suited to use as woodland because of wetness. It is suited to use as habitat for wetland wildlife. Tree species that are tolerant of prolonged wetness should be selected for planting to reduce seedling mortality. Windthrow can be reduced by planting deep-rooted species. In undrained areas this soil is in water-tolerant plants and is used as habitat for wetland wildlife.

This soil is not suitable as a site for buildings or septic tank absorption fields because of flooding, wetness, and low strength.

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

WuB—Wooster-Riddles silt loams, 2 to 6 percent slopes. This map unit consists of deep, gently sloping, well drained soils in slightly convex areas on uplands. The areas generally are about 45 percent Wooster silt loam and 45 percent Riddles silt loam. The pattern and position of the soils and the relative proportion of each in the mapped areas are random and unpredictable. It was not practical to separate the soils in mapping. The areas are mainly irregular in shape and range from 5 to 200 acres in size.

Typically, the Wooster soil has a dark grayish brown, friable silt loam surface layer about 6 inches thick. The subsurface layer is light yellowish brown, friable silt loam about 4 inches thick. The subsoil is about 48 inches thick. The upper part is yellowish brown, friable and firm silt loam and loam and has mottles below a depth of about 21 inches; the lower part is a yellowish brown, very firm and brittle gravelly loam fragipan. The substratum to a depth of about 60 inches is yellowish brown, firm gravelly loam glacial till. In some areas the surface layer is loam. In a few areas there is more sand in the subsoil. In a few areas bedrock is between depths of 40 and 60 inches. In some areas the soil is only moderately well drained, and it has gray mottles above the fragipan.

Typically, the Riddles soil has a dark brown, friable silt loam surface layer about 8 inches thick. The subsoil is about 48 inches thick. The upper part is dark yellowish brown, friable silt loam, and the middle and lower parts are yellowish brown and dark yellowish brown, firm loam and clay loam. The substratum to a depth of about 60 inches is olive brown, firm loam glacial till. In some areas the surface layer is loam, and in a few areas there is more sand in the subsoil. In a few areas bedrock is between depths of 40 and 60 inches.

Included with these soils in mapping and making up about 10 percent of most areas are small areas of the moderately deep Loudonville soils, which are mainly in higher positions than the Wooster and Riddles soils.

A seasonal high water table is at a depth of 48 to 72 inches in the Wooster soil. Permeability is moderately slow in the Wooster soil and moderate in the Riddles soil. The root zone in the Wooster soil is restricted to the moderately deep zone above the fragipan; it is deep in the Riddles soil. The available water capacity is low in the Wooster soil and moderate or high in the Riddles soil. Both soils have good tilth, and runoff is medium. The subsoil of the Wooster soil is very strongly acid to medium acid, and that of the Riddles soil is strongly acid or medium acid. The content of organic matter is moderate in both soils.

These soils are used for crops. They are well suited to corn, soybeans, and small grains as well as to specialty crops, such as potatoes and orchard fruits (fig. 7). Control of erosion and reducing surface crusting are the main concerns in management. Conservation tillage, which leaves crop residue on the surface, contour tillage, contour stripcropping, and grassed waterways help reduce erosion. These soils are well suited to no-till. Returning crop residue to the soil, planting cover crops, and applying barnyard manure improve fertility, reduce crusting and erosion, and increase the infiltration of water. Random subsurface drains are needed in some slightly wetter areas.

In some areas these soils are used for hay and pasture. They are well suited to these uses. Most pastures are in a rotation with cultivated crops. Pastures on these soils can be grazed early in spring.

In some areas these soils are used as woodland. They are well suited to trees. Trees grow well if competing vegetation is controlled by mowing, shallow tillage, spraying, or cutting.

These soils are well suited as a site for buildings; however, because of its slight seasonal wetness, the Wooster soil is not so well suited to this use as the Riddles soil. On the Wooster soil, drains at the base of footings and exterior coating on basement walls of buildings help prevent wet basements. On the Riddles soil, backfilling around the foundation with material that has a low shrink-swell potential reduces damage from the shrinking and swelling of the soil. Using a suitable base material for local roads and streets reduces

Figure 7.—Oats have been harvested on this field in an area of Wooster-Riddles silt loams, 2 to 6 percent slopes.

damage resulting from frost action and low soil strength. The Wooster soil is moderately well suited to use as a site for septic tank absorption fields, and the Riddles soil is well suited. Because the Riddles soil is more permeable than the Wooster soil, septic tank absorption fields should be located on the Riddles soil wherever possible. Enlarging the absorption field increases the absorption of effluent.

These soils are in capability subclass IIe and in woodland suitability subclass 1o.

WuC—Wooster-Riddles silt loams, 6 to 12 percent slopes. This map unit consists of deep, sloping, well drained soils on side slopes of ridges and along drainageways on uplands. The areas generally are about 45 percent Wooster silt loam and 45 percent Riddles silt loam. The pattern and position of the soils and the relative proportion of each in the mapped areas are random and unpredictable. It was not practical to separate the soils in mapping. The areas are mainly long and narrow and range in size from about 3 to 300 acres.

Typically, the Wooster soil has a dark grayish brown, friable silt loam surface layer about 10 inches thick. The subsoil is about 48 inches thick. The upper part is yellowish brown, friable and firm silt loam and loam, and the lower part is a yellowish brown, very firm and brittle gravelly loam fragipan. The substratum to a depth of about 60 inches is yellowish brown, firm loam glacial till. In some areas the surface layer is loam, and in a few areas the subsoil has more sand. In a few areas bedrock is between depths of 40 and 60 inches. In some areas the soil is moderately well drained and has gray mottles above the fragipan.

Typically, the Riddles soil has a dark brown, friable silt loam surface layer about 8 inches thick. The subsoil is about 46 inches thick. The upper part is dark yellowish brown, friable silt loam, and the middle and lower parts are yellowish brown and dark yellowish brown, firm loam and clay loam. The substratum to a depth of about 60 inches is olive brown, firm loam glacial till. In some areas the surface layer is loam, and in a few areas the subsoil has more sand. In a few areas bedrock is between depths of 40 and 60 inches.

Included with these soils in mapping are small areas of the more droughty Chili soils near outwash plains and stream terraces. Also included are small areas of the moderately deep Loudonville soils on shoulder slopes. The included soils make up about 10 percent of most areas.

A seasonal high water table is at a depth of 48 to 72 inches in the Wooster soil. Permeability is moderately slow in the Wooster soil and moderate in the Riddles soil. The root zone in the Wooster soil is restricted to the moderately deep zone above the fragipan; it is deep in the Riddles soil. The available water capacity is low in the Wooster soil and moderate or high in the Riddles soil. Both soils have good tilth, and runoff is rapid. The subsoil of the Wooster soil is very strongly acid to medium acid, and that of the Riddles soil is strongly acid or medium acid. The content of organic matter is moderate in both soils.

These soils are used for farming. They are moderately well suited to corn, small grains, and soybeans. Control of erosion and reducing surface crusting are the main concerns in management. These soils are well suited to no-till and other forms of conservation tillage, which leave crop residue on the surface; contour tillage, stripcropping, and grassed waterways also help reduce erosion. Returning crop residue to the soil, planting cover crops, and applying barnyard manure improve fertility, reduce crusting, and increase infiltration. Random subsurface drains are needed in some slightly wetter areas.

These soils are well suited to grasses and legumes for hay and pasture. Most pastures are in a rotation with cultivated crops. Pastures on these soils can be grazed early in spring. Using no-till seeding and maintaining a vigorous stand of the desirable pasture plants help control erosion.

In some areas these soils are used as woodland. They are well suited to trees. Trees grow well if competing plant growth is controlled by spraying, mowing, or disking.

These soils are moderately well suited as a site for buildings and to septic tank absorption fields; the slope limits these uses. The slight seasonal wetness and moderately slow permeability of the Wooster soil and the moderate shrink-swell potential of the Riddles soil are also limitations. Buildings should be designed to conform to the natural slope of the land. On the Wooster soil, drains at the base of footings and exterior coating on basement walls of buildings help prevent wet basements. On the Riddles soil, backfilling around the foundation with material that has a low shrink-swell potential reduces damage caused by the shrinking and swelling of the soil. Using a suitable base material for local roads and streets reduces damage resulting from frost action and low soil strength. Because the Riddles soil is more permeable than the Wooster soil, septic tank absorption fields should be located on the Riddles soil wherever possible. Enlarging an absorption field increases the absorption of effluent. Maintaining a plant cover and using other water control practices during construction reduce erosion.

These soils are in capability subclass IIIe and in woodland suitability subclass 1o.

WuC2—Wooster-Riddles silt loams, 6 to 12 percent slopes, eroded. This map unit consists of deep, sloping, well drained soils on side slopes of ridges and along drainageways on uplands. On both soils, erosion has removed part of the original surface layer. The present surface layer is a mixture of the original surface layer and the subsoil material. The areas generally are about 45 percent Wooster silt loam and 45 percent Riddles silt loam. The pattern and position of the soils and the relative proportion of each in the mapped areas are random and unpredictable. It was not practical to separate the soils in mapping. The areas are mainly long and narrow and range in size from 3 to 75 acres.

Typically, the Wooster soil has a dark brown, friable silt loam surface layer about 9 inches thick. The subsoil is about 45 inches thick. The upper part is brown and yellowish brown, firm silt loam and loam; the middle part is an olive brown, very firm and brittle loam fragipan; and the lower part is yellowish brown, firm loam. The substratum to a depth of about 60 inches is dark brown, firm loam glacial till. In some areas the surface layer is loam, gravelly silt loam, or gravelly loam. In some areas the subsoil and substratum have more sand. In a few areas bedrock is between depths of 40 and 60 inches. In some areas the soil is only moderately well drained, and it has gray mottles above the fragipan.

Typically, the Riddles soil has a dark brown, friable silt loam surface layer about 8 inches thick. The subsoil is about 48 inches thick. The upper part is dark yellowish brown, friable silt loam, and the middle and lower parts are yellowish brown and dark yellowish brown, firm loam and clay loam. The substratum to a depth of about 60 inches is olive brown, firm loam glacial till. In some areas the surface layer is loam, gravelly silt loam, or gravelly loam, and in some areas the subsoil has more sand. In a few areas bedrock is between depths of 40 and 60 inches.

Included with these soils in mapping are small areas of the more droughty Chili soils near outwash plains and stream terraces. Also included are small areas of the moderately deep Loudonville soils on shoulder slopes. The included soils make up about 10 percent of most areas.

A seasonal high water table is at a depth of 48 to 72 inches in the Wooster soil. Permeability is moderately slow in the Wooster soil and moderate in the Riddles soil. The root zone in the Wooster soil is mainly restricted to the moderately deep zone above the fragipan; it is deep in the Riddles soil. The available water capacity is low in the Wooster soil and moderate or high in the Riddles soil. Both soils have good tilth; runoff is rapid, and the content of organic matter is moderately low. The subsoil of the Wooster soil is very strongly acid to medium acid, and that of the Riddles soil is strongly acid or medium acid.

These soils are used for farming. They are moderately well suited to corn and small grains and poorly suited to soybeans. Control of erosion and reducing surface crusting are the main concerns in management, especially where soybeans are grown. A cropping system should include meadow crops. No-till and other forms of conservation tillage, which leave crop residue on the surface, contour stripcropping, winter cover crops, and grassed waterways help reduce crusting and erosion. Erosion is severe in areas that are used for soybeans. However, if no-till is used, an occasional crop of soybeans can be grown. Contour stripcropping is adapted to side slopes of ridges. Artificial drainage is needed in some slightly wetter areas.

These soils are well suited to grasses and legumes for hay and pasture. Many pastures are in a rotation with cultivated crops. Controlling further erosion is a concern in management. Using no-till seeding in establishing pasture and maintaining a vigorous stand of the desirable pasture plants reduce erosion. Also, a rotation that includes grasses and legumes grown over a long period helps to improve tilth and increase the content of organic matter.

In some areas these soils are used as woodland. They are well suited to woodland and to use as habitat for woodland and openland wildlife. Trees common in the area grow well if competing plant growth is controlled by spraying, mowing, or disking.

These soils are moderately well suited as a site for buildings and to septic tank absorption fields. The slope, the slight seasonal wetness and moderately slow permeability of the Wooster soil, and the moderate shrink-swell potential of the Riddles soil are limitations. Buildings should be designed to conform to the natural slope of the land. On the Wooster soil, drains at the base of footings and exterior coating on basement walls of buildings help prevent wet basements. Backfilling around the foundation of buildings on the Riddles soil with material that has a low shrink-swell potential reduces damage caused by shrinking and swelling. Using a suitable base material for local roads and streets reduces damage resulting from frost action and low soil strength. Because the Riddles soil is more permeable than the Wooster soil, septic tank absorption fields should be located on the Riddles soil wherever possible. Enlarging an absorption field increases the absorption of effluent. Maintaining a plant cover and using water control practices during construction reduce erosion.

These soils are in capability subclass IIIe and in woodland suitability subclass 1o.

WuD2—Wooster-Riddles silt loams, 12 to 18 percent slopes, eroded. These are deep, moderately steep, well drained soils on side slopes of ridgetops and along drainageways on uplands. Erosion has removed part of the original surface layer of each soil. The present surface layer is a mixture of the original surface layer and subsoil material. Most areas are about 45 percent Wooster silt loam and 45 percent Riddles silt loam. However, the pattern and position of the soils and the relative proportion of each in the mapped areas are random and unpredictable. It was not practical to separate the soils in mapping. The areas generally are long and narrow and range from 3 to 150 acres in size.

Typically, the Wooster soil has a brown, friable silt loam surface layer about 7 inches thick. The subsoil is about 37 inches thick. The upper part is yellowish brown, firm silt loam; the middle part is a dark brown, very firm and brittle loam fragipan; and the lower part is dark brown, firm loam. The substratum to a depth of about 60 inches is dark yellowish brown, firm loam glacial till. In some areas the surface layer is loam, gravelly silt loam, or gravelly loam. In some areas there is more sand in the subsoil and substratum. Bedrock is at a depth of 40 to 60 inches in a few areas. In some areas the soil is moderately well drained and has gray mottles above the fragipan.

Typically, the Riddles soil has a brown, friable silt loam surface layer about 8 inches thick. The subsoil is about 42 inches thick. The upper part is dark yellowish brown, friable silt loam; the middle and lower parts are yellowish brown and dark yellowish brown, firm loam and clay loam. The substratum to a depth of about 60 inches is olive brown, firm loam glacial till. In some areas the surface layer is loam, gravelly silt loam, or gravelly loam, and in some areas there is more sand in the subsoil. In a few areas bedrock is between depths of 40 and 60 inches.

Included with these soils in mapping are small areas of the more droughty Chili soils near outwash plains and stream terraces. Also included are small areas of the moderately deep Loudonville soils on shoulder slopes. The included soils make up about 10 percent of most areas.

A seasonal high water table is at a depth of 48 to 72 inches in the Wooster soil. Permeability is moderately slow in the Wooster soil and moderate in the Riddles soil. In the Wooster soil the root zone is mainly restricted to the moderately deep zone above the fragipan; it is deep in the Riddles soil. The available water capacity is low in the Wooster soil and moderate or high in the Riddles soil. Both soils have good tilth; runoff is very rapid, and the content of organic matter is moderately low. The subsoil in the Wooster soil is very strongly acid to medium acid, and it is strongly acid or medium acid in the Riddles soil.

In some areas these soils are used for crops. They are poorly suited to continuous corn, soybeans, and small grains, but they are moderately well suited to these crops in a cropping system with meadow crops. The slope and the very severe hazard of erosion are the main management concerns. These soils are well suited to no-till. Some areas are well suited to stripcropping, but most areas are not adapted to this practice because of the short slopes and the dissecting drainageways. Grassed waterways are used in natural drainageways to reduce gullying. Conservation tillage, which leaves crop residue on the surface, reduces soil loss by erosion.

These soils are moderately well suited to grasses and legumes for pasture and hay. If the soils are plowed for seeding or the pasture is overgrazed, there is a very severe hazard of further erosion. Reseeding with a cover crop or companion crop, using a mulch, or no-till seeding reduces the risk of erosion. Proper stocking rates, pasture rotation, timely grazing, and weed control help keep the soils and plants in good condition.

In many areas these soils are in native hardwoods. They are well suited to trees and shrubs. The slope limits the use of equipment. Seedlings grow well if competing plants are controlled by spraying, mowing, or disking. Locating logging roads and skid trails on the contour wherever possible and seeding disturbed areas with a quick-growing cover crop help reduce runoff and erosion.

These soils are poorly suited as sites for buildings and to septic tank absorption fields. The moderately steep slopes, the moderate shrink-swell potential of the Riddles soil, and the moderately slow permeability and slight seasonal wetness of the Wooster soil are limitations for these uses. Buildings should be designed to conform to the natural slope of the land. Locating roads and streets on the contour reduces the grade. Drains at the base of footings and exterior coating on basement walls help prevent wet basements. On the Riddles soil, backfilling around the foundation with material that has a low shrink-swell potential reduces damage caused by the shrinking and swelling of the soil. Because the Riddles soil is more permeable than the Wooster soil, septic tank absorption fields should be located on the Riddles soil wherever possible. Placing leach lines on the contour reduces lateral seepage of effluent to the surface. Maintaining plant cover on a construction site and using water control practices help reduce erosion. The soils in filled areas are subject to slippage.

These soils are in capability subclass IVe and in woodland suitability subclass 1r.

WyC—Wooster-Urban land complex, 6 to 12 percent slopes. This complex consists of a deep, sloping, well drained Wooster soil and areas of Urban land on complex slopes on uplands. Most areas are about 55 percent Wooster silt loam and 35 percent Urban land. The areas of Wooster soil and of Urban land are so intricately mixed or so small in size that it was not practical to separate them in mapping. The mapped areas typically are irregular in shape and range in size from 20 acres to 500 acres.

Typically, the Wooster soil has a dark grayish brown, friable silt loam surface layer about 10 inches thick. The subsoil is about 48 inches thick. The upper part is yellowish brown, friable and firm silt loam and loam, and the lower part is a yellowish brown, very firm and brittle loam and clay loam fragipan. The substratum to a depth of about 60 inches is yellowish brown, firm loam glacial till. In some areas the soil is moderately well drained and has gray mottles above the fragipan. In a few areas bedrock is between depths of 40 and 60 inches. In some places, the soil has been radically altered. Some low areas have been filled or leveled during construction, and other small areas have been cut, built up, or smoothed.

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

Included with this complex in mapping and making up about 10 percent of most areas are small areas of the moderately deep Loudonville soils.

The seasonal high water table is at a depth of 48 to 72 inches in the Wooster soil. Permeability is moderately slow in the fragipan of this soil. In the Wooster soil, root growth is mainly restricted to the moderately deep zone above the fragipan. The available water capacity in this zone is low. Tilth is good, and runoff is rapid. The subsoil is very strongly acid to medium acid. The content of organic matter is moderate.

The Wooster soil is in the parks, open spaces, gardens, and lawns. It is moderately well suited to gardens and lawns and well suited to shrubs and trees; however, the rooting zone for shrubs and trees is restricted by the fragipan. Erosion is a hazard if the plant cover is removed and the soil is left bare. The surface layer crusts after hard rains. Returning plant residue and other organic material to the soil reduces crusting and soil loss by erosion. In some areas the soil has been radically altered and is not so suitable for lawns and gardens. In these areas, the exposed subsoil material has very poor tilth. It is sticky when wet and hard when dry. Texture can vary considerably in these areas within a short distance. Incorporating large amounts of organic material into the soil in these areas improves the available water capacity, infiltration, and tilth.

The Wooster soil is moderately well suited as a site for buildings and to septic tank absorption fields. Its slope, moderately slow permeability, and slight seasonal wetness limit these uses. Buildings should be designed to conform to the natural slope of the land. Drains at the base of footings and exterior coating on basement walls help prevent wet basements. In constructing local roads and streets, using a suitable base material reduces damage caused by frost action. Enlarging septic tank absorption fields increases the absorption of effluent; nevertheless, sanitary facilities should be connected to central sewers and treatment facilities wherever possible. Maintaining a plant cover and using water control practices during construction reduce erosion.

The Wooster soil is in capability subclass IIIe. It is not assigned to a woodland suitability subclass.

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. The acreage of high-quality farmland is limited, and the U.S. Department of Agriculture recognizes that government at local, state, and federal levels, as well as individuals, must encourage and facilitate the wise use of our nation's prime farmland.

Prime farmland soils, as defined by the U.S. Department of Agriculture, are soils that are best suited to producing food, feed, forage, fiber, and oilseed crops. Such soils have properties that are favorable for the economic production of sustained high yields of crops. The soils need only to be treated and managed using acceptable farming methods. The moisture supply, of course, must be adequate, and the growing season has to be sufficiently long. Prime farmland soils produce the highest yields with minimal inputs of energy and economic resources, and farming these soils results in the least damage to the environment.

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

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

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

More than 70 percent of Wayne County is prime farmland—about 253,086 acres, and most of this acreage is in the northern half of the county. Although the southern half of the county is rolling, there are large areas of prime farmland in this part of the county. About 76 percent of all prime farmland is in crops, mainly corn, hay, small grains, soybeans, and potatoes.

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

The following map units, or soils, make up prime farmland in Wayne County. If a soil is considered to be prime farmland only under certain conditions, the conditions are specified in parentheses after the map unit name. The location of each map unit is shown on the detailed soil maps at the back of this publication. The extent of each unit is given in table 4. The soil qualities that affect use and management are described in the section "Detailed Soil Map Units." This list does not constitute a recommendation for a particular land use.

BnA Bennington silt loam, 0 to 2 percent slopes (where drained)
BnB Bennington silt loam, 2 to 6 percent slopes (where drained)
BtA Bogart loam, 0 to 2 percent slopes
BtB Bogart loam, 2 to 6 percent slopes
CdA Canfield silt loam, 0 to 2 percent slopes
CdB Canfield silt loam, 2 to 6 percent slopes
CdB2 Canfield silt loam, 2 to 6 percent slopes, eroded
CgB Cardington silt loam, 2 to 6 percent slopes
CgB2 Cardington silt loam, 2 to 6 percent slopes, eroded
CnA Chili loam, 0 to 2 percent slopes
CnB Chili loam, 2 to 6 percent slopes
Cs Condit silt loam (where drained)
EuA Euclid silt loam, occasionally flooded (where drained)
FcA Fitchville silt loam, 0 to 2 percent slopes (where drained)
FcB Fitchville silt loam, 2 to 6 percent slopes (where drained)
GfA Glenford silt loam, 0 to 2 percent slopes
GfB Glenford silt loam, 2 to 6 percent slopes
HdA Haskins silt loam, 0 to 3 percent slopes (where drained)
JtA Jimtown loam, 0 to 2 percent slopes (where drained)

JtB Jimtown loam, 2 to 6 percent slopes (where drained)
Le Lobdell silt loam, occasionally flooded
LnB Loudonville silt loam, 2 to 6 percent slopes
Ly Luray silty clay loam (where drained)
McB Mechanicsburg silt loam, 2 to 6 percent slopes
MtB Mitiwanga silt loam, 1 to 4 percent slopes (where drained)
Or Orrville silt loam, occasionally flooded (where drained)
OtB Oshtemo sandy loam, 2 to 6 percent slopes
ReA Ravenna silt loam, 0 to 2 percent slopes (where drained)
ReB Ravenna silt loam, 2 to 6 percent slopes (where drained)
RgB Rawson silt loam, 2 to 6 percent slopes
RhB Riddles silt loam, 2 to 6 percent slopes
RsB Rittman silt loam, 2 to 6 percent slopes
RsB2 Rittman silt loam, 2 to 6 percent slopes, eroded
Sb Sebring silt loam (where drained)
Tg Tioga silt loam, occasionally flooded
TrA Tiro silt loam, 0 to 2 percent slopes (where drained)
WaA Wadsworth silt loam, 0 to 2 percent slopes (where drained)
WaB Wadsworth silt loam, 2 to 6 percent slopes (where drained)
WuB Wooster-Riddles silt loams, 2 to 6 percent slopes

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

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

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

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

Crops and Pasture

Stanley L. Bahmer, district conservationist, Soil Conservation Service, helped prepare this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed Soil Map Units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

In 1967, 258,582 acres in Wayne County was used for crops and pasture, according to the Conservation Needs Inventory (10). Of this total, 42,042 acres was used as permanent pasture; 75,883 acres for row crops, mainly corn; 51,286 acres for close-growing crops, mainly wheat and oats; and 51,506 acres for rotation hay and pasture. The rest of the acreage was used for other purposes.

The potential exists for increased food and fiber production on soils that are presently in other uses in Wayne County. About 30,000 acres of potentially good cropland is currently used as woodland and about 25,000 acres as pasture. This acreage could be converted to cropland if needed; however, about 95 percent of this acreage is limited by wetness or by a hazard of erosion. However, if the proper conservation practices are used, these problems can be reduced. Food production could also be greatly increased by using the latest technology for crop production on all cropland in the county.

The acreage in crops and pasture has gradually decreased as more land is used for urban development. In 1967, urban and built-up land took up about 25,000 acres in the county (10). This acreage has increased at the rate of about 400 acres per year.

The major part of the cropland supports dairy and livestock enterprises, primarily dairy. Cash-grain farms are scattered throughout the county. The southeastern part of the county is taken up mainly by general livestock farms. Most of the cropland is planted to corn for use as grain or silage and to forage and small grains. Soybeans are grown on about 10 percent of the acreage in row crops. A small percentage of the cropland is used for a variety of specialized crops, such as berries, fruits, and potatoes.

Information on the latest varieties and on recommended fertilizers, herbicides, and tillage methods can be found in the Agronomy Guide (9) or can be obtained from the local office of the Cooperative Extension Service.

Problems in soil management are discussed on the following pages. They include erosion; soil drainage; droughtiness; maintaining levels of fertility, lime, and organic matter; and tilth. Also, the commonly grown field crops and some other field crops and special crops that are suited to the soils in Wayne County are briefly discussed.

Erosion is a major problem in soil management on about 65 percent of the cropland and pasture in Wayne County (10). Erosion is a hazard on all soils that have slopes of more than 2 percent. On some soils, such as Wooster-Riddles silt loams, 6 to 12 percent slopes, eroded, erosion is by far the most serious problem. On other soils, such as Bennington silt loam, 2 to 6 percent slopes, erosion and wetness are limitations.

Erosion causes the loss of the surface layer of the soil. This layer has received most of the residue of the plants, native or cultivated, that have grown on the soil. For this reason, the surface layer has more organic matter than other parts of the soil. In most Wayne County soils, the surface layer is darker colored than the subsoil and substratum. Because of its content of organic matter, the surface soil is capable of storing and releasing more available water and plant nutrients per unit volume than other layers of the soil. Thus, its loss reduces considerably the nutrient-supplying power of the soil.

The subsoil in Alexandria and Bennington soils and in many other soils in Wayne County is higher in clay content than the surface layer. When erosion removes soil from the surface, the plow layer extends deeper until it reaches into the subsoil, which generally has a higher content of clay. As the clay content of the surface layer increases, tilth deteriorates and the plow layer becomes harder to work and more inhospitable as a seedbed.

Rooting depth is restricted in many Wayne County soils. In some soils, such as Canfield and Rittman soils, the restriction is caused by a dense subsoil layer called a fragipan. In other soils, such as Loudonville or Mitiwanga soils, the rooting depth is limited by bedrock. Erosion at the surface reduces the depth to the restrictive layer, thus reducing the volume of soil available for root development.

For these reasons, the control of erosion is important to sustain high crop yields. Several means of controlling erosion are available.

One of the simplest measures is cross-slope cultivation. This method is quite effective on soils that have slopes of 2 to 6 percent. On soils that typically have long, uniform slopes, such as Canfield silt loam, 2 to 6 percent slopes, it is quite easy to till across the slope. On soils that have short, irregular slopes, for example, Bennington silt loam, 2 to 6 percent slopes, it is unlikely that tillage in any one direction will completely eliminate cultivation up and down the slope.

Contour stripcropping has been used extensively in the county for many years. Its use is most widespread on soils that have rather uniform slopes of 6 to 18 percent. This practice is not well adapted to short, irregular slopes, such as those in many areas of sloping to steep Chili soils.

The return of crop residue and the use of hay crops in the rotation are equally applicable to smooth slopes and irregular slopes. Residue reduces raindrop impact on the surface, preventing soil particles from being dislodged. A close-growing hay crop slows the velocity of runoff, thus reducing the amount of soil carried away. The practicality of using hay crops to control erosion depends mainly on the type of farming operation.

Terraces and diversions reduce runoff, erosion, and the length of the slope. They are most practical on deep, well drained soils that have smooth slopes. Chili soils commonly are suitable for terracing. Most of the soils in Wayne County are not so suitable for terraces and diversions because they have irregular slopes, excessive wetness, a high content of clay in the subsoil, a fragipan which would be exposed in terrace channels, or bedrock at a depth between 20 and 40 inches.

No-till or reduced tillage in producing crops acts to control erosion by preventing bare soil from being exposed to raindrop impact and runoff water. No-till methods are best adapted on well drained, medium-textured or moderately coarse-textured soils, such as Chili, Riddles, Oshtemo, and Wooster soils. In such soils the surface layer is friable enough, even when not loosened artificially, to make good contact with a seed that is pressed into it. Moderately well drained soils, such as Canfield, Cardington, and Rittman soils, are also suited to no-till methods. Wetter or more clayey soils are not so well suited to no-till methods. Seasonal wetness during the planting season affects soil temperature, seed germination, and seed-soil contact. These soils can be made more suitable for no-till planting by installing adequate artificial drainage.

Modified tillage methods, in which other implements are used instead of the moldboard plow, are also coming into wider use. Any tillage method that reduces the soil surface exposed to rainfall and runoff reduces soil loss by erosion.

Soil blowing is a hazard on Carlisle and Linwood soils, which have a muck surface layer, on Oshtemo soils, which have a sandy loam surface layer, and, to a lesser degree, on other soils in the county. Maintaining a plant cover, using a mulch, or keeping the surface rough by proper tillage minimizes soil blowing on these soils. Also, windbreaks of suitable shrubs are effective in reducing soil blowing.

Many permanent pastures are on moderately steep or steep soils, on which runoff is rapid. The key to erosion control on pasture is the maintenance of a thick sod cover. Overgrazing, which reduces the cover, causes erosion losses. Practices that tend to increase the cover, such as fertilizing and liming, help to reduce these losses.

Many of the pastures in Wayne County are on gently sloping soils, which are occasionally used for cultivated crops. Special care is needed to minimize erosion losses if pastures are used for cultivated crops. No-till methods of pasture seeding are being developed to permit the reseeding of pastures with a minimum of soil loss.

Information on the design of erosion control practices for each kind of soil is available at the local office of the Soil Conservation Service.

Soil drainage is an important concern in soil management in Wayne County. The roots of most plants do not grow without free oxygen. Very little free oxygen is available in soils that are saturated with water. Wet soils remain cold in the spring. Wetness delays the use of farm machinery. Grazing when the soil is wet damages plants and compacts the soil.

Soil scientists recognize classes of natural drainage as they make a soil survey. Each soil series is assigned to a drainage class. Wooster soils, for example, are well drained, Bennington soils are somewhat poorly drained, and Luray soils are very poorly drained. Drainage classes are based on the depth to the seasonal high water table during the wettest part of the year, generally late in winter or early in spring. The level of the seasonal high water table is indicated by colors in the soil; an experienced soil scientist can accurately estimate this level regardless of when he examines the soil. The drainage classes refer to the water table level under natural conditions and do not relate to the adequacy of artificial drainage.

About 30 percent of Wayne County, or 108,120 acres, is made up of well drained soils. Such soils have adequate natural drainage for crop production. Wooster and Riddles soils are the most extensive well drained soils. However, about 14,200 acres of the well drained soils have slopes steeper than 18 percent. Most of these are Berks soils.

About 36.7 percent of Wayne County, or 132,579 acres, consists of moderately well drained soils. These soils generally have adequate natural drainage for most crops, but there are also included wetter soils in low spots, springs, and seep areas, in which artificial drainage is helpful. Canfield, Cardington, Glenford, and Rittman soils are the most extensive moderately well drained soils in the county.

About 24 percent of Wayne County, or 86,587 acres, is made up of somewhat poorly drained soils. These soils have a seasonal high water table mostly between depths of 6 and 30 inches in the wettest part of the year. A complete drainage system is needed for most crops to produce good yields. Fitchville, Orrville, Ravenna, and Wadsworth soils are the most extensive somewhat poorly drained soils.

Most of the rest of the county consists of poorly drained and very poorly drained soils in which the water table is above the surface or within 12 inches of the surface for extended periods under natural conditions. Artificial drainage is essential if these soils are to be used as cropland. Melvin soils are the most extensive poorly drained soils in the county, and Luray soils are the most extensive very poorly drained soils.

The design of a surface and subsurface drainage system varies with the kind of soil. A combination of surface and subsurface drains generally is needed in areas of the poorly drained and very poorly drained soils that are used for intensive row cropping. Drains must be more closely spaced in soils that have slow or very slow permeability than in the more permeable soils. Developing adequate outlets for subsurface drainage systems is difficult in many areas of Luray, Melvin, and Sebring soils.

Organic soils oxidize and subside when they are drained. Special drainage systems are needed to control the depth and duration of drainage. Lowering the water table to a suitable level during the growing season and raising it to the surface during the rest of the year minimize the oxidation and subsidence of organic soils.

On wet soils, such crops as alfalfa and winter small grains require better surface and subsurface drainage than, for example, corn and soybeans. Late-planted soybeans are grown successfully in some areas that are not drained sufficiently for most other crops.

Many of the naturally wet soils are highly productive if they are adequately drained. Their natural wetness has slowed the oxidation of organic matter and the leaching of lime; thus, these soils are higher in natural fertility than nearby soils that have better natural drainage. Information on drainage design for each kind of soil in the county is available at the local office of the Soil Conservation Service.

Droughtiness is a major hazard on a relatively small acreage of cropland in Wayne County. The lack of available moisture is most likely to be limiting to cultivated crops on soils that formed in sandy or gravelly outwash deposits, such as Chili and Oshtemo soils, and on soils that are moderately deep to bedrock or to a fragipan, such as Berks, Dekalb, and Rittman soils. Some of these droughty soils are suitable for irrigation.

The effects of drought are more evident on pastures than on cultivated fields. On most moderately steep or steep soils, pasture grasses make little growth during the dry part of the summer. The most practical means of overcoming this problem is to renovate pastures to the extent that drought-resistant legumes, such as alfalfa, can be included in the pasture seeding. Generally, plants growing in highly fertile soil use the available water most efficiently.

Maintaining levels of fertility, lime, and organic matter that are adequate to sustain high yields of crops and pasture is a concern on all soils in the county. The fertility of a soil depends upon its past use, management, and long-term fertility history. These factors differ widely from farm to farm, even on the same soil type. For this reason, differences in fertility are not considered in mapping soils. A regular program of soil testing is needed to determine the amount and kind of fertilizer needed on a given field at a given time to produce a certain crop.

While the amount and kind of fertilizer needed to build up fertility can differ widely even within soil types, the ability of the soil to store and release plant nutrients is a property of the soil itself. Soils that have a high content of clay and organic matter have a high capacity for storing and releasing plant nutrients. Luray silty clay loam is such a soil. Soils that have less clay and organic matter, such as Oshtemo sandy loam, have a low capacity for storing and releasing nutrients. On eroded soils, the plow layer has a lower content of organic matter than on uneroded soils of the same series; thus, eroded soils have a reduced capacity for storing and releasing plant nutrients.

If a large amount of fertilizer and lime is applied to steep or very porous soils, much is likely to be lost through runoff or leaching before it is held by the soil in a form that can be used by plants. For this reason, frequent light applications of fertilizer and lime are more effective on such soils than a single large application.

Most of the soils in Wayne County are naturally acid in the rooting zone of most crops. Even soils that contain natural lime deep in the soil profile, for example, Bennington soils, have a surface pH value of 4.5 to 6.0 where they have not been limed. Soils that formed dominantly in acid soil materials, such as Wooster soils, have a surface pH value of 4.5 to 5.5 where lime has not been added.

Most crops commonly grown in the area require a pH value of at least 5.5 in the rooting zone for best growth. Alfalfa, however, grows best at a pH value of 6.5 or more.

Phosphorus availability is closely dependent on pH. Much of the phosphate fertilizer applied to very acid soils combines with iron and aluminum and is not available to plants.

Earthworms, which incorporate plant residue into the soil, are most active at pH values near neutral. Their activity results in better soil structure.

The organic matter in the soil releases considerable nitrogen and phosphorus and some micronutrients as it breaks down. It improves soil structure and makes the soil easier to work. It also has a high capacity for storing and releasing plant nutrients. Additions of crop residue and barnyard manure are especially beneficial in restoring productivity to severely eroded soils.

Tilth is an important factor in seed germination and in the infiltration of water into the soil. Soils that have good tilth are granular and porous.

Most of the soils that are used for crops in Wayne County have a silt loam surface layer that is light in color and moderate or moderately low in content of organic matter. Generally, the structure of such soils is weak or moderate, and heavy rainfall causes a crust to form on the surface. The crust hardens as it dries, thus reducing the infiltration of water, increasing runoff, and retarding seed germination. Regular additions of crop residue, manure, and other organic materials help to improve soil structure and reduce crusting. Grazing when the soils are wet and soft causes soil compaction and poor tilth, damages plants, and reduces air and water movement in the soil.

Fall plowing generally is not a good practice on soils that have a light-colored silt loam surface layer because of the crust that forms during winter and spring. After fall plowing, many of the soils are nearly as dense and hard at planting time as they were before they were plowed. About 65 percent of the cropland, or 167,000 acres, consists of sloping soils that are subject to damaging erosion if they are plowed in fall (10).

The Luray soils have a dark-colored surface layer. They commonly are wet until late in spring. If they are plowed when wet, they tend to be very cloddy when dry, thus making it difficult to prepare a good seedbed. Fall plowing on these soils generally results in good tilth in spring.

Field crops suited to the soils and climate in Wayne County include many that are not now commonly grown. Corn and soybeans are the common row crops. Grain sorghum, sunflowers, and other crops can be grown if economic conditions are favorable.

Wheat and oats are the common close-growing crops. Rye, barley, buckwheat, and flax can be grown. Alfalfa and red clover are the legumes commonly grown for hay. Bromegrass, timothy, fescue, and bluegrass can be grown for seed.

Special crops grown commercially in the county are potatoes, vegetables, small fruits, tree fruits, sod, Christmas trees, and nursery plants. Potatoes are grown in several areas. A small acreage in areas throughout the county is used for melons, strawberries, raspberries, other small fruits, and vegetables. Apples are the most important tree fruit grown in the county.

Deep soils that have good natural drainage and that warm up early in spring are especially well suited to many vegetables and small fruits. These are the Chili, Mechanicsburg, Oshtemo, Riddles, and Wooster soils that have slopes of less than 6 percent. Crops generally can be planted and harvested earlier on all these soils than on other soils in the county.

If the muck soils are adequately drained, they are well suited to a wide range of vegetable crops. Potatoes are grown on muck soils in the southwestern part of the county. Sod is grown on muck soils near Orrville. Carlisle and Linwood soils make up about 3,593 acres in the county.

Most of the well drained soils are suitable for orchards and nursery plants. However, soils in low positions where frosts are frequent and air drainage is poor generally are not so well suited to early vegetables, small fruits, and orchards.

The latest information and suggestions for growing special crops can be obtained from local offices of the Cooperative Extension Service and the Soil Conservation Service.

Yields Per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit (13). Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

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

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

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

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

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

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

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

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

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

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated by adding an Arabic numeral to the subclass symbol, for example, IIe-4 or IIIe-6.

The acreage of soils in each capability class and subclass is shown in table 6. The capability classification of each map unit is given in the section "Detailed Soil Map Units."

Woodland Management and Productivity

Nearly all of Wayne County was forest land at the time of settlement. The trees were mostly hardwoods. As a result of clearing, the acreage of woodland has been reduced to about 52,870 acres or 15 percent of the county (10). Most of the remaining areas are in small farm woodlots. The steepest, wettest, or least accessible parts of the farms have typically remained wooded. Most of the woodland has been cut over, and much of it has been grazed.

Compared to the total returns from the sale of other farm products, income from the sale of wood products is small. However, oak and black walnut logs of good quality are still being cut from the better managed woodlots. Also, farm woodlots are a source of wood for the fireplace, lumber for rough construction, and edible nuts.

Woodland should be protected from grazing and fire. Grazing by livestock damages new growth on existing trees and increases seedling mortality. Selective cutting and thinning help remove the less desirable species. Species selected for planting should be adapted to the soil. Spraying, mowing, shallow tillage, and selective cutting help to control plant competition.

Information on forest management is available from the Cooperative Extension Service; the Ohio Department of Natural Resources, Division of Forestry; the United States Department of Agriculture, Agricultural Stabilization and Conservation Service; and the local office of the Soil Conservation Service.

Table 7 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination (woodland suitability) symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *t*, toxic substances in the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: x, w, t, d, c, s, f, and r.

In table 7, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Ratings of *windthrow hazard* are based on soil characteristics that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that few trees may be blown down by strong winds; *moderate*, that some trees will be blown down during periods of excessive soil wetness and strong winds; and *severe*, that many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

Trees to plant are those that are suited to the soils and to commercial wood production.

Windbreaks and Environmental Plantings

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

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

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

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

Recreation

The soils of the survey area are rated in table 9 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 9, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 9 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 12 and interpretations for dwellings without basements and for local roads and streets in table 11.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking 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

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 10, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor (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 are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, 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 are also considerations. Examples of wild herbaceous plants are foxtail, goldenrod, smartweed, ragweed, and milkweed.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, beech, maple, hawthorn, dogwood, hickory, blackberry, and black walnut. 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, spruce, fir, cedar, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are wild millet, chickweed, 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. The 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 woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils *may be included within the mapped areas of a specific soil.*

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 11 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, 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 12 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 12 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to 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 12 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

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

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

The ratings in table 12 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, 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 13 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 13, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

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

Plant growth is affected by 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 14 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed 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. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 15 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (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, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

Physical and Chemical Properties

Table 16 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion and the amount of soil lost. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops.

They are extremely erodible, and vegetation is difficult to establish.

2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to wind erosion.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 16, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 17 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 17 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs, on the average, no more than once in 2 years; and *frequent* that it occurs, on the average, more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

Some areas in Wayne County are subject to controlled inundation. These areas are above flood storage dams where water is held and slowly released to reduce flooding downstream. The approximate flood pool lines are shown on the detailed soil maps. The Mohicanville Dam flood pool is located in Clinton and Plain Townships. Also, there are three Chippewa Watershed protection structures in Wayne County; two are in Canaan Township, and the third is in Green Township.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 17 are the depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 17.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Physical and Chemical Analyses of Selected Soils

Many of the soils in Wayne County were sampled, and laboratory data were determined by the Soil Characterization Laboratory, Department of Agronomy, Ohio State University, Columbus, Ohio. The physical and chemical data obtained on most samples include particle size distribution, reaction, organic matter content, calcium carbonate equivalent, and extractable cations.

These data were used in classifying and correlating these soils and in evaluating their behavior under various land uses. Ten of the sample profiles were selected as representative of the respective series and are described in the section "Soil Series and Their Morphology." These series and their laboratory identification numbers are: Bennington (WN-46), Berks (WN-57), Bogart (WN-77), Canfield (WN-S17), Dekalb (WN-56), Euclid (WN-61), Jimtown (WN-60), Killbuck (WN-44), Lobdell (WN-63), and Wooster (WN-S2).

In addition to the Wayne County data, laboratory data are also available from nearby counties in northeastern Ohio. These data and the Wayne County data are on file at the Department of Agronomy, Ohio State University; the Ohio Department of Natural Resources, Division of Lands and Soil; and the State Office of the Soil Conservation Service in Columbus, Ohio. Some of these data have been published through special studies of soils in nearby counties (6, 7, 8).

Engineering Index Test Data

Several of the soils in Wayne 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 described in this publication were tested. These series and their laboratory identification numbers are Euclid series (WN-61) and Jimtown series (WN-60).

In addition to the Wayne County data, engineering test data are also available from nearby counties that have many of the same soils. These data and the Wayne County data are on file at the Department of Agronomy, Ohio State University; the Ohio Department of Natural Resources, Division of Lands and Soil; and the State Office of the Soil Conservation Service in Columbus, Ohio.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (14). 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 18 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Alfisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udalf (*Ud*, meaning humid, plus *alf*, from Alfisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hapludalfs (*Hapl*, meaning minimal horizonation, plus *udalf*, the suborder of the Alfisols that have a udic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Hapludalfs.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, mesic Typic Hapludalfs.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (12). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (14). 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."

Alexandria Series

The Alexandria series consists of deep, well drained soils that formed in glacial till on uplands. Permeability is moderately slow. The slope ranges from 12 to 50 percent.

Alexandria soils are similar to Cardington, Rawson, and Riddles soils and commonly are adjacent to Cardington soils. Unlike Alexandria soils, Cardington soils are moderately well drained and have low-chroma mottles in the upper part of the subsoil. Rawson soils formed in loamy material over lacustrine deposits or glacial till. Rawson and Riddles soils have less clay in the subsoil than Alexandria soils.

Typical pedon of Alexandria silt loam, 18 to 50 percent slopes, about 3 miles south of West Salem, in Congress Township, about 1,190 feet east and 925 feet south of the northwest corner of sec. 25, T. 23 N., R. 15 W.

A—0 to 4 inches; very dark gray (10YR 3/1) silt loam, light brownish gray (10YR 6/2) dry; moderate fine granular structure; friable; many fine and coarse roots; 2 percent coarse fragments; medium acid; abrupt irregular boundary.

E—4 to 10 inches; pale brown (10YR 6/3) silt loam; weak medium platy structure parting to weak very fine subangular blocky; friable; common fine and coarse roots; 3 percent coarse fragments; strongly acid; clear smooth boundary.

BE—10 to 14 inches; yellowish brown (10YR 5/4) silty clay loam; weak medium subangular blocky structure; firm; common fine and coarse roots; thin continuous pale brown (10YR 6/3) silt coatings on faces of peds; thin very patchy dark yellowish brown (10YR 4/4) clay films on faces of peds and in pores; 2 percent coarse fragments; strongly acid; clear wavy boundary.

Bt1—14 to 20 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium and coarse subangular blocky structure; firm; common fine and coarse roots; thin continuous brown (10YR 4/3) silt coatings on faces of peds; thin patchy dark brown (7.5YR 4/4) clay films on faces of peds and in pores; 5 percent coarse fragments; medium acid; clear smooth boundary.

Bt2—20 to 31 inches; dark yellowish brown (10YR 4/4) silty clay loam; few fine distinct strong brown (7.5YR 5/6) mottles; moderate coarse subangular blocky structure; firm; common fine and coarse roots; medium continuous brown (10YR 4/3) silt coatings on faces of peds; thin patchy dark brown (7.5YR 4/4) clay films on faces of peds; 5 percent coarse fragments; neutral; clear wavy boundary.

Bt3—31 to 36 inches; dark yellowish brown (10YR 4/4) silty clay loam; few fine distinct strong brown (7.5YR 5/6) mottles; weak coarse subangular blocky structure; firm; medium continuous brown (10YR 4/3) silt coatings on faces of peds; thin patchy dark brown (7.5YR 4/4) clay films on faces of peds; 5 percent coarse fragments; slight effervescence; mildly alkaline; clear wavy boundary.

C1—36 to 43 inches; dark yellowish brown (10YR 4/4) clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; massive; firm; many medium white (10YR 8/2) carbonate coatings; 8 percent coarse fragments; strong effervescence; moderately alkaline; clear wavy boundary.

C2—43 to 60 inches; dark brown (10YR 4/3) clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; massive; firm; many medium white (10YR 8/2) carbonate coatings; 8 percent coarse fragments; strong effervescence; moderately alkaline.

The solum typically is 32 to 46 inches thick, but the range is 27 to 50 inches. The depth to carbonates ranges from 27 to 46 inches. Coarse fragments make up 1 to 5 percent of the volume in the upper part of the solum and 5 to 15 percent in the lower part of the solum and in the C horizon.

The A horizon has hue of 10YR, value of 3, and chroma of 1 or 2. An Ap horizon is present in some pedons. It has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The A horizon is dominantly silt loam, but in some eroded areas it is silty clay loam. It is strongly acid or medium acid.

The B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is silty clay loam or clay loam. It is strongly acid or medium acid in the upper part and ranges from medium acid to mildly alkaline in the lower part.

The C horizon typically has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is loam, clay loam, or silty clay loam. It is mildly alkaline or moderately alkaline, and free carbonates commonly are present.

Bennington Series

The Bennington series consists of deep, somewhat poorly drained soils that formed in glacial till on uplands. Permeability is slow. The slope ranges from 0 to 6 percent.

These soils have less clay in the argillic horizon than is definitive for the Bennington series. This difference, however, does not affect the use or behavior of the soils.

Bennington soils are similar to Haskins and Tiro soils and commonly are adjacent to Cardington, Condit, Mitiwanga, and Tiro soils. Unlike Bennington soils, Cardington soils are moderately well drained and do not have mottles immediately below the surface layer. Condit soils are poorly drained and have dominant low chroma in the subsoil. Haskins soils formed in water-deposited loamy material over lacustrine sediment or glacial till. Mitiwanga soils have bedrock at a depth of 20 to 40 inches. Tiro soils are more silty in the upper part of the subsoil than Bennington soils.

Typical pedon of Bennington silt loam, 2 to 6 percent slopes, about 1.5 miles east of West Salem, in Congress Township, about 1,840 feet west and 1,220 feet south of the northeast corner of sec. 8, T. 21 N., R. 14 W.

Ap—0 to 10 inches; grayish brown (10YR 5/2) silt loam, light brownish gray (10YR 6/2) dry; weak medium granular structure; friable; many fine and medium roots; 4 percent coarse fragments; slightly acid; abrupt smooth boundary.

E—10 to 11 inches; pale brown (10YR 6/3) silt loam; few fine faint light brownish gray (10YR 6/2) mottles; weak thin platy structure; friable; common fine and medium roots; few fine black (10YR 2/1) concretions (Fe and Mn oxides); 2 percent coarse fragments; medium acid; clear smooth boundary.

BE—11 to 14 inches; yellowish brown (10YR 5/4) silty clay loam; common fine distinct light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; firm; common fine and medium roots; thin continuous brown (10YR 5/3) silt coatings on faces of peds; thin very patchy clay films on faces of peds; few fine black (10YR 2/1) concretions (Fe and Mn oxides); 2 percent coarse fragments; very strongly acid; clear smooth boundary.

Bt1—14 to 19 inches; yellowish brown (10YR 5/4) clay loam; common medium distinct light brownish gray (10YR 6/2) and few fine distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; firm; common fine roots; thin continuous grayish brown (10YR 5/2) silt coatings on faces of peds; thin patchy clay films on faces of peds; few fine black (10YR 2/1) concretions (Fe and Mn oxides); 2 percent coarse fragments; very strongly acid; clear wavy boundary.

Bt2—19 to 30 inches; dark yellowish brown (10YR 4/4) clay loam; many medium distinct gray (10YR 6/1) and few fine prominent yellowish red (5YR 5/8) mottles; moderate medium subangular blocky structure; firm; few fine roots; thin continuous grayish brown (10YR 5/2) silt coatings on faces of peds; thin patchy clay films on faces of peds; common medium black (10YR 2/1) concretions (Fe and Mn oxides); 5 percent coarse fragments; medium acid; clear wavy boundary.

Bt3—30 to 34 inches; dark yellowish brown (10YR 4/4) clay loam; common medium distinct gray (10YR 6/1) mottles; weak coarse prismatic structure parting to weak very thick platy; firm; few fine roots; thin continuous gray (10YR 6/1) clay films on vertical faces of peds; common medium black (10YR 2/1) concretions (Fe and Mn oxides); 5 percent coarse fragments; neutral; clear wavy boundary.

C1—34 to 40 inches; dark yellowish brown (10YR 4/4) clay loam; few fine prominent yellowish red (5YR 4/6) mottles; massive; very firm; few fine roots; thin patchy gray (10YR 6/1) clay films on faces of peds; few fine black (10YR 2/1) concretions (Fe and Mn oxides); few fine white (10YR 8/1) carbonate coatings; 8 percent coarse fragments; slight effervescence; moderately alkaline; gradual wavy boundary.

C2—40 to 50 inches; dark yellowish brown (10YR 4/4) loam; massive; very firm; thin patchy gray (10YR 5/1) silt coatings on vertical fractures; common fine white (10YR 8/1) carbonate coatings; 10 percent coarse fragments; strong effervescence; moderately alkaline; diffuse wavy boundary.

C3—50 to 60 inches; dark yellowish brown (10YR 4/4) silty clay loam; massive; very firm; thin patchy gray (10YR 5/1) silt coatings on vertical fractures; common fine white (10YR 8/1) carbonate coatings; 10 percent coarse fragments; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 28 to 44 inches. Coarse fragments make up 1 to 5 percent of the volume to a depth of 20 inches and 3 to 12 percent in the solum below 20 inches and in the C horizon.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2. It ranges from medium acid to neutral where the soil has been limed. In uncultivated areas the A horizon overlies an E horizon.

The Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 or 4. It commonly is clay loam, but the range includes silty clay loam. Some individual subhorizons are silty clay. The Bt horizon ranges from very strongly acid to medium acid in the upper part and medium acid to neutral in the lower part.

The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 to 4. It is clay loam, loam, or silty clay loam. It is mildly alkaline or moderately alkaline.

Berks Series

The Berks series consists of moderately deep, well drained soils on side slopes mainly along major stream valleys on uplands. The soils formed in residuum of interbedded acid siltstone, shale, and fine-grained sandstone. Permeability is moderate or moderately rapid. The slope ranges from 12 to 70 percent.

Berks soils are similar to Dekalb soils and are commonly adjacent to Loudonville, Mechanicsburg, Riddles, and Wooster soils. Dekalb soils have more sand and less silt in the solum than Berks soils, and Loudonville, Mechanicsburg, Riddles, and Wooster soils have a lower percentage of coarse fragments in the subsoil. Unlike Berks soils, Mechanicsburg, Riddles, and Wooster soils are deep to bedrock.

Typical pedon of Berks silt loam, 25 to 70 percent slopes, about 4 miles northwest of Wooster, in Chester Township, about 2,380 feet south and 2,600 feet east of the northwest corner of sec. 25, T. 20 N., R. 14 W.

A—0 to 2 inches; dark gray (10YR 4/1) silt loam, gray (10YR 6/1) dry; weak fine granular structure; friable; common fine and few coarse roots; 10 percent coarse fragments; extremely acid; abrupt irregular boundary.

EB—2 to 6 inches; pale brown (10YR 6/3) silt loam; weak fine and medium granular structure; friable;

common fine and few coarse roots; 10 percent coarse fragments; very strongly acid; clear smooth boundary.

Bw1—6 to 11 inches; yellowish brown (10YR 5/4) channery silt loam; weak fine and medium subangular blocky structure; friable; common fine and few coarse roots; 15 percent coarse fragments; very strongly acid; clear wavy boundary.

Bw2—11 to 18 inches; yellowish brown (10YR 5/4) very channery silt loam; weak medium subangular blocky structure; friable; common fine roots; 50 percent coarse fragments; very strongly acid; clear wavy boundary.

BC—18 to 28 inches; brown (10YR 5/3) extremely channery silt loam; weak medium subangular blocky structure; friable; few fine roots; 70 percent coarse fragments; very strongly acid; clear irregular boundary.

R—28 inches; brown (10YR 4/3) fractured fine-grained sandstone bedrock; very thickly bedded.

The solum is 20 to 36 inches thick, and the depth to bedrock ranges from 20 to 40 inches. Coarse fragments make up 10 to 15 percent of the A horizon and 15 to 75 percent of individual subhorizons of the B horizon.

The A horizon is 1 to 4 inches thick and has hue of 10YR, value of 2 to 4, and chroma of 1 or 2. It is extremely acid to strongly acid. In some pedons there is an Ap horizon, which has hue of 10YR, value of 3 to 5, and chroma of 2 to 4.

The B horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. It is very strongly acid or strongly acid.

Bedrock commonly is fractured siltstone or fine-grained sandstone.

Bethesda Series

The Bethesda series consists of deep, well drained soils that formed in acid regolith. The regolith accumulated as a result of surface mining and is a mixture of partly weathered fine earth and fragments of acid shale, siltstone, coal, and medium-grained and fine-grained sandstone. Permeability is moderately slow. The slope ranges from 2 to 70 percent.

Bethesda soils are similar to and commonly are adjacent to Fairpoint soils. Fairpoint soils are less acid in the C horizon than Bethesda soils.

Typical pedon of Bethesda silty clay loam, 2 to 12 percent slopes, about 2.3 miles southeast of Mount Eaton, in Paint Township, about 1,500 feet east and 675 feet south of the northwest corner of sec. 24, T. 15 N., R. 11 W.

Ap—0 to 6 inches; dark gray (10YR 4/1) silty clay loam, gray (10YR 6/1) dry; weak medium and coarse granular structure; friable; common fine roots; 12 percent coarse fragments; neutral; abrupt smooth boundary.

C1—6 to 29 inches; variegated dark gray (10YR 4/1), light olive brown (2.5Y 5/4), and yellowish brown (10YR 5/6) very shaly silty clay loam; massive; firm; few fine roots; 25 percent shale fragments, 10 percent siltstone fragments, and 5 percent coal fragments; extremely acid; clear smooth boundary.

C2—29 to 52 inches; variegated light brownish gray (2.5Y 6/2), gray (10YR 5/1), and brownish yellow (10YR 6/6) very shaly silty clay loam; massive; firm; 25 percent shale fragments and 15 percent fine-grained sandstone fragments; extremely acid; clear smooth boundary.

C3—52 to 60 inches; variegated gray (10YR 5/1) and yellowish brown (10YR 5/6) very channery silty clay loam; massive; firm; 20 percent coal fragments, 10 percent siltstone fragments, and 5 percent fine-grained sandstone fragments; extremely acid.

The depth to bedrock is more than 5 feet. Coarse fragments make up 35 to 75 percent of the volume below the Ap horizon. They are dominantly less than 10 inches in diameter, but they include some stones or boulders. The soil ranges from strongly acid to extremely acid throughout, except in the surface layer where lime has been applied.

The A horizon is dominantly silty clay loam, but it is clay loam, silt loam, or loam in some pedons. It has hue of 7.5YR to 2.5Y or is neutral; value is 4 to 6, and chroma is 0 to 6.

The C horizon is the very shaly, extremely shaly, very channery, or extremely channery analogs of silty clay loam, clay loam, silt loam, or loam. It has hue of 7.5YR or 5Y or is neutral; value is 3 to 6, and chroma is 0 to 6.

Bogart Series

The Bogart series consists of deep, moderately well drained soils on outwash plains, stream terraces, and kames. These soils formed in stratified glacial outwash deposits. Permeability is moderate or moderately rapid over rapid. The slope ranges from 0 to 6 percent.

Bogart soils are similar to Chili and Glenford soils and commonly are adjacent to Chili and Jimtown soils. Unlike Bogart soils, Chili soils are well drained and do not have low-chroma mottles in the subsoil. Glenford soils have more silt and less gravel and sand in the subsoil than Bogart soils. Jimtown soils are somewhat poorly drained and have low-chroma mottles immediately below the surface layer.

Typical pedon of Bogart loam, 2 to 6 percent slopes, about 1.8 miles southwest of Creston, in Canaan Township, about 1,450 feet east and 2,500 feet north of the southwest corner of sec. 11, T. 17 N., R. 13 W.

Ap—0 to 9 inches; dark brown (10YR 4/3) loam, pale brown (10YR 6/3) dry; weak fine and medium granular structure; friable; many fine and medium roots; 5 percent gravel; slightly acid; abrupt smooth boundary.

BE—9 to 16 inches; yellowish brown (10YR 5/4) loam; moderate fine and medium granular structure; friable; common fine and medium roots; thin very patchy brown (10YR 4/3) silt coatings on faces of peds; 7 percent gravel; slightly acid; clear wavy boundary.

Bt1—16 to 22 inches; yellowish brown (10YR 5/4) gravelly loam; many fine and medium faint yellowish brown (10YR 5/6) and common medium distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; friable; few fine and medium roots; thin very patchy yellowish brown (10YR 5/4) clay films on vertical faces of peds; 18 percent coarse fragments; slightly acid; clear wavy boundary.

Bt2—22 to 29 inches; brown (10YR 5/3) gravelly loam; many medium distinct yellowish brown (10YR 5/6) and many medium faint grayish brown (10YR 5/2) mottles; moderate medium and coarse subangular blocky structure; friable; few fine and medium roots; thin very patchy brown (10YR 5/3) clay films on vertical faces of peds and medium very patchy brown (10YR 5/3) clay films on horizontal faces of peds; 20 percent gravel; slightly acid; clear wavy boundary.

Bt3—29 to 34 inches; brown (10YR 5/3) very gravelly loam; many medium distinct dark grayish brown (10YR 4/2) and yellowish brown (10YR 5/6) mottles; moderate medium and coarse subangular blocky structure; friable; few fine roots; thin patchy brown (10YR 5/3) clay films on vertical faces of peds and thin very patchy brown (10YR 5/3) clay films on horizontal faces of peds; 45 percent gravel; slightly acid; clear wavy boundary.

Bt4—34 to 43 inches; dark brown (10YR 4/3) very gravelly sandy clay loam; common medium distinct yellowish brown (10YR 5/6) and common medium faint dark grayish brown (10YR 4/2) mottles; weak medium subangular blocky structure; friable; few fine roots; thin patchy brown (10YR 4/3) clay films on horizontal and vertical faces of peds; 40 percent gravel; slightly acid; gradual wavy boundary.

Bt5—43 to 50 inches; dark brown (10YR 4/3) gravelly sandy loam; few fine distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; very friable; few fine roots; thin patchy brown (10YR 4/3) clay bridging between sand grains; 25 percent gravel; slightly acid; gradual wavy boundary.

C—50 to 60 inches; dark brown (10YR 4/3) gravelly loamy sand; single grained; loose; 20 percent gravel; neutral.

The solum is 30 to 50 inches thick. Coarse fragments make up 0 to 30 percent of the volume in the upper 10 inches of the BE and B horizons and 15 to 50 percent in the solum below a depth of 20 inches.

The Ap horizon has hue of 10YR, value of 4, and chroma of 2 or 3. It is commonly loam but is silt loam in some pedons. Where it has been limed, it ranges from medium acid to neutral. In uncultivated areas there are an A 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 sandy loam, loam, or sandy clay loam and the gravelly or very gravelly analogs. Some pedons are silt loam to a depth of 24 inches. The Bt horizon is very strongly acid to slightly acid.

The C horizon is loam to loamy sand and the gravelly or very gravelly analogs. It is sand, gravelly sand, or very gravelly sand in some pedons. It ranges from strongly acid to neutral.

Canfield Series

The Canfield series consists of deep, moderately well drained soils on uplands. The soils formed mainly in glacial till, but in many areas the till was covered by a thin mantle of loess. These soils have a fragipan. Permeability is moderate above the fragipan and slow in the fragipan. The slope ranges from 0 to 12 percent.

Canfield soils are similar to Rittman and Wooster soils and commonly are adjacent to Ravenna, Riddles, and Wooster soils. Unlike Canfield soils, Ravenna soils are somewhat poorly drained and have mottles immediately below the surface layer. Riddles soils are well drained and do not have a fragipan. Rittman soils have more clay in the subsoil than Canfield soils. Wooster soils are well drained and generally are in higher positions on the landscape than Canfield soils.

Typical pedon of Canfield silt loam, 2 to 6 percent slopes, about 2 miles north of Apple Creek, in East Union Township, about 750 feet east and 130 feet south of the northwest corner of sec. 16, T. 16 N., R. 12 W.

Ap—0 to 8 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak medium granular structure; friable; medium acid; abrupt smooth boundary.

E—8 to 10 inches; brown (10YR 5/3) silt loam; weak fine subangular blocky structure; friable; strongly acid; clear smooth boundary.

BE—10 to 12 inches; yellowish brown (10YR 5/4) silt loam; weak and moderate fine subangular blocky structure; friable; thin silt coatings on faces of peds; strongly acid; clear wavy boundary.

2Bt1—12 to 21 inches; yellowish brown (10YR 5/4) loam; moderate medium subangular blocky structure; firm; thin continuous clay films on faces of peds; 5 percent small sandstone and shale fragments; strongly acid; clear wavy boundary.

2Bt2—21 to 26 inches; light olive brown (2.5Y 5/4) loam; common medium distinct light olive gray (5Y 6/2) mottles; moderate medium subangular blocky structure; firm; thin patchy clay films on faces of peds; 5 percent sandstone and shale fragments; strongly acid; clear irregular boundary.

2Btx1—26 to 40 inches; dark yellowish brown (10YR 4/4) loam; many coarse prominent gray (5Y 5/1) mottles; weak very coarse prismatic structure parting to weak thick platy; very firm, brittle; common thin clay films on horizontal prism and plate faces; thin gray clay flows and silt coatings on vertical faces of prisms; 8 percent sandstone and shale fragments; strongly acid; gradual wavy boundary.

2Btx2—40 to 55 inches; light olive brown (2.5Y 5/4) loam; very weak thick platy structure; very firm, brittle; thin gray clay films on vertical faces of peds; many medium black (10YR 2/1) and very dark brown (10YR 2/2) stains, streaks, and concretions (Fe and Mn oxides); 10 percent small sandstone and shale fragments; medium acid; diffuse irregular boundary.

2C—55 to 72 inches; light olive brown (2.5Y 5/4) gravelly loam; massive; friable; 15 percent sandstone and shale fragments; medium acid.

The thickness of the solum ranges from 40 to 64 inches, and the depth to the top of the fragipan ranges from 15 to 30 inches. Some pedons do not have the thin silt mantle. Coarse fragments range from 0 to 6 percent above the fragipan, 5 to 15 percent in the fragipan, and 10 to 30 percent in the C horizon.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. Where lime has been applied, the A horizon is medium acid to neutral. In uncultivated areas the A horizon is 1 to 4 inches thick.

The Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 4 to 6. It is dominantly loam or silt loam, but it includes subhorizons of clay loam or silty clay loam. It is very strongly acid or strongly acid. The Btx horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 to 6. It is typically loam or silt loam. Reaction is very strongly acid to neutral.

The C horizon has hue of 10YR or 2.5Y, value of 5, and chroma of 3 to 6. It is loam, silt loam, or sandy loam and the gravelly analogs. It is medium acid to mildly alkaline.

Cardington Series

The Cardington series consists of deep, moderately well drained soils that formed in glacial till on uplands. Permeability is moderately slow. The slope ranges from 2 to 12 percent.

These soils have less clay in the argillic horizon than is definitive for the Cardington series. This difference, however, does not affect the use or behavior of the soils.

Cardington soils are similar to Alexandria and Riddles soils and commonly are adjacent to Alexandria, Bennington, and Riddles soils. Unlike Cardington soils, Alexandria and Riddles soils are well drained and do not have low-chroma mottles in the upper 10 inches of the argillic horizon. Bennington soils are somewhat poorly drained and have mottles immediately below the surface layer.

Typical pedon of Cardington silt loam, 2 to 6 percent slopes, about 3.5 miles southeast of West Salem, in Congress Township, about 2,070 feet west and 500 feet south of the northeast corner of sec. 21, T. 21 N., R. 14 W.

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate fine and medium granular structure; friable; many fine and medium roots; 3 percent coarse fragments; slightly acid; abrupt smooth boundary.

BE—8 to 14 inches; yellowish brown (10YR 5/4) silt loam; weak fine subangular blocky structure; firm; common fine and medium roots; 4 percent coarse fragments; medium acid; clear wavy boundary.

Bt1—14 to 18 inches; yellowish brown (10YR 5/4) clay loam; few fine distinct light brownish gray (10YR 6/2) and few fine faint yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; common fine and medium roots; thin patchy dark yellowish brown (10YR 4/4) clay films on faces of peds; 5 percent coarse fragments; very strongly acid; clear smooth boundary.

Bt2—18 to 26 inches; dark yellowish brown (10YR 4/4) clay loam; common medium distinct light brownish gray (10YR 6/2) and few fine distinct yellowish brown (10YR 5/6) mottles; moderate medium angular blocky structure; firm; few fine and medium roots; thin patchy dark yellowish brown (10YR 4/4) and light brownish gray (10YR 6/2) clay films on faces of peds; 5 percent coarse fragments; very strongly acid; clear smooth boundary.

Bt3—26 to 40 inches; dark yellowish brown (10YR 4/4) silty clay loam; few medium distinct light brownish gray (10YR 6/2) mottles; weak coarse prismatic structure parting to moderate coarse angular blocky; firm; few fine roots; thin patchy dark yellowish brown (10YR 4/4) and light brownish gray (10YR 6/2) clay films on faces of peds; few medium very dark grayish brown (10YR 3/2) concretions (Fe and Mn oxides); 7 percent coarse fragments; slightly acid; clear wavy boundary.

C—40 to 60 inches; dark yellowish brown (10YR 4/4) silty clay loam; massive; firm; common fine and medium white (10YR 8/2) carbonate coatings; 10 percent coarse fragments; strong effervescence; moderately alkaline.

The solum is 28 to 45 inches thick. The depth to carbonates ranges from 26 to 45 inches. The content of coarse fragments, which are mainly partly weathered sandstone and shale, is 0 to 5 percent to a depth of 20 inches, 2 to 10 percent in the solum below a depth of 20 inches, and 2 to 15 percent in the C horizon.

The Ap horizon has hue of 10YR, value of 4, and chroma of 2 or 3. It is dominantly silt loam, but it is silty clay loam in some eroded areas. Where it has been limed, it ranges from medium acid to neutral. In uncultivated areas there are an A 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 silty clay loam or clay loam. It ranges from very strongly acid to medium acid in the upper part and medium acid to neutral in the lower part. Some pedons have a BC horizon that is mildly alkaline.

The C horizon is silty clay loam, clay loam, loam, or silt loam. It is mildly alkaline or moderately alkaline.

Carlisle Series

The Carlisle series consists of deep, very poorly drained soils that formed in organic deposits in bogs and depressions on lake plains, outwash terraces, flood plains, and till plains. Permeability is moderately slow to moderately rapid. The slope is less than 2 percent.

Carlisle soils are similar to Linwood soils and commonly are adjacent to Killbuck, Linwood, Luray, Melvin, and Sebring soils. Unlike Carlisle soils, Killbuck, Luray, Melvin, and Sebring soils formed in mineral material. Linwood soils formed in less than 51 inches of organic material over mineral material.

Typical pedon of Carlisle muck, about 2.5 miles west-northwest of Shreve, in Clinton Township, about 185 feet east and 1,850 feet south of the northwest corner of sec. 16, T. 18 N., R. 14 W.

Op—0 to 7 inches; black (10YR 2/1) broken face and rubbed sapric material, very dark grayish brown (10YR 3/2) dry; about 10 percent fiber, 1 percent rubbed; weak fine granular structure; friable; many fine roots; estimated mineral content 35 percent; very strongly acid; abrupt smooth boundary.

Oa1—7 to 11 inches; black (10YR 2/1) broken face and very dark brown (10YR 2/2) rubbed sapric material; about 10 percent fiber, trace rubbed; moderate fine subangular blocky structure; friable; common fine roots; estimated mineral content 25 percent; about 20 percent strong brown (7.5YR 5/6) sapric material mixed throughout; very strongly acid; clear smooth boundary.

Oa2—11 to 16 inches; black (10YR 2/1) broken face and rubbed sapric material; about 5 percent fiber, trace rubbed; moderate medium and coarse subangular blocky structure; friable; few fine roots; estimated mineral content 20 percent; very strongly acid; clear smooth boundary.

Oa3—16 to 24 inches; black (10YR 2/1) broken face and rubbed sapric material; about 5 percent fiber, trace rubbed; massive; nonsticky; few fine roots; estimated mineral content 20 percent; very strongly acid; clear smooth boundary.

Oa4—24 to 45 inches; dark yellowish brown (10YR 3/4) broken face sapric material that changes to very dark brown (10YR 2/2) when oxidized (2 to 4 minutes), very dark brown (10YR 2/2) rubbed; about 15 percent fiber, 2 percent rubbed; massive; nonsticky; few fine roots; estimated mineral content 15 percent; strongly acid; gradual wavy boundary.

Oa5—45 to 60 inches; dark yellowish brown (10YR 3/4) broken face sapric material that changes to very dark brown (10YR 2/2) when oxidized (2 to 4 minutes), very dark brown (10YR 2/2) rubbed; about 10 percent fiber, 1 percent rubbed; massive; nonsticky; estimated mineral content 25 percent; few woody fragments; strongly acid.

The organic deposits are more than 51 inches thick.

The surface tier ranges from very strongly acid to neutral. The subsurface tier has hue of 5YR to 10YR or is neutral; it has value of 2 or 3 and chroma of 0 to 4. Broken faces commonly become darker upon exposure to the air. The subsurface tier is dominantly sapric material, and the rubbed fiber content is less than 10 percent of the organic volume. Reaction ranges from very strongly acid to neutral. The bottom tier has color similar to that of the subsurface tier. It has variable amounts of woody and herbaceous layers; however, herbaceous fibers generally constitute the greater part. This tier is dominantly sapric material, but some pedons have thin layers of hemic material. Reaction ranges from strongly acid to neutral.

Chili Series

The Chili series consists of deep, well drained soils that formed in stratified outwash deposits on plains, stream terraces, and kames. Permeability is moderately rapid. The slope ranges from 0 to 70 percent.

Chili soils are similar to Oshtemo and Bogart soils and commonly are adjacent to Bogart and Jimtown soils. Unlike Chili soils, Bogart soils are moderately well drained and have low- chroma mottles in the lower part of the subsoil. Jimtown soils are somewhat poorly drained and have low-chroma mottles immediately below the surface layer. Oshtemo soils have less clay and more sand in the subsoil than Chili soils.

Typical pedon of Chili loam, 2 to 6 percent slopes, about 1.5 miles southwest of Creston, in Canaan Township, about 2,245 feet east and 2,480 feet south of the northwest corner of sec. 11, T. 17 N., R. 13 W.

Ap—0 to 9 inches; dark brown (7.5YR 4/2) loam, light brownish gray (10YR 6/2) dry; moderate medium and coarse granular structure; friable; many fine and medium roots; 2 percent gravel; neutral; abrupt smooth boundary.

Bt1—9 to 18 inches; brown (7.5YR 4/4) clay loam; moderate fine and medium subangular blocky structure; friable; common fine and medium roots; dark brown (7.5YR 4/2) silt coatings in root channels; thin very patchy brown (7.5YR 4/4) clay films on faces of peds; 10 percent gravel; medium acid; gradual wavy boundary.

Bt2—18 to 29 inches; dark yellowish brown (10YR 4/4) gravelly clay loam; moderate medium and coarse subangular blocky structure; friable; common fine and medium roots; thin patchy dark yellowish brown (10YR 4/4) clay films on faces of peds; 15 percent gravel; medium acid; clear wavy boundary.

Bt3—29 to 37 inches; stratified dark yellowish brown (10YR 4/4) sandy clay loam and brown (7.5YR 4/4) fine sandy loam; weak coarse subangular blocky structure; firm; common fine roots; thin patchy brown (7.5YR 4/4) clay films on faces of peds; 12 percent gravel; medium acid; clear wavy boundary.

Bt4—37 to 49 inches; brown (7.5YR 4/4) gravelly clay loam; weak medium subangular blocky structure; firm; common fine roots; thin patchy brown (7.5YR 4/4) clay films on faces of peds and bridging sand grains; 25 percent gravel; slightly acid; clear wavy boundary.

BC—49 to 54 inches; brown (7.5YR 4/4) sandy loam; weak coarse subangular blocky structure; friable; common fine roots; 5 percent gravel; slightly acid; clear wavy boundary.

C—54 to 60 inches; brown (10YR 4/3) very gravelly loamy sand; single grained; loose; 35 percent gravel; slight effervescence; mildly alkaline.

The solum ranges in thickness from 30 to 65 inches, but typically it is 40 to 60 inches thick. The amount of gravel is variable in most pedons because of stratification. It ranges from 0 to 30 percent in the A and B horizons above a depth of 20 inches, 15 to 50 percent in the B and C horizons from 20 to 40 inches, and 25 to 60 percent in the B and C horizons below 40 inches. Some pedons have a silt mantle 8 to 22 inches thick.

The Ap horizon has hue of 10YR or 7.5YR, value of 4, and chroma of 2 or 3. It is commonly loam or gravelly loam, but in some pedons it is silt loam. Reaction, where the soil has been treated with lime, ranges from medium acid to neutral.

The Bt horizon has hue of 5YR to 10YR, value of 4 or 5, and chroma of 3 to 6. It is loam, fine sandy loam, sandy loam, clay loam, or sandy clay loam and the gravelly or very gravelly analogs. Less commonly, the range includes silt loam or silty clay loam to a depth of 24 inches. It ranges from strongly acid to slightly acid.

The C horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 to 4. It typically is stratified sand or loamy sand and the gravelly or very gravelly analogs. In some pedons it has thin subhorizons of sandy loam. It ranges from strongly acid to mildly alkaline.

Condit Series

The Condit series consists of deep, poorly drained soils that formed in glacial till on uplands. Permeability is slow. The slope is 0 to 2 percent.

Condit soils are similar to Sebring soils and commonly are adjacent to Bennington and Cardington soils. Unlike Condit soils, Bennington and Cardington soils are not dominantly gray in the upper part of the subsoil. Bennington soils are somewhat poorly drained, and Cardington soils are moderately well drained. Sebring soils formed in lacustrine deposits, have more silt and less clay in the subsoil than Condit soils, and have an ochric epipedon.

Typical pedon of Condit silt loam, about 1.5 miles east of West Salem, in Congress Township, about 1,450 feet south and 2,510 feet west of the northeast corner of sec. 8, T. 21 N., R. 14 W.

Ap1—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; few fine distinct olive (5Y 5/4) and strong brown (7.5YR 5/6) mottles; weak fine and medium granular structure; friable; many fine and coarse roots; 2 percent coarse fragments; neutral; abrupt smooth boundary.

Ap2—8 to 10 inches; dark grayish brown (10YR 4/2) silt loam; common fine distinct gray (N 5/0) mottles; weak fine subangular blocky structure parting to weak medium granular; friable; common fine roots; few fine reddish brown (5YR 3/4) concretions (Fe and Mn oxides); 2 percent coarse fragments; neutral; abrupt smooth boundary.

Bg—10 to 14 inches; dark gray (N 4/0) silty clay loam; common fine prominent light olive brown (2.5Y 5/6) mottles; weak fine subangular blocky structure; firm; common fine roots; thin very patchy clay films on faces of peds; common fine dark reddish brown (5YR 3/4) concretions (Fe and Mn oxides); 2 percent coarse fragments; slightly acid; clear smooth boundary.

Btg1—14 to 20 inches; gray (N 5/0) silty clay loam; many fine prominent light olive brown (2.5Y 5/6) mottles; moderate medium subangular blocky structure; firm; common fine roots; thin patchy clay films on faces of peds; common fine dark reddish brown (5YR 3/4) concretions and stains (Fe and Mn oxides); 2 percent coarse fragments; medium acid; clear smooth boundary.

Btg2—20 to 28 inches; dark gray (N 4/0) silty clay; common fine prominent dark grayish brown (2.5Y 4/2) mottles; moderate coarse subangular blocky structure; firm; few fine roots; thin patchy clay films on faces of peds; few fine black (N 2/0) stains and concretions (Fe and Mn oxides); 2 percent coarse fragments; slightly acid; clear smooth boundary.

Btg3—28 to 34 inches; gray (N 5/0) silty clay loam; few fine prominent olive brown (2.5Y 4/4) and few fine distinct dark gray (N 4/0) mottles; moderate coarse subangular blocky structure; firm; few fine roots; thin patchy clay films on faces of peds; few fine black (N 2/0) stains and concretions (Fe and Mn oxides); 2 percent coarse fragments; neutral; clear wavy boundary.

Btg4—34 to 43 inches; gray (N 5/0) silty clay loam; many medium prominent light olive brown (2.5Y 5/6) mottles; weak coarse subangular blocky structure; firm; thin patchy clay films on faces of peds; few fine black (N 2/0) stains and concretions (Fe and Mn oxides); 4 percent coarse fragments; neutral; clear wavy boundary.

Btg5—43 to 46 inches; gray (N 5/0) clay loam; many medium prominent light olive brown (2.5Y 5/6) mottles; weak coarse subangular blocky structure; firm; thin patchy clay films on faces of peds; few fine black (N 2/0) stains and concretions (Fe and Mn oxides); 5 percent coarse fragments; slight effervescence; mildly alkaline; clear wavy boundary.

C—46 to 60 inches; olive brown (2.5Y 4/4) clay loam; many coarse prominent gray (N 5/0) mottles; massive; firm; few fine black (N 2/0) stains and concretions (Fe and Mn oxides) along seams; 5 percent coarse fragments; strong effervescence; mildly alkaline.

The thickness of the solum and the depth to carbonates range from 30 to 52 inches. The content of coarse fragments, primarily small angular pebbles, is 2 to 5 percent by volume in the solum and 2 to 10 percent in the C horizon.

The Ap horizon has hue of 10YR, value of 4, and chroma of 1 or 2. Reaction, where the soil has been treated with lime, ranges from medium acid to neutral. In uncultivated areas there are an A and an E horizon.

The Bt horizon has hue of 10YR to 5Y is neutral; it has value of 4 or 5 and chroma of 0 to 2. It is silty clay, silty clay loam, or clay loam. It ranges from strongly acid to slightly acid in the upper part and from medium acid to mildly alkaline in the lower part.

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.

Coshocton Series

The Coshocton series consists of deep, moderately well drained soils that formed in colluvium and in the underlying residuum of shale bedrock on uplands. Permeability is moderately slow or slow. The slope ranges from 6 to 12 percent.

Coshocton soils commonly are adjacent to Berks, Canfield, and Loudonville soils. Unlike Coshocton soils, Berks and Loudonville soils are moderately deep to bedrock and are well drained. Berks soils have more rock fragments in the subsoil than Coshocton soils. Canfield soils formed in glacial till and, in many areas, in a thin mantle of loess; they have a fragipan, which Coshocton soils do not have.

Typical pedon of Coshocton silt loam, 6 to 12 percent slopes, about 3.2 miles southeast of Mount Eaton, in Paint Township, about 1,200 feet north and 130 feet west of the southeast corner of sec. 24, T. 15 N., R. 11 W.

Ap—0 to 7 inches; dark brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; moderate medium and coarse granular structure; friable; many fine and medium roots; 3 percent coarse fragments; slightly acid; abrupt smooth boundary.

Bt1—7 to 15 inches; yellowish brown (10YR 5/6) silt loam; moderate medium and coarse subangular blocky structure; friable; few fine roots; very patchy yellowish brown (10YR 5/6) clay films on vertical faces of peds; 5 percent coarse fragments; medium acid; clear wavy boundary.

Bt2—15 to 21 inches; dark yellowish brown (10YR 4/6) clay loam; many medium distinct grayish brown (10YR 5/2), yellowish brown (10YR 5/6), and brown (7.5YR 5/4) mottles; weak coarse prismatic structure parting to strong medium and coarse subangular blocky; firm; few fine roots; continuous grayish brown (10YR 5/2) clay films on horizontal and vertical faces of peds; 3 percent coarse fragments; medium acid; clear wavy boundary.

Bt3—21 to 28 inches; grayish brown (10YR 5/2) clay loam; many medium distinct yellowish brown (10YR 5/6) and dark brown (7.5YR 4/4) mottles; strong medium and coarse subangular blocky structure; very firm; few very fine roots; very patchy grayish brown (10YR 5/2) clay films on the vertical and horizontal faces of peds; 5 percent coarse fragments; strongly acid; clear irregular boundary.

2Bt4—28 to 33 inches; dark grayish brown (10YR 4/2) shaly loam; common medium distinct yellowish brown (10YR 5/4) and common medium faint very dark grayish brown (10YR 3/2) mottles; weak thick platy structure parting to moderate medium subangular blocky; firm; few very fine roots; very patchy dark grayish brown (10YR 4/2) clay films on vertical and horizontal faces of peds; 15 percent coarse fragments; strongly acid; gradual wavy boundary.

2C—33 to 48 inches; dark gray (10YR 4/1) very shaly loam; few medium distinct dark brown (10YR 4/3) mottles; weak thick platy structure derived from bedrock; very firm; very patchy dark gray (10YR 4/1) clay films on vertical and horizontal faces of peds; 60 percent soft shale fragments; strongly acid; gradual wavy boundary.

2R—48 inches; dark gray (10YR 4/1) soft shale; cannot be dug but can be chipped with a spade.

The depth to a lithic contact ranges from 40 to 72 inches or more. The solum is 30 to 50 inches thick. The depth to material that weathered from shale is 20 to 40 inches.

The Ap horizon ranges from medium acid to neutral where lime has been applied.

The B horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 2 to 6. It is silt loam, silty clay loam, or clay loam in the upper part and silty clay loam, loam, or clay loam and the shaly or channery analogs in the lower part. It is medium acid or strongly acid in the upper part and medium acid to very strongly acid in the lower part.

The C horizon has value of 4 or 5 and chroma of 1 to 4. It is loam, silty clay loam, or silty clay and the channery, very channery, shaly, or very shaly analogs. It is strongly acid or very strongly acid.

Dekalb Series

The Dekalb series consists of moderately deep, well drained, rapidly permeable soils on knobs and steep side slopes on uplands. The soils formed in residuum of acid sandstone. The slope ranges from 12 to 25 percent.

Dekalb soils are similar to Berks soils and commonly are adjacent to Loudonville, Riddles, and Wooster soils. Berks soils have less sand and more silt in the solum than Dekalb soils, and Loudonville, Riddles, and Wooster soils have a lower percentage of coarse fragments in the subsoil. Riddles and Wooster soils, unlike Dekalb soils, are deep to bedrock.

Typical pedon of Dekalb channery loam, 18 to 25 percent slopes, about 3.4 miles southeast of Doylestown, in Chippewa Township, about 420 feet west and 130 feet south of the northeast corner of sec. 25, T. 18 N., R. 11 W.

A—0 to 3 inches; very dark grayish brown (10YR 3/2) channery loam; weak fine granular structure; friable; many fine and medium roots; 15 percent coarse fragments; very strongly acid; abrupt irregular boundary.

E—3 to 8 inches; brown (10YR 5/3) channery very fine sandy loam; weak thin platy structure; friable; common fine and medium roots; few fine dark grayish brown (10YR 4/2) krotovinas; 15 percent coarse fragments; very strongly acid; gradual wavy boundary.

Bw1—8 to 11 inches; yellowish brown (10YR 5/4) channery very fine sandy loam; weak medium subangular blocky structure; friable; common fine roots; few fine dark grayish brown (10YR 4/2) krotovinas; 20 percent coarse fragments; very strongly acid; gradual wavy boundary.

Bw2—11 to 24 inches; yellowish brown (10YR 5/6) very channery sandy loam; weak medium subangular blocky structure; friable; common fine roots; 40 percent coarse fragments; very strongly acid; gradual wavy boundary.

BC—24 to 30 inches; yellowish brown (10YR 5/6) very channery sandy loam; weak coarse subangular blocky structure; friable; common fine roots; 45 percent coarse fragments; very strongly acid; clear irregular boundary.

R—30 inches; hard sandstone bedrock that has some vertical fractures; soil material and some fine roots in fractures.

The thickness of the solum and the depth to bedrock range from 20 to 40 inches. Flat sandstone fragments 1 to 10 inches across make up 10 to 60 percent of the volume in the Bw horizon and have a weighted average content of 35 to 75 percent in the textural control section.

The A horizon is 2 to 4 inches thick. It has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is commonly channery loam, but in some pedons it is very fine sandy loam or sandy loam. The A horizon is very strongly acid or strongly acid, unless it is limed.

The E horizon is 3 to 6 inches thick.

The Bw horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 4 to 8. It is loam, very fine sandy loam, fine sandy loam, or sandy loam and the channery, very channery, or extremely channery analogs. The content of clay, on the average, is between 6 and 18 percent. The Bw horizon ranges from extremely acid to strongly acid.

In some pedons there is a C horizon.

Euclid Series

The Euclid series consists of deep, somewhat poorly drained soils on low stream terraces. The soils formed in stratified material. Permeability is moderately slow. The slope is 0 to 2 percent.

Euclid soils are similar to Fitchville soils and commonly are adjacent to Fitchville, Orrville, and Melvin soils. Fitchville soils have an argillic horizon, which Euclid soils do not have. Unlike Euclid soils, Orrville and Melvin soils are on flood plains, and they do not have a steady decrease in organic matter with increasing depth. Melvin soils are poorly drained and have dominant low-chroma colors in the subsoil.

Typical pedon of Euclid silt loam, occasionally flooded, about 1.5 miles northwest of Marshallville, in Chippewa Township, about 1,715 feet west and 265 feet north of the southeast corner of sec. 28, T. 18 N., R. 11 W.

Ap—0 to 11 inches; dark brown (10YR 4/3) silt loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; many fine and medium roots; strongly acid; abrupt smooth boundary.

AB—11 to 16 inches; dark brown (10YR 4/3) silt loam; many medium distinct gray (10YR 5/1) and few fine faint brown (10YR 5/3) mottles; weak thick platy structure; friable; common fine roots; few fine black (10YR 2/1) concretions (Fe and Mn oxides); medium acid; clear wavy boundary.

Bw1—16 to 20 inches; yellowish brown (10YR 5/4) silt loam; many medium distinct gray (10YR 5/1) and few fine faint yellowish brown (10YR 5/6) mottles; weak fine and medium subangular blocky structure; friable; common fine roots; grayish brown (2.5Y 5/2) silt coatings on faces of peds; few fine black (10YR 2/1) concretions (Fe and Mn oxides); medium acid; clear wavy boundary.

Bw2—20 to 27 inches; dark yellowish brown (10YR 4/4) silty clay loam; many medium prominent gray (5Y 6/1) and common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure; firm; common fine roots; thin continuous gray (5Y 6/1) silt coatings on faces of peds; common fine black (10YR 2/1) concretions (Fe and Mn oxides); medium acid; clear wavy boundary.

Bw3—27 to 33 inches; dark yellowish brown (10YR 4/4) silty clay loam; many medium prominent gray (5Y 6/1) and common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure; firm; few fine roots; thin continuous gray (5Y 6/1) silt coatings on faces of peds; common fine black (10YR 2/1) concretions (Fe and Mn oxides); slightly acid; clear wavy boundary.

Bg1—33 to 40 inches; gray (N6/0) silty clay loam; many medium prominent strong brown (7.5YR 5/6) and common fine prominent olive (5Y 5/3) mottles; weak coarse prismatic structure; firm; few fine roots; medium very patchy gray (5Y 6/1) silt coatings on faces of peds; thin strata of loam; common fine black (10YR 2/1) concretions (Fe and Mn oxides); slightly acid; clear wavy boundary.

Bg2—40 to 50 inches; gray (N6/0) silty clay loam; many medium prominent strong brown (7.5YR 5/6) and common fine prominent olive (5Y 5/3) mottles; weak coarse subangular blocky structure; firm; few fine roots; medium very patchy gray (5Y 6/1) silt coatings on faces of peds; common fine black (10YR 2/1) concretions (Fe and Mn oxides); slightly acid; clear wavy boundary.

BC—50 to 54 inches; dark brown (7.5YR 4/4) clay loam; many medium prominent gray (N6/0) mottles; weak coarse subangular blocky structure; firm; common fine black (10YR 2/1) concretions (Fe and Mn oxides); neutral; clear wavy boundary.

C—54 to 60 inches; strong brown (7.5YR 5/6) silt loam; many medium prominent gray (10YR 6/1) and many medium distinct dark yellowish brown (10YR 4/4) mottles; massive; friable; few fine black (10YR 2/1) concretions (Fe and Mn oxides); neutral.

The solum is 35 to 55 inches thick. Stratification is evident within the series control section.

The Ap horizon has hue of 10YR, value of 4 or 5 (6 or more dry), and chroma of 2 or 3.

The Bw and Bg horizons have hue of 7.5YR or 10YR, or hue is neutral; value is 4 to 6, and chroma is 0 to 6. The B horizon is silt loam or silty clay loam. In some pedons it has thin subhorizons of loam. It ranges from very strongly acid to slightly acid.

The C horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 1 to 6. It is dominantly silt loam, silty clay loam, or loam. In some pedons it has thin strata of fine sandy loam. It ranges from medium acid to neutral.

Fairpoint Series

The Fairpoint series consists of deep, well drained soils that formed in medium acid to neutral regolith from surface mining. The regolith is a mixture of partly weathered fine earth and fragments of neutral or calcareous shale and some fine-grained and medium-grained sandstone, siltstone, limestone, and coal. Permeability is moderately slow. The slope ranges from 2 to 12 percent.

Fairpoint soils are similar to and commonly are adjacent to Bethesda soils. Bethesda soils are more acid in the C horizon than Fairpoint soils.

Typical pedon of Fairpoint silty clay loam, 2 to 12 percent slopes, about 0.6 mile southwest of Mount Eaton, in Paint Township, about 600 feet west and 2,075 feet north of the southeast corner of sec. 16, T. 15 N., R. 11 W.

Ap—0 to 5 inches; variegated dark grayish brown (10YR 4/2) and gray (5Y 5/1) silty clay loam, light brownish gray (10YR 6/2) and light gray (10YR 7/2) dry; weak medium granular structure; friable; common fine roots; 5 percent dark yellowish brown (10YR 4/4) shale fragments; neutral; abrupt smooth boundary.

C1—5 to 23 inches; variegated dark brown (10YR 3/3), gray (N 5/0), and dark reddish brown (2.5YR 2/4) very shaly silty clay loam; massive; firm; few fine roots; 20 percent soft shale fragments, 10 percent fine-grained sandstone fragments, 5 percent limestone fragments, and 2 percent coal fragments; neutral; clear wavy boundary.

C2—23 to 40 inches; variegated gray (10YR 5/1), yellowish brown (10YR 5/6), gray (N 5/0), and dark brown (7.5YR 4/2) very shaly silty clay loam; massive; firm; few fine roots; 25 percent soft shale fragments, 5 percent fine-grained sandstone fragments, 5 percent limestone fragments, and 5 percent coal fragments; neutral; clear wavy boundary.

C3—40 to 50 inches; gray (N 5/0) extremely shaly silty clay loam; massive; firm; 70 percent soft shale fragments; neutral; clear wavy boundary.

C4—50 to 60 inches; variegated dark grayish brown (10YR 4/2), gray (10YR 5/1), and yellowish brown (10YR 5/6) very shaly silty clay loam; massive; firm; 35 percent soft shale fragments; neutral.

The depth to bedrock is more than 5 feet. The content of rock fragments in the C horizon ranges from 20 to 75 percent and is, on the average, about 40 percent. Coarse fragments commonly are up to 10 inches across and typically include stones and boulders.

The A horizon has hue of 7.5YR to 5Y, value of 4 to 6, and chroma of 0 to 6. It is dominantly silty clay loam, but it is clay loam or silt loam in some pedons. In a few places the surface horizon is the channery or shaly analog of these textures. The A horizon ranges from medium acid to neutral, except where lime has been applied.

The C horizon has hue of 2.5YR to 5Y, or it is neutral; it has value of 2 to 6 and chroma of 0 to 6. The C horizon is commonly very channery, extremely channery, very shaly, or extremely shaly silty clay loam. In some pedons, it is very channery, extremely channery, very shaly, or extremely shaly analogs of clay loam, silt loam, or loam. Reaction typically ranges from medium acid to neutral, but in some pedons there are thin strata that are mildly alkaline or moderately alkaline.

Fitchville Series

The Fitchville series consists of deep, somewhat poorly drained soils on old glacial lakebeds. The soils formed dominantly in silty lacustrine deposits. Permeability is moderately slow. The slope ranges from 0 to 6 percent.

Fitchville soils are similar to Euclid, Jimtown, and Tiro soils and commonly are adjacent to Euclid, Glenford, and Sebring soils. Unlike Fitchville soils, Euclid soils do not have an argillic horizon. Glenford soils are moderately well drained and do not have low-chroma mottles immediately below the A horizon. Jimtown soils have more sand and gravel in the subsoil than Fitchville soils. Sebring soils are poorly drained and have dominant low-chroma colors in the subsoil. Tiro soils have glacial till in the lower part of the soil.

Typical pedon of Fitchville silt loam, 0 to 2 percent slopes, about 4 miles east of Marshallville, in Chippewa Township, about 1,055 feet north and 395 feet east of the southwest corner of sec. 36, T. 18 N., R. 11 W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate fine granular structure; friable; many fine and medium roots; neutral; abrupt smooth boundary.

BE—9 to 12 inches; yellowish brown (10YR 5/6) silt loam; few fine distinct grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; friable; common fine roots; thin continuous brown (10YR 5/3) silt coatings on faces of peds; medium acid; clear smooth boundary.

Bt1—12 to 18 inches; yellowish brown (10YR 5/6) silty clay loam; common medium distinct grayish brown (10YR 5/2) mottles; moderate medium angular blocky structure; firm; common fine roots; medium continuous grayish brown (10YR 5/2) silt coatings on faces of peds; thin very patchy gray (10YR 6/1) clay films in pores and on faces of peds; medium acid; clear wavy boundary.

Bt2—18 to 26 inches; yellowish brown (10YR 5/6) silty clay loam; common medium distinct light brownish gray (10YR 6/2) mottles; weak coarse prismatic structure parting to moderate medium angular blocky; firm; common fine roots; light brownish gray (10YR 6/2) medium continuous silt coatings on faces of peds and thin patchy clay films in pores and on faces of peds; few fine black (10YR 2/1) concretions (Fe and Mn oxides); strongly acid; clear wavy boundary.

Bt3—26 to 33 inches; dark yellowish brown (10YR 4/4) silty clay loam; many medium distinct gray (10YR 6/1) mottles; moderate coarse prismatic structure parting to weak coarse angular blocky; firm; few fine roots; medium continuous grayish brown (10YR 5/2) silt coatings on faces of peds; thin patchy dark yellowish brown (10YR 4/4) clay films in pores and on faces of peds; common fine black (10YR 2/1) concretions (Fe and Mn oxides); strongly acid; clear wavy boundary.

Bt4—33 to 43 inches; dark yellowish brown (10YR 4/4) silty clay loam; common fine distinct gray (10YR 6/1) mottles; moderate coarse angular blocky structure; very firm; few fine roots; medium continuous grayish brown (10YR 5/2) silt coatings on faces of peds; thick very patchy dark yellowish brown (10YR 4/4) clay films in pores and on faces of peds; some laminations; few fine light gray (10YR 7/2) gypsum crystals; medium acid; clear wavy boundary.

Bt5—43 to 52 inches; olive brown (2.5YR 4/4) silty clay loam; common medium prominent gray (10YR 5/1) and few fine prominent strong brown (7.5YR 5/6) mottles; weak coarse angular blocky structure; very firm; few fine roots; medium continuous grayish brown (10YR 5/2) silt coatings on faces of peds; thick very patchy olive brown (2.5Y 4/4) clay films on faces of peds; some laminations; common fine and medium very dark brown (10YR 2/2) concretions (Fe and Mn oxides); slightly acid; clear wavy boundary.

C—52 to 60 inches; dark yellowish brown (10YR 4/4) silty clay loam; massive; firm; common medium gray (10YR 5/1) streaks along fracture lines; neutral.

The solum is 30 to 60 inches thick. Laminations are evident within the series control section.

The Ap horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2. In uncultivated areas there are an A and an E horizon. The Ap horizon ranges from medium acid to neutral where lime has been applied.

The Bt horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 6. It is silty clay loam or silt loam and has thin strata of loam or clay loam in some pedons. It ranges from very strongly acid to medium acid in the upper part and from medium acid to neutral in the lower part.

The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4. It is commonly stratified silt loam and silty clay loam, but in some pedons it has thin strata of loam, fine sandy loam, clay loam, or silty clay. It ranges from slightly acid to mildly alkaline.

Glenford Series

The Glenford series consists of deep, moderately well drained soils on old glacial lakebeds and on terraces along streams. The soils formed dominantly in silty lacustrine deposits. Permeability is moderately slow. The slope ranges from 0 to 18 percent.

Glenford soils are similar to Bogart soils and commonly are adjacent to Fitchville, Luray, and Sebring soils. Bogart soils have more sand and gravel and less silt in the subsoil than Glenford soils. Unlike Glenford soils, Fitchville soils are somewhat poorly drained and have low-chroma mottles immediately below the surface layer. Luray soils are very poorly drained. Sebring soils are poorly drained and have dominant low-chroma colors immediately below the A horizon.

Typical pedon of Glenford silt loam, 2 to 6 percent slopes, about 2.5 miles south of West Salem, in Congress Township, about 2,510 feet north and 100 feet west of the southeast corner of sec. 24, T. 23 N., R. 15 W.

Ap—0 to 9 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

BE—9 to 15 inches; yellowish brown (10YR 5/4) silt loam; moderate fine and medium subangular blocky structure; firm; common fine roots; thin continuous brown (10YR 5/3) silt coatings on faces of peds; 30 percent of upper 3 inches is dark brown (10YR 4/3) material of the A horizon; medium acid; clear smooth boundary.

Bt1—15 to 20 inches; yellowish brown (10YR 5/4) silty clay loam; few fine distinct light brownish gray (10YR 6/2) mottles; moderate medium and coarse subangular blocky structure; firm; common fine roots; thin continuous brown (10YR 5/3) silt coatings on faces of peds; thin very patchy dark yellowish brown (10YR 4/4) clay films on faces of peds; medium acid; clear smooth boundary.

Bt2—20 to 25 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct light brownish gray (10YR 6/2) and common fine distinct strong brown (7.5YR 5/6) mottles; moderate coarse subangular blocky structure; firm; common fine roots; thin continuous yellowish brown (10YR 5/4) silt coatings on faces of peds; thin patchy dark yellowish brown (10YR 4/4) clay films on faces of peds; strongly acid; clear smooth boundary.

Bt3—25 to 38 inches; dark yellowish brown (10YR 4/4) silty clay loam; common medium distinct light brownish gray (10YR 6/2) and common fine distinct strong brown (7.5YR 5/6) mottles; moderate coarse subangular blocky structure; firm; few fine roots; thin continuous yellowish brown (10YR 5/4) silt coatings on faces of peds; thin patchy dark yellowish brown (10YR 4/4) clay films on faces of peds; few fine black (10YR 2/1) concretions (Fe and Mn oxides); medium acid; clear smooth boundary.

Bt4—38 to 52 inches; dark yellowish brown (10YR 4/4) silty clay loam; many medium distinct light brownish gray (10YR 6/2) and many fine distinct yellowish brown (10YR 5/6) mottles; weak very coarse angular blocky structure parting to weak very thick platy along laminations; firm; few fine roots; thin patchy dark yellowish brown (10YR 4/4) clay films on faces of peds; few fine black (10YR 2/1) concretions (Fe and Mn oxides); slightly acid; clear wavy boundary.

C—52 to 60 inches; dark yellowish brown (10YR 4/4) silt loam; many medium distinct light brownish gray (10YR 6/2) and many fine distinct yellowish brown (10YR 5/6) mottles; massive; firm; neutral.

The solum is 30 to 55 inches thick. Coarse fragments generally are absent, but in some pedons they make up 1 to 5 percent of the lower part of the solum and the C horizon. Stratification is evident within the series control section.

The Ap horizon has hue of 10YR, value of 4, and chroma of 2 or 3. In uncultivated areas there are an A and an E horizon. The Ap horizon ranges from medium acid to neutral where lime has been applied.

The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. It is silty clay loam or silt loam. It is very strongly acid to medium acid in the upper part and medium acid to neutral in the lower part.

The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 to 6. It commonly is stratified and is dominantly silt loam and silty clay loam, but it also includes thin strata of loam, fine sandy loam, very fine sand, or fine sand. It ranges from medium acid to mildly alkaline.

Haskins Series

The Haskins series consists of deep, somewhat poorly drained soils on stream terraces and outwash plains. The soils formed in water-deposited loamy material and in the underlying lacustrine sediment or glacial till. Permeability is moderate in the loamy material and slow or very slow in the underlying material. The slope ranges from 0 to 3 percent.

Haskins soils are similar to Bennington, Jimtown, and Tiro soils and are commonly adjacent to Bogart, Fitchville, Glenford, and Jimtown soils. Unlike Haskins soils, Bennington soils formed in glacial till on uplands. Bogart and Glenford soils are moderately well drained and have less gray color in the subsoil than Haskins soils. Bogart and Jimtown soils have more sand and gravel in the lower part of the subsoil and in the substratum. Fitchville, Glenford, and Tiro soils have more silt and less sand in the subsoil.

Typical pedon of Haskins silt loam, 0 to 3 percent slopes, about 1 mile west-southwest of Reedsburg, in Plain Township, about 1,155 feet north and 490 feet east of the southwest corner of sec. 1, T. 21 N., R. 15 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium and coarse granular structure; friable; common fine roots; 5 percent coarse fragments; neutral; abrupt smooth boundary.

BE—8 to 12 inches; yellowish brown (10YR 5/4) loam; few fine distinct strong brown (7.5YR 5/8), common fine distinct light brownish gray (10YR 6/2), and many fine distinct grayish brown (10YR 5/2) mottles; moderate medium and coarse subangular blocky structure; firm; common fine roots; grayish brown (10YR 5/2) silt coatings on faces of peds; 10 percent coarse fragments; medium acid; clear smooth boundary.

Bt1—12 to 18 inches; brown (10YR 5/3) clay loam; few fine distinct light olive brown (2.5Y 5/4) mottles; weak coarse prismatic structure parting to moderate medium and coarse subangular blocky; firm; few fine roots; grayish brown (10YR 5/2) thin continuous clay films and medium continuous silt coatings on faces of peds; few fine black (10YR 2/1) concretions (Fe and Mn oxides); 10 percent coarse fragments; slightly acid; clear smooth boundary.

Bt2—18 to 24 inches; brown (10YR 5/3) sandy clay loam; common fine distinct yellowish brown (10YR 5/6) and common medium faint grayish brown (10YR 5/2) mottles; weak very thick platy structure parting to weak fine subangular blocky; firm; few fine roots; gray (10YR 5/1) medium patchy clay films and medium continuous silt coatings on faces of peds; common fine and medium black (10YR 2/1) concretions (Fe and Mn oxides); 8 percent coarse fragments; slightly acid; clear smooth boundary.

2Bt3—24 to 30 inches; dark brown (10YR 4/3) silty clay; many medium and coarse distinct gray (10YR 5/1) mottles; weak coarse angular blocky structure; firm; few fine roots along faces of peds; gray (10YR 5/1) thin and medium patchy clay films and medium continuous silt coatings on faces of peds; few fine black (10YR 2/1) concretions (Fe and Mn oxides); 1 percent coarse fragments; neutral; clear smooth boundary.

2C—30 to 60 inches; dark brown (10YR 4/3) silty clay; many medium and coarse distinct gray (10YR 5/1) mottles; massive; very firm; mildly alkaline.

The solum is 25 to 45 inches thick. The content of gravel ranges from 0 to 10 percent in the A horizon, 0 to 20 percent in the B horizon, and 0 to 10 percent in the 2B and 2C horizons.

The Ap horizon is commonly silt loam, but in some pedons it is loam. It ranges from medium acid to neutral.

The B horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 4. It is clay loam, sandy clay loam, or loam and the gravelly analogs. It ranges from strongly acid to slightly acid. The 2B horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It is silty clay, clay loam, or silty clay loam. It is slightly acid or neutral.

The 2C horizon is silty clay, clay loam, and silty clay loam. It is neutral to moderately alkaline.

Jimtown Series

The Jimtown series consists of deep, somewhat poorly drained soils that formed in stratified outwash deposits on stream terraces and outwash plains. Permeability is moderate. The slope ranges from 0 to 6 percent.

Jimtown soils are similar to Fitchville and Haskins soils and commonly are adjacent to Bogart, Chili, and Luray soils. Unlike Jimtown soils, Bogart soils are moderately well drained and do not have low-chroma mottles immediately below the surface layer. Chili soils are well drained and do not have low-chroma mottles in the subsoil. Fitchville soils have more silt and less sand and gravel in the subsoil and substratum than Jimtown soils. Haskins soils are underlain by lacustrine sediment or glacial till. Luray soils are very poorly drained and have a mollic epipedon.

Typical pedon of Jimtown loam, 0 to 2 percent slopes, about 1 mile east of Creston, in Canaan Township, about 1,155 feet south and 25 feet west of the northeast corner of sec. 1, T. 17 N., R. 13 W.

Ap—0 to 11 inches; dark grayish brown (10YR 4/2) loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; many fine and medium roots; 1 percent gravel; medium acid; abrupt smooth boundary.

EBg—11 to 22 inches; light brownish gray (10YR 6/2) loam; common medium distinct dark grayish brown

(10YR 4/2) and common fine distinct yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; friable; common fine and medium roots; 2 percent gravel; medium acid; clear smooth boundary.

Bt1—22 to 29 inches; yellowish brown (10YR 5/4) loam; many medium distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; firm; common fine and medium roots; medium continuous light brownish gray (10YR 6/2) silt coatings on faces of peds; thin patchy clay films on faces of peds; common fine black (10YR 2/1) concretions (Fe and Mn oxides); 3 percent gravel; medium acid; clear smooth boundary.

Bt2—29 to 43 inches; dark yellowish brown (10YR 4/4) gravelly sandy clay loam; many medium distinct gray (10YR 5/1) and common fine distinct yellowish brown (10YR 5/6) mottles; moderate coarse subangular blocky structure; firm; few fine and medium roots; medium continuous light brownish gray (10YR 6/2) silt coatings on faces of peds; thin patchy clay films on faces of peds; 20 percent gravel; strongly acid; clear wavy boundary.

Bt3—43 to 49 inches; dark yellowish brown (10YR 4/4) gravelly sandy clay loam; many medium prominent gray (N 5/0) mottles; weak coarse subangular blocky structure; firm; few fine roots; medium continuous light brownish gray (10YR 6/2) silt coatings on faces of peds; thin patchy clay films on faces of peds; 20 percent gravel; medium acid; clear wavy boundary.

Bt4—49 to 55 inches; dark yellowish brown (10YR 4/4) gravelly sandy loam; common medium prominent dark gray (N 4/0) and common fine distinct strong brown (7.5YR 5/6) mottles; weak coarse subangular blocky structure; friable; few fine roots; medium continuous light brownish gray (10YR 6/2) silt coatings on faces of peds; thin patchy clay films on faces of peds; common fine black (10YR 2/1) concretions (Fe and Mn oxides); 15 percent gravel; medium acid; clear wavy boundary.

Cg—55 to 60 inches; dark gray (N 4/0) gravelly sandy loam; common fine prominent brown (7.5YR 4/4) mottles; weak coarse subangular blocky structure; friable; many fine black (10YR 2/1) concretions (Fe and Mn oxides); 15 percent gravel; slightly acid.

The solum is 30 to 55 inches thick. Coarse fragments make up 0 to 30 percent of the volume above a depth of 20 inches and 15 to 50 percent as an average from 20 to 40 inches.

The Ap horizon has hue of 10YR, value of 3 or 4 (6 or more dry), and chroma of 1 or 2. The A horizon commonly is loam, but in some pedons it is silt loam. In uncultivated areas there are an A and an E horizon. The A horizon ranges from medium acid to neutral where lime has been applied.

The Bt horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 4. It is loam, sandy clay loam, or clay loam and the gravelly analogs. In some pedons it has subhorizons of sandy loam, silt loam, or gravelly sandy loam. It is strongly acid to slightly acid.

The C horizon is gravelly or very gravelly loam, sandy loam, loamy sand, or sand. It ranges from strongly acid to slightly acid.

Killbuck Series

The Killbuck series consists of deep, poorly drained soils on flood plains. The soils formed in recent alluvium overlying a buried soil that has a dark surface horizon. Permeability is moderately slow. The slope is 0 to 2 percent.

Killbuck soils are similar to Luray soils and commonly are adjacent to Carlisle, Linwood, Luray, Melvin, Sebring, and Wallkill soils. Unlike Killbuck soils, the Carlisle, Linwood, and Wallkill soils have horizons of organic material. Melvin, Luray, and Sebring soils do not have a buried soil. Luray and Sebring soils have an argillic horizon, which Killbuck soils do not have.

Typical pedon of Killbuck silt loam, frequently flooded, about 5 miles south-southwest of Wooster, in Wooster Township, about 825 feet west and 2,600 feet south of the northeast corner of sec. 31, T. 15 N., R. 13 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak very fine subangular blocky structure; friable; many roots; neutral; abrupt smooth boundary.

Bg1—8 to 15 inches; grayish brown (10YR 5/2) silt loam; many coarse distinct pale brown (10YR 6/3) and common fine distinct strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; friable; common roots; slightly acid; clear smooth boundary.

Bg2—15 to 21 inches; gray (10YR 5/1) silt loam; common fine distinct grayish brown (10YR 5/2) and strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to weak medium subangular blocky; friable; common roots; slightly acid; abrupt smooth boundary.

2Ab—21 to 33 inches; very dark gray (N 3/0) silty clay; common fine distinct strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to weak coarse subangular blocky; firm; few roots; dark gray (10YR 4/1) thin continuous coatings on faces of peds; slightly acid; gradual smooth boundary.

2Bgb1—33 to 41 inches; dark gray (N 4/0) silty clay loam; common fine distinct yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) mottles; moderate coarse prismatic structure; firm; few roots; gray (N 5/0) continuous coatings on faces of peds; slightly acid; clear smooth boundary.

2Bgb2—41 to 51 inches; gray (5Y 5/1) silty clay loam; common medium prominent yellowish brown (10YR 5/6) and common fine prominent strong brown (7.5YR 5/6) mottles; weak coarse prismatic structure; firm; few roots; gray (N 5/0) continuous coatings on vertical faces of peds; slightly acid; gradual wavy boundary.

2Cg—51 to 60 inches; gray (5Y 5/1) silty clay loam; common medium prominent strong brown (7.5YR 5/6) and common coarse distinct dark gray (N 4/0) mottles; massive; firm; medium acid.

The silty recent alluvium is 15 to 36 inches thick over the 2Ab horizon. Coarse fragments are essentially absent above a depth of 40 inches.

The Ap horizon has hue of 10YR, value of 4, and chroma of 1 or 2. Reaction, where lime has been applied, ranges from medium acid to neutral.

The Bg horizon has hue of 10YR or 2.5Y, or it is neutral; it has value of 3 to 5 and chroma of 2 or less. It is silt loam or silty clay loam. Reaction ranges from medium acid to neutral. In some pedons the Bg horizon is underlain by a Cg horizon that is similar to it in color and texture.

The 2Ab horizon has hue of 10YR or is neutral; it has value of 2 or 3 and chroma of 2 or less. It ranges from silt loam to silty clay. Reaction ranges from medium acid to neutral.

The 2Bgb and 2Cg horizons have hue of 10YR to 5Y or are neutral; they have value of 4 to 6 and chroma of 2 or less. The texture is silty clay loam or silt loam to a depth of 40 inches. Below a depth of 40 inches there are thin sandy and gravelly strata in some pedons. Reaction ranges from medium acid to mildly alkaline.

Linwood Series

The Linwood series consists of deep, very poorly drained organic soils in bogs and depressions on lake plains, outwash terraces, flood plains, and till plains. The soils formed in organic deposits over loamy mineral material. Permeability is moderately slow to moderately rapid in the organic layers and moderate in the loamy material. The slope is less than 2 percent.

Linwood soils are similar to Carlisle soils and commonly are adjacent to Carlisle, Killbuck, Luray, Melvin, and Wallkill soils. Unlike Linwood soils, Carlisle soils formed in organic material more than 51 inches thick. Killbuck, Luray, and Melvin soils formed in mineral material. Wallkill soils have 16 to 40 inches of alluvium overlying the organic material.

Typical pedon of Linwood muck, about 1.5 miles south of Blachleyville, in Plain Township, about 1,850 feet west and 330 feet south of the northeast corner of sec. 32, T. 19 N., R. 14 W.

Oa1—0 to 11 inches; black (10YR 2/1) broken face, very dark gray (10YR 3/1) rubbed, sapric material, black (10YR 2/1) dry; about 5 percent fiber, 1 percent rubbed; weak fine and medium granular structure; friable; many fine roots; thin deposit of dark grayish brown (10YR 4/2) silt loam on surface as a result of recent flooding; medium acid; clear smooth boundary.

Oa2—11 to 19 inches; black (10YR 2/1) broken face, very dark gray (10YR 3/1) rubbed, sapric material; about 10 percent fiber, 1 percent rubbed; moderate medium subangular blocky structure; firm; many fine roots; strongly acid; clear smooth boundary.

Oa3—19 to 32 inches; black (10YR 2/1) broken face, very dark gray (10YR 3/1) rubbed, sapric material; about 10 percent fiber, 1 percent rubbed; moderate coarse subangular blocky structure; firm; common fine roots; few woody fragments; strongly acid; abrupt wavy boundary.

2Cg1—32 to 38 inches; gray (5Y 5/1) silt loam; common medium prominent dark brown (7.5YR 4/4) mottles; weak coarse subangular blocky structure; firm; neutral; clear wavy boundary.

2Cg2—38 to 60 inches; gray (5Y 5/1) silty clay loam; common medium prominent strong brown (7.5YR 5/8) and dark brown (7.5YR 4/4) mottles; massive; firm; neutral.

The depth to the 2C horizon ranges from 16 to 51 inches.

The surface tier has hue of 10YR to 2.5Y or is neutral; it has value of 2 or 3 and chroma of 0 to 2 on broken faces and rubbed. It ranges from strongly acid to neutral. The subsurface tier has hue of 10YR to 2.5Y or is neutral; it has value of 2 or 3 and chroma of 0 to 3 on broken faces and rubbed. It ranges from strongly acid to neutral.

The 2C horizon has hue of 10YR to 5Y, value of 4 to 6, and chroma of 1 or 2. It ranges from sandy loam to silty clay loam. It is medium acid to neutral.

Lobdell Series

The Lobdell series consists of deep, moderately well drained soils that formed in recent alluvium on flood plains. Permeability is moderate. The slope is 0 to 2 percent.

These soils have less clay in the subsoil than is definitive for the Lobdell series. This difference, however, does not affect the use or behavior of the soils.

Lobdell soils are similar to Tioga soils and commonly are adjacent to Melvin, Orrville, and Tioga soils. Unlike Lobdell soils, Melvin soils are poorly drained, and Orrville soils are somewhat poorly drained. Melvin and Orrville soils have more gray colors in the subsoil than Lobdell soils. Tioga soils are well drained and do not have low-chroma mottles within 24 inches of the surface.

Typical pedon of Lobdell silt loam, occasionally flooded, about 1 mile west of Pleasant Home, in

Congress Township, about 540 feet east and 200 feet south of the northwest corner of sec. 36, T. 23 N., R. 15 W.

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak coarse and medium granular structure; friable; few fine roots; 1 percent coarse fragments; neutral; abrupt smooth boundary.

Bw1—8 to 13 inches; dark brown (10YR 4/3) silt loam; common medium distinct strong brown (7.5YR 5/6) mottles; weak coarse subangular blocky structure parting to weak medium subangular blocky; friable; few fine roots; 2 percent coarse fragments; neutral; abrupt smooth boundary.

Bw2—13 to 18 inches; dark brown (10YR 4/3) loam; few fine distinct dark brown (7.5YR 4/4) and strong brown (7.5YR 5/6) and few fine faint brown (10YR 5/3) mottles; weak coarse subangular blocky structure parting to weak fine and medium subangular blocky; friable; few fine roots; 1 percent coarse fragments; slightly acid; clear smooth boundary.

Bw3—18 to 26 inches; dark yellowish brown (10YR 4/4) silt loam; common medium distinct strong brown (7.5YR 5/6) and grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; friable; few fine roots; 1 percent coarse fragments; medium acid; clear smooth boundary.

BC—26 to 36 inches; dark yellowish brown (10YR 4/4) silt loam; many medium distinct grayish brown (10YR 5/2) and common medium distinct dark brown (7.5YR 4/4) mottles; weak fine and medium subangular blocky structure; very friable; few fine roots; 1 percent coarse fragments; medium acid; clear smooth boundary.

C1—36 to 52 inches; dark yellowish brown (10YR 4/4) fine sandy loam; common fine distinct grayish brown (10YR 5/2) mottles; weak fine subangular blocky structure; very friable; few fine roots; 1 percent coarse fragments; medium acid; clear smooth boundary.

C2—52 to 60 inches; brown (10YR 5/3) fine sandy loam; common medium distinct dark brown (7.5YR 4/4) and common medium faint grayish brown (10YR 5/2) mottles; massive; firm; 1 percent coarse fragments; medium acid.

The solum is 24 to 50 inches thick. The content of coarse fragments in the B and C horizons ranges from 0 to 15 percent.

The Ap horizon has hue of 10YR, value of 4, and chroma of 2 or 3. It typically is silt loam, but in some pedons it is loam. Where lime has been applied, the Ap horizon is medium acid to neutral.

The B horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 or 4. It is dominantly silt loam, but the range includes loam. In some pedons the B horizon has thin subhorizons of sandy loam, fine sandy loam, clay loam, or silty clay loam. It is strongly acid to neutral in the upper part and medium acid to neutral in the lower part.

The C horizon has hue of 10YR to 5Y, value of 4 to 6, and chroma of 1 to 4. It is loam, silt loam, sandy loam, fine sandy loam, clay loam, or fine sand. In many pedons it is stratified. It ranges from medium acid to neutral.

Loudonville Series

The Loudonville series consists of moderately deep, well drained soils that formed in glacial till on uplands. The till is underlain by sandstone, siltstone, or shale bedrock at a depth of 20 to 40 inches. Permeability is moderate. The slope ranges from 2 to 18 percent.

Loudonville soils are similar to Mechanicsburg soils and commonly are adjacent to Berks, Canfield, Mitiwanga, Riddles, and Wooster soils. Unlike Loudonville soils, Berks soils do not have an argillic horizon, and they have more coarse fragments in the subsoil than Loudonville soils. Canfield, Mechanicsburg, Riddles, and Wooster soils are deep to bedrock. Canfield and Wooster soils have a fragipan, which Loudonville soils do not have. Mechanicsburg soils formed in glacial till and in residuum of the underlying fractured bedrock. Mitiwanga soils are somewhat poorly drained and have low-chroma mottles immediately below the surface layer.

Typical pedon of Loudonville silt loam, 2 to 6 percent slopes, about 1.7 miles south of Doylestown, in Chippewa Township, about 2,450 feet west and 2,400 feet north of the southeast corner of sec. 15, T. 18 N., R. 11 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak medium granular structure; friable; many fine roots; 3 percent coarse fragments; medium acid; abrupt smooth boundary.

BE—8 to 13 inches; yellowish brown (10YR 5/4) silt loam; weak fine subangular blocky structure; friable; common fine roots; 2 percent coarse fragments; very strongly acid; clear smooth boundary.

Bt1—13 to 30 inches; yellowish brown (10YR 5/6) silt loam; moderate medium subangular blocky structure; firm; few fine roots; thin very patchy dark yellowish brown (10YR 4/4) clay films on faces of peds and on the upper surface of coarse fragments; 5 percent coarse fragments; very strongly acid; clear wavy boundary.

Bt2—30 to 36 inches; dark yellowish brown 10YR 4/4) loam; few fine distinct light brownish gray (10YR 6/2) mottles; weak coarse blocky structure; firm; thin very patchy dark yellowish brown (10YR 4/4) clay films on faces of peds and on the upper surface of coarse fragments; 10 percent coarse fragments; very strongly acid; clear irregular boundary.

2R—36 inches; 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 0 to 5 percent in the A horizon and 2 to 15 percent in the B horizon.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. In uncultivated areas there is an A horizon 2 to 4 inches thick. The A horizon ranges from very strongly acid to medium acid, unless the soil has been limed.

The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is loam, silt loam, clay loam, or silty clay loam. It is very strongly acid to medium acid. Some pedons have a 2B or 2C horizon or both; the material in these horizons derived from weathered bedrock.

The R horizon is sandstone, siltstone, or shale.

Luray Series

The Luray series consists of deep, very poorly drained soils on slackwater terraces and on uplands. The soils formed in lacustrine sediment. Permeability is moderately slow. The slope is 0 to 2 percent.

Luray soils are similar to Killbuck and Sebring soils and commonly are adjacent to Carlisle, Euclid, Killbuck, Linwood, and Sebring soils. Unlike Luray soils, Carlisle and Linwood soils have organic material in the solum. Euclid and Sebring soils have an ochric epipedon. Killbuck soils have recent alluvium over a buried soil.

Typical pedon of Luray silty clay loam, about 5.7 miles northeast of Dalton, in Baughman Township, 250 feet west and 400 feet south of the northeast corner of sec. 13, T. 17 N., R. 11 W.

Ap—0 to 6 inches; very dark gray (10YR 3/1) silty clay loam, dark grayish brown (10YR 4/2) dry; common fine faint very dark gray (N 3/0) mottles; weak very coarse granular structure parting to medium and coarse granular; friable; common fine roots; less than 2 percent coarse fragments; neutral; abrupt smooth boundary.

A—6 to 10 inches; very dark gray (N 3/0) silty clay loam, dark gray (N 4/0) dry; weak coarse subangular blocky structure; firm; common fine roots; less than 2 percent coarse fragments; slightly acid; clear smooth boundary.

Btg1—10 to 17 inches; dark gray (N 4/0) silty clay; few medium distinct dark brown (10YR 4/3) and common medium distinct grayish brown (2.5Y 5/2) mottles; weak medium and coarse prismatic structure parting to moderate coarse subangular blocky; firm; common fine roots; thin very patchy very dark gray (N 3/0) clay films on faces of peds; less than 2 percent coarse fragments; slightly acid; gradual wavy boundary.

Btg2—17 to 29 inches; olive gray (5Y 5/2) silty clay loam; few fine prominent light olive brown (2.5Y 5/6) and common fine prominent dark gray (N 4/0) mottles; moderate medium and coarse prismatic structure parting to moderate coarse subangular blocky; very firm; few fine roots; thin patchy dark gray (N 4/0) clay films on faces of peds; less than 2 percent coarse fragments; slightly acid; clear wavy boundary.

Btg3—29 to 38 inches; gray (N 5/0) silty clay loam; few medium prominent strong brown (7.5YR 5/6) and common medium prominent light olive brown (2.5Y 5/4) mottles; weak medium and coarse prismatic structure parting to moderate coarse subangular blocky; very firm; few fine roots; thin patchy very dark gray (N 3/0) and gray (N 5/0) clay films on faces of peds; less than 2 percent coarse fragments; neutral; gradual wavy boundary.

BCg—38 to 58 inches; gray (N 5/0) silty clay loam; common medium prominent light olive brown (2.5Y 5/4) and common medium and coarse prominent yellowish brown (10YR 5/6) mottles; moderate coarse and medium subangular blocky structure in the upper part grading to weak coarse subangular blocky in the lower part; very firm; few fine roots; less than 2 percent coarse fragments; mildly alkaline; diffuse wavy boundary.

Cg—58 to 60 inches; gray (N 5/0) silty clay loam; common fine and medium distinct grayish brown (2.5Y 5/2) and common fine prominent light olive brown (2.5Y 5/6) mottles; massive; very firm; less than 2 percent coarse fragments; strong effervescence; moderately alkaline.

The solum is 36 to 48 inches thick. The mollic epipedon ranges in thickness from 10 to 17 inches.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. Where the soil is limed, this horizon ranges from medium acid to neutral.

The Bt horizon has hue of 10YR to 5Y or is neutral; value is 3 to 6, and chroma is 0 to 2. The Bt horizon is silty clay loam or silty clay. It is medium acid to neutral.

The C horizon is clay loam or silty clay loam. In some pedons it has thin strata of loam or sandy loam. The C horizon is slightly acid to moderately alkaline.

Mechanicsburg Series

The Mechanicsburg series consists of deep, well drained soils on uplands. The soils formed in glacial till 20 to 36 inches thick and in residuum of the underlying fractured siltstone and fine-grained sandstone. Permeability is moderate. The slope ranges from 2 to 18 percent.

Mechanicsburg soils are similar to Loudonville and Riddles soils and commonly are adjacent to Berks, Canfield, Riddles, and Wooster soils. Berks and Loudonville soils are moderately deep to bedrock. Berks soils have more coarse fragments in the subsoil than Mechanicsburg soils and do not have an argillic horizon.

Canfield, Riddles, and Wooster soils are more than 60 inches deep to bedrock, and Canfield and Wooster soils have a fragipan.

Typical pedon of Mechanicsburg silt loam, 2 to 6 percent slopes, about 1 mile south of Mechanicsburg, in Wayne Township, about 2,110 feet east and 780 feet north of the southwest corner of sec. 19, T. 16 N., R. 13 W.

Ap—0 to 9 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; many fine roots; 5 percent coarse fragments; medium acid; abrupt smooth boundary.

BA—9 to 14 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium subangular blocky structure; friable; common fine roots; 5 percent coarse fragments; strongly acid; clear smooth boundary.

Bt1—14 to 27 inches; dark brown (7.5YR 4/4) silt loam; moderate medium subangular blocky structure; firm; few fine roots; thin patchy dark brown (7.5YR 4/4) clay films on faces of peds; few fine concretions (Fe and Mn oxides); 10 percent coarse fragments; very strongly acid; clear smooth boundary.

2Bt2—27 to 32 inches; dark yellowish brown (10YR 4/4) channery loam; weak coarse subangular blocky structure; firm; few fine roots; thin very patchy brown (10YR 5/3) clay films on faces of peds; few fine concretions (Fe and Mn oxides); 20 percent coarse fragments; very strongly acid; clear wavy boundary.

2C—32 to 60 inches; yellowish brown (10YR 5/4) extremely channery loam; massive; friable; few fine roots in vertical and horizontal fractures between displaced rock fragments; 80 percent flat siltstone fragments about 4 to 10 inches in length; very strongly acid in the upper part, grading to medium acid at 60 inches.

2R—60 inches; yellowish brown (10YR 5/4) fractured, hard siltstone; fractures are more than 4 inches apart.

The thickness of the solum and the depth to material that weathered from fractured bedrock range from 20 to 36 inches. The depth to bedrock ranges from 40 to 72 inches. The percentage of fine-grained sandstone or siltstone coarse fragments generally increases with depth and ranges from 0 to 10 percent in the A horizon, 1 to 20 percent in the B horizon, 15 to 50 percent in the 2B horizon, and 60 to 90 percent in the 2C horizon.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. In uncultivated areas there is a thin A horizon. Reaction ranges from very strongly acid to neutral.

The B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. It is loam, silt loam, clay loam, or silty clay loam and the gravelly or channery analogs. It is very strongly acid to medium acid.

The 2C horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. It is the extremely channery or extremely flaggy analogs of silt loam, loam, very fine sandy loam, fine sandy loam, or sandy loam.

Melvin Series

The Melvin series consists of deep, poorly drained soils that formed in alluvium on flood plains. Permeability is moderate. The slope is 0 to 2 percent.

Melvin soils are similar to Orrville soils and commonly are adjacent to Euclid, Killbuck, Lobdell, and Orrville soils. Unlike Melvin soils, Euclid and Orrville soils are somewhat poorly drained and do not have dominant low-chroma colors immediately below the surface layer. Killbuck soils have alluvium over a dark buried soil. Lobdell soils are moderately well drained and do not have low-chroma mottles in the upper part of the subsoil.

Typical pedon of Melvin silt loam, frequently flooded, about 2.5 miles southwest of Wooster, in Wooster Township, about 100 feet west and 2,510 feet north of the southeast corner of sec. 20, T. 15 N., R. 13 W.

Ap—0 to 6 inches; dark gray (10YR 4/1) silt loam, gray (10YR 6/1) dry; few fine distinct dark brown (7.5YR 4/4) mottles; weak fine and medium granular structure; friable; many fine and medium roots; slightly acid; abrupt smooth boundary.

Bg1—6 to 20 inches; gray (10YR 5/1) silt loam; many medium prominent yellowish red (5YR 4/6) mottles; weak medium subangular blocky structure; friable; common fine and medium roots; slightly acid; clear smooth boundary.

Bg2—20 to 28 inches; dark grayish brown (10YR 4/2) silt loam; common medium prominent reddish brown (5YR 4/4) mottles; weak medium subangular blocky structure; friable; common fine roots; slightly acid; clear smooth boundary.

Bg3—28 to 35 inches; dark grayish brown (10YR 4/2) silt loam; common medium distinct gray (10YR 5/1) and dark brown (10YR 3/3) mottles; weak medium subangular blocky structure; friable; common fine roots; slightly acid; clear smooth boundary.

Cg1—35 to 40 inches; grayish brown (10YR 5/2) silt loam; common medium distinct dark brown (7.5YR 3/2) mottles; massive; firm; slightly acid; clear smooth boundary.

Cg2—40 to 50 inches; dark gray (10YR 4/1) silty clay loam; common fine and medium prominent reddish brown (5YR 4/4) mottles; massive; firm; slightly acid; clear smooth boundary.

Cg3—50 to 55 inches; gray (10YR 5/1) silty clay loam; common fine and medium prominent yellowish red (5YR 4/6) and common medium faint dark gray (10YR 4/1) mottles; massive; firm; neutral; clear smooth boundary.

Cg4—55 to 60 inches; grayish brown (10YR 5/2) silty clay loam; many fine and medium distinct yellowish brown (10YR 5/4) and few fine distinct gray (N 5/0) mottles; massive; firm; neutral.

The solum is 24 to 36 inches thick. The content of coarse fragments ranges from 0 to 5 percent to a depth of 30 inches and 0 to 20 percent below that depth.

The Ap horizon has hue of 10YR, value of 4, and chroma of 1 or 2. It is slightly acid or neutral.

The B horizon has hue of 10YR to 5Y or is neutral; value is 4 to 6, and chroma is 0 to 2. The B horizon is dominantly silt loam or silty clay loam, but it includes strata of loam. It is slightly acid or neutral. In some pedons, the upper part of the B horizon is medium acid.

The C horizon has colors similar to those of the B horizon. It is silt loam or silty clay loam. Below a depth of 40 inches the soil commonly is stratified with layers of loam, sandy loam, or sand and gravel. The C horizon is slightly acid or neutral.

Mitiwanga Series

The Mitiwanga series consists of moderately deep, somewhat poorly drained soils on uplands. The soils formed in glacial till 20 to 40 inches thick over sandstone bedrock. Permeability is moderate. The slope ranges from 1 to 4 percent.

Mitiwanga soils are commonly adjacent to Bennington, Loudonville, Ravenna, and Rittman soils. Unlike Mitiwanga soils, Bennington, Ravenna, and Rittman soils are deep to bedrock. Loudonville soils are well drained, and Rittman soils are moderately well drained and do not have so much gray color in the subsoil as Mitiwanga soils have. Ravenna and Rittman soils have a fragipan, which Mitiwanga soils do not have.

Typical pedon of Mitiwanga silt loam, 1 to 4 percent slopes, about 1.2 miles southwest of Burbank, in Congress Township, about 1,125 feet east and 1,200 feet north of the southwest corner of sec. 1, T. 21 N., R. 14 W.

Ap—0 to 10 inches; dark grayish brown (2.5YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; many fine and medium roots; few fine distinct black (10YR 2/1) concretions (Fe and Mn oxides); 2 to 3 percent coarse fragments; slightly acid; abrupt smooth boundary.

BE—10 to 12 inches; yellowish brown (10YR 5/4) silty clay loam; few fine distinct light brownish gray (10YR 6/2) and common medium faint yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; common fine roots; few fine distinct black (10YR 2/1) concretions (Fe and Mn oxides); 2 to 3 percent coarse fragments; medium acid; clear smooth boundary.

Bt1—12 to 17 inches; yellowish brown (10YR 5/4) silty clay loam; many medium distinct light brownish gray (10YR 6/2) and few medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; common fine roots; thin patchy grayish brown (10YR 5/2) clay films on vertical and horizontal faces of peds; medium continuous grayish brown (10YR 5/2) silt coatings on faces of peds; common fine distinct black (10YR 2/1) concretions (Fe and Mn oxides); 2 percent coarse fragments; strongly acid; clear smooth boundary.

Bt2—17 to 25 inches; dark yellowish brown (10YR 4/4) silty clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure parting to moderate coarse subangular blocky; firm; common fine roots; thin continuous gray (10YR 5/1) clay films on horizontal faces of peds and thin patchy gray (10YR 5/1) clay films on vertical faces of peds; medium continuous gray (10YR 5/1) silt coatings on faces of peds; common fine distinct black (10YR 2/1) concretions (Fe and Mn oxides); 4 percent coarse fragments; medium acid; clear smooth boundary.

Bt3—25 to 31 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 subangular blocky structure; firm; gray (10YR 6/1) medium patchy clay films and medium continuous silt coatings on faces of peds; few fine distinct black (10YR 2/1) concretions (Fe and Mn oxides); common fine roots; 6 percent coarse fragments; medium acid; clear wavy boundary.

2R—31 inches; hard, fine-grained sandstone.

The thickness of the solum and the depth to bedrock range from 20 to 40 inches. The content of coarse fragments in the B horizon ranges from 2 to 15 percent.

The Ap horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2. It ranges from medium acid to neutral where lime has been applied.

The Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4. It is silt loam, silty clay loam, clay loam, or loam. It ranges from very strongly acid to medium acid.

Some pedons have a C horizon.

In some pedons there is a layer of shattered or fractured bedrock a few inches thick immediately above the lithic contact. Bedrock is typically sandstone, but in some pedons it is siltstone or shale.

Orrville Series

The Orrville series consists of deep, somewhat poorly drained soils that formed in alluvium on flood plains. Permeability is moderate. The slope is 0 to 2 percent.

Orrville soils are similar to Melvin soils and commonly are adjacent to Euclid, Killbuck, Lobdell, Melvin, and Tioga soils. Euclid soils have more silt and less sand in the subsoil than Orrville soils. They are on low stream terraces. Unlike Orrville soils, Killbuck and Melvin soils are poorly drained and have dominant low-chroma colors immediately below the surface layer. Lobdell soils are moderately well drained, and Tioga soils are well drained. Lobdell and Tioga soils do not have low-chroma mottles just below the surface layer.

Typical pedon of Orrville silt loam, occasionally flooded, about 2.4 miles south-southwest of West Salem, in Congress Township, about 150 feet south and 2,475 feet west of the northeast corner of sec. 24, T. 23 N., R. 15 W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, light grayish brown (10YR 6/2) dry; moderate medium granular structure; friable; many fine and medium roots; 1 percent gravel; neutral; abrupt smooth boundary.

BE—9 to 15 inches; brown (10YR 5/3) silt loam; common fine distinct gray (10YR 5/1) mottles; weak medium subangular blocky structure parting to moderate medium granular; friable; common fine and medium roots; thin continuous grayish brown (10YR 5/2) coatings on ped faces; few fine distinct dark brown (7.5YR 3/2) concretions (Fe and Mn oxides); 1 percent gravel; slightly acid; clear smooth boundary.

Bg1—15 to 24 inches; grayish brown (10YR 5/2) silt loam; common fine distinct olive (5Y 4/3) mottles; weak coarse subangular blocky structure parting to moderate medium granular; friable; common fine and medium roots; few medium dark reddish brown (2.5YR 3/4) stains (Fe oxides); few medium yellowish red (5YR 4/6) concretions (Fe and Mn oxides); 1 percent gravel; slightly acid; clear smooth boundary.

Bg2—24 to 29 inches; gray (5Y 5/1) silt loam; weak coarse subangular blocky structure parting to weak medium granular; friable; few fine roots; few medium dark reddish brown (2.5YR 3/4) stains (Fe oxides); many medium yellowish red (5YR 4/6) concretions (Fe and Mn oxides); 1 percent gravel; slightly acid; clear smooth boundary.

Bg3—29 to 32 inches; olive gray (5Y 5/2) fine sandy loam; many medium faint gray (5Y 5/1) and common fine prominent dark brown (10YR 4/3) mottles; weak coarse subangular blocky structure parting to weak medium granular; friable; few fine roots; many medium yellowish red (5YR 4/6) concretions (Fe and Mn oxides); 1 percent gravel; slightly acid; clear wavy boundary.

Cg1—32 to 48 inches; gray (5Y 5/1) silt loam; massive; friable; few fine roots; common medium yellowish red (5YR 4/6) concretions (Fe and Mn oxides); 1 percent gravel; neutral; clear wavy boundary.

Cg2—48 to 55 inches; gray (N 5/0) coarse sandy loam; common fine faint brownish yellow (10YR 6/6) mottles; massive; friable; few fine roots; many medium yellowish red (5YR 4/6) concretions (Fe and Mn oxides); 5 percent gravel; neutral; clear wavy boundary.

Cg3—55 to 60 inches; gray (N 5/0) gravelly sandy loam; many medium prominent olive (5Y 5/3) mottles; single grained; loose; thin patchy dark reddish brown (2.5YR 3/4) coatings on gravel; 20 percent gravel; neutral.

The solum is 24 to 50 inches thick. The content of coarse fragments ranges from 0 to 5 percent in the A horizon, 0 to 15 percent in the B horizon, and 0 to 25 percent in the C horizon.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2. It is dominantly silt loam, but in some pedons it is fine sandy loam, sandy loam, or loam. Reaction, where the soil has been limed, ranges from medium acid to neutral.

The B horizon has hue of 10YR to 5Y or is neutral; value is 4 to 6, and chroma is 0 to 6. The B horizon is dominantly silt loam, loam, or fine sandy loam and less commonly silty clay loam or clay loam. In some pedons it has thin strata of sandy loam, fine sandy loam, or loamy sand. The B horizon ranges from slightly acid to strongly acid.

The C horizon has hue of 10YR to 5Y or is neutral; value is 4 to 6, and chroma is 0 to 4. The C horizon is silt loam, sandy clay loam, coarse sandy loam, sandy loam, loamy sand, or loam and the gravelly analogs. It ranges from strongly acid to neutral.

Oshtemo Series

The Oshtemo series consists of deep, well drained soils that formed in glaciofluvial deposits along the sides of major stream valleys and on outwash plains. Permeability is moderately rapid over very rapid. The slope ranges from 2 to 6 percent.

Oshtemo soils are similar to Chili soils and commonly are adjacent to Bogart and Chili soils. Unlike Oshtemo soils, Bogart soils are moderately well drained and have low-chroma mottles in the lower part of the subsoil. Bogart and Chili soils have more clay and less sand in the subsoil than Oshtemo soils.

Typical pedon of Oshtemo sandy loam, 2 to 6 percent slopes, about 0.5 mile northwest of Blachleyville, in Plain Township, about 1,190 feet east and 1,125 feet south of the northwest corner of sec. 20, T. 19 N., R. 14 W.

Ap—0 to 9 inches; dark brown (10YR 4/3) sandy loam, light yellowish brown (10YR 6/4) dry; weak fine and medium granular structure; friable; many fine and medium roots; 2 percent coarse fragments; medium acid; abrupt smooth boundary.

Bt1—9 to 16 inches; dark brown (7.5YR 4/4) sandy loam; weak medium and coarse subangular blocky structure; friable; common fine and medium roots; thin very patchy brown (7.5YR 5/4) clay films on faces of peds; some clay bridging between sand grains and small pebbles; 2 percent coarse fragments; slightly acid; clear wavy boundary.

Bt2—16 to 26 inches; reddish brown (5YR 4/4) sandy loam; moderate medium and coarse subangular blocky structure; friable; common fine roots; thin very patchy brown (7.5YR 5/4) clay films on faces of peds; some clay bridging between sand grains and pebbles; 1 percent coarse fragments; slightly acid; clear smooth boundary.

Bt3—26 to 36 inches; reddish brown (5YR 4/3) sandy loam; many medium distinct dark brown (7.5YR 4/4) mottles; moderate medium and coarse subangular blocky structure; friable; common fine roots; thin very patchy dark reddish brown (5YR 3/4) clay films on faces of peds; some clay bridging between sand grains and pebbles; 1 percent coarse fragments; strongly acid; gradual wavy boundary.

Bt4—36 to 39 inches; dark reddish brown (5YR 3/4) sandy loam; moderate medium and coarse subangular blocky structure; friable; common fine roots; thin very patchy dark reddish brown (5YR 3/3) clay films on faces of peds; some clay bridging between sand grains and pebbles; 5 percent coarse fragments; strongly acid; clear wavy boundary.

BC—39 to 44 inches; dark brown (7.5YR 4/4) sandy loam; moderate medium and coarse subangular blocky structure; very friable; few fine roots; some dark reddish brown (5YR 3/4) clay bridging between sand grains and pebbles; 10 percent coarse fragments; strongly acid; clear irregular boundary.

C—44 to 60 inches; yellowish brown (10YR 5/4) sand; single grained; loose; few fine roots; 5 percent coarse fragments; medium acid.

The solum is 42 to 65 inches thick. The content of coarse fragments ranges from 1 to 30 percent in the Bt horizon and to 40 percent in the C horizon.

The Ap horizon has hue of 10YR, value of 3 to 5, and chroma of 2 or 3. It is dominantly sandy loam, but in some pedons it is loamy sand. Reaction, where the soil is limed, is medium acid to neutral.

The Bt horizon has hue of 5YR to 10YR, value of 3 to 5, and chroma of 3 to 6. The B horizon is dominantly sandy loam, but it includes layers of gravelly sandy loam, gravelly sandy clay loam, sandy clay loam, or loamy sand. It ranges from strongly acid to slightly acid.

The C horizon has hue of 10YR, value of 5, and chroma of 2 to 4. In some pedons the C horizon is stratified. It ranges from medium acid to mildly alkaline.

Ravenna Series

The Ravenna series consists of deep, somewhat poorly drained soils that formed in glacial till on uplands; in many areas, the till was covered by a thin mantle of loess. Permeability is moderate above a fragipan in these soils and slow in the fragipan. The slope ranges from 0 to 6 percent.

Ravenna soils are similar to Wadsworth soils and commonly are adjacent to Canfield, Riddles, Sebring, and Wooster soils. Unlike Ravenna soils, Canfield soils are moderately well drained and do not have low-chroma mottles immediately below the surface layer. Riddles and Wooster soils are well drained and do not have low-chroma mottles within 24 inches of the surface. Riddles and Sebring soils do not have a fragipan. Sebring soils are poorly drained and have dominant low-chroma colors immediately below the surface layer. Wadsworth soils have more clay in the subsoil than Ravenna soils.

Typical pedon of Ravenna silt loam, 0 to 2 percent slopes, about 2 miles north of Apple Creek, in East Union Township, about 1,820 feet east and 885 feet south of the northwest corner of sec. 16, T. 16 N., R. 12 W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; medium acid; abrupt smooth boundary.

E—9 to 11 inches; light yellowish brown (10YR 6/4) silt loam; many medium distinct light brownish gray (10YR 6/2) and yellowish brown (10YR 5/6) mottles; weak fine and medium subangular blocky structure; friable; strongly acid; clear smooth boundary.

BE—11 to 14 inches; yellowish brown (10YR 5/4) silt loam; many medium distinct grayish brown (2.5Y 5/2) mottles; moderate medium subangular blocky structure; friable; thin continuous light brownish gray (10YR 6/2) silt coatings on faces of peds; strongly acid; clear wavy boundary.

2Bt—14 to 18 inches; dark yellowish brown (10YR 4/4) loam; common medium distinct pale brown (10YR 6/3) mottles; moderate medium and coarse subangular blocky structure; firm; thin continuous grayish brown (10YR 5/2) and light brownish gray (10YR 6/2) clay films on faces of peds; thin very patchy silt coatings on faces of peds; 3 percent coarse fragments; strongly acid; clear wavy boundary.

2Btx1—18 to 27 inches; dark yellowish brown (10YR 4/4) loam; common medium distinct light brownish gray (10YR 6/2) and yellowish brown (10YR 5/4) mottles; moderate very coarse prismatic structure parting to coarse subangular blocky; firm, brittle; thin continuous grayish brown (2.5Y 5/2) clay films on faces of peds and thick continuous gray (10YR 5/1 and 6/1) clay films on vertical faces of prisms; common black (10YR 2/1) stains and concretions (Fe and Mn oxides); 5 percent coarse fragments; strongly acid; gradual wavy boundary.

2Btx2—27 to 45 inches; dark yellowish brown (10YR 4/4) loam; common medium distinct light brownish gray (10YR 6/2) and gray (10YR 5/1) mottles; weak very coarse prismatic structure parting to weak thick platy; very firm, brittle; thick continuous gray (N 5/0) clay films on vertical faces of prisms; yellowish red (5YR 5/6) rind between the coating and the prism interior; common black (10YR 2/1) and dark brown (10YR 4/3) stains and concretions (Fe and Mn oxides); 5 percent coarse fragments; medium acid; gradual wavy boundary.

2B't—45 to 55 inches; brown (10YR 4/3) loam; moderate coarse prismatic structure; very firm; thick continuous gray (N 5/0) clay films on vertical faces of prisms; 8 percent coarse fragments; slightly acid; gradual wavy boundary.

2C1—55 to 70 inches; yellowish brown (10YR 5/4) loam; massive with weak structural breaks; firm; occasional thick dark gray (N 4/0) to gray (N 5/0) clay films on weak vertical structural breaks; 10 percent coarse fragments; slightly acid; gradual wavy boundary.

2C2—70 to 90 inches; yellowish brown (10YR 5/4) loam; massive; firm; 10 percent coarse fragments; calcareous; mildly alkaline.

The solum is 40 to 80 inches thick. The depth to the top of the fragipan ranges from 14 to 30 inches. The coarse fragments are dominantly sandstone but include some shale and a few crystalline rocks.

The Ap horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 to 3. Reaction, where the soil has been limed, ranges from medium acid to neutral.

The 2Bt horizon has hue of 7.5YR to 2.5Y, value of 4 or 5, and chroma of 2 to 6. It is loam, silt loam, clay loam, or silty clay loam. It is strongly acid or medium acid. The 2Btx horizon ranges from 10 to 32 inches in thickness. It has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 or 4. It is sandy loam, loam, or silt loam. It ranges from very strongly acid in the upper part to slightly acid in the lower part.

The C horizon has hue of 10YR or 2.5Y, value of 5, and chroma of 3 to 8. It is silt loam, loam, or sandy loam. It ranges from medium acid to mildly alkaline.

Rawson Series

The Rawson series consists of deep, moderately well drained soils on stream terraces and outwash plains. The soils formed in water-deposited loamy material and in the underlying lacustrine sediment or glacial till. Permeability is moderate in the loamy material and slow or very slow in the underlying material. The slope ranges from 2 to 6 percent.

These soils have gray mottles at a shallower depth than is definitive for the Rawson series. This difference, however, does not affect the use or behavior of the soils.

Rawson soils are similar to Alexandria and Riddles soils and commonly are adjacent to Bogart, Glenford, and Haskins soils. Unlike Rawson soils, Alexandria and Riddles soils are well drained and formed in glacial till on uplands. Bogart soils have more sand and gravel in the lower part of the subsoil and in the substratum than Rawson soils, and Glenford soils have less sand and more silt in the solum. Haskins soils are somewhat poorly drained and have low-chroma mottles immediately below the surface layer.

Typical pedon of Rawson silt loam, 2 to 6 percent slopes, about 7 miles southwest of Rittman, in Milton Township, about 400 feet north and 2,245 feet west of the southeast corner of sec. 28, T. 18 N., R. 12 W.

Ap1—0 to 9 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak fine and medium granular structure; friable; many fine and medium roots; 2 percent coarse fragments; slightly acid; abrupt smooth boundary.

Ap2—9 to 12 inches; dark yellowish brown (10YR 4/4) silt loam; weak fine and medium subangular blocky structure; friable; many fine and medium roots; 2 percent coarse fragments; medium acid; abrupt smooth boundary.

Bt1—12 to 17 inches; yellowish brown (10YR 5/6) loam; moderate medium and coarse subangular blocky structure; firm; common fine and medium roots; thin patchy dark reddish brown (5YR 3/4) clay films on faces of peds; dark yellowish brown (10YR 4/4) coatings in root channels; few fine distinct very dark brown (10YR 2/2) concretions (Fe and Mn oxides); 5 percent coarse fragments; strongly acid; clear wavy boundary.

Bt2—17 to 27 inches; yellowish brown (10YR 5/6) gravelly clay loam; common fine distinct light brownish gray (10YR 6/2), dark brown (7.5YR 4/4), and yellowish red (5YR 4/6) mottles; moderate medium subangular blocky structure; firm; common fine roots; thin patchy dark reddish brown (5YR 3/4) clay films on faces of peds; few fine prominent black (10YR 2/1) concretions (Fe and Mn oxides); 20 percent gravel; strongly acid; gradual wavy boundary.

Bt3—27 to 33 inches; yellowish brown (10YR 5/4) gravelly clay loam; common fine distinct yellowish red (5YR 5/8) and common fine and medium distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; firm; few fine roots; thin patchy yellowish brown (10YR 5/4) clay films on faces of peds and clay bridging sand grains; 25 percent gravel; medium acid; gradual wavy boundary.

Bt4—33 to 39 inches; dark yellowish brown (10YR 4/4) gravelly clay loam; common fine distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; firm; few fine roots; thin patchy dark brown (10YR 4/3) clay films on faces of peds and clay bridging sand grains; 25 percent gravel; slightly acid; abrupt smooth boundary.

2Bt5—39 to 45 inches; dark brown (10YR 4/3) silty clay; many medium distinct gray (10YR 5/1) mottles; weak coarse angular blocky structure; very firm; thin patchy brown (10YR 5/3) clay films on vertical faces of peds; neutral; gradual smooth boundary.

2C—45 to 60 inches; dark brown (10YR 4/3) silty clay; many medium distinct gray (10YR 5/1) mottles; massive; very firm; mildly alkaline.

The solum is 24 to 48 inches thick. The depth to the underlying lacustrine sediment or glacial till ranges from 22 to 40 inches. The content of gravel ranges from 0 to 15 percent in the A horizon, 2 to 30 percent in the B horizon, and 0 to 10 percent in the 2B and 2C horizons.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is dominantly silt loam, but in some pedons it is loam or sandy loam. Reaction, where the soil has been limed, ranges from medium acid to neutral.

The B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is dominantly gravelly clay loam or sandy clay loam, but it ranges to loam or gravelly loam. In some pedons there are thin strata of sandy loam and gravelly sandy loam. The B horizon is strongly acid to slightly acid. The 2B horizon is silty clay, clay loam, or silty clay loam.

The 2C horizon is commonly silty clay, but it ranges to clay loam and silty clay loam. It is mildly alkaline or moderately alkaline. It has free carbonates in some pedons.

Riddles Series

The Riddles series consists of deep, well drained, moderately permeable soils on uplands. The soils formed mainly in glacial till, but in some areas the till was covered by a thin mantle of loess. The slope ranges from 2 to 25 percent.

Riddles soils are similar to Alexandria and Cardington soils and commonly are adjacent to Canfield, Cardington, Loudonville, Mechanicsburg, and Wooster soils. Alexandria soils have more clay in the subsoil than Riddles soils. Canfield and Cardington soils are moderately well drained and have low-chroma mottles in the upper part of the subsoil. Canfield soils have a fragipan, which Riddles soils do not have. Loudonville soils have hard bedrock between depths of 20 and 40 inches. Mechanicsburg soils formed in glacial till and in material that weathered from the underlying fractured rock. Wooster soils have a fragipan.

Typical pedon of Riddles silt loam, 2 to 6 percent slopes, about 2.9 miles north of Shreve, in Clinton Township, about 660 feet west and 1,320 feet south of the northeast corner of sec. 3, T. 18 N., R. 14 W.

Ap—0 to 9 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak medium granular structure; friable; many fine and medium roots; 2 percent coarse fragments; medium acid; abrupt smooth boundary.

BA—9 to 18 inches; yellowish brown (10YR 5/4) silt loam; weak very thick platy structure in the upper part grading to moderate medium subangular blocky in the lower part; friable; common fine roots; thin patchy dark brown (10YR 4/3) silt coatings on faces of peds; 2 percent coarse fragments; medium acid; clear wavy boundary.

Bt1—18 to 26 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium and coarse subangular blocky structure; friable; common fine roots; thin very patchy dark yellowish brown (10YR 4/4) clay films on faces of peds; 4 percent coarse fragments; strongly acid; clear wavy boundary.

Bt2—26 to 31 inches; dark brown (10YR 4/3) clay loam; common fine faint brown (10YR 5/3) mottles; moderate coarse subangular blocky structure; firm; few fine roots; thin continuous dark brown (10YR 4/3) clay films on faces of peds; few fine black (10YR 2/1) concretions (Fe and Mn oxides); 7 percent coarse fragments; strongly acid; clear wavy boundary.

Bt3—31 to 37 inches; dark brown (10YR 4/3) clay loam; common fine faint brown (10YR 5/3) and few fine distinct grayish brown (10YR 5/2) mottles; moderate coarse subangular blocky structure; firm; thin patchy dark brown (10YR 4/3) clay films on faces of peds; few fine black (10YR 2/1) concretions (Fe and Mn oxides); 9 percent coarse fragments; strongly acid; clear wavy boundary.

Bt4—37 to 45 inches; dark brown (10YR 4/3) clay loam; weak coarse subangular blocky structure; firm; thin patchy dark brown (10YR 4/3) clay films on faces of peds; few fine black (10YR 2/1) concretions (Fe and Mn oxides); 10 percent coarse fragments; slightly acid; clear wavy boundary.

C1—45 to 50 inches; dark brown (10YR 4/3) loam; massive; firm; 12 percent coarse fragments; slight effervescence; mildly alkaline; gradual wavy boundary.

C2—50 to 60 inches; dark brown (10YR 4/3) loam; massive; firm; 12 percent coarse fragments; strong effervescence; moderately alkaline.

The solum is 40 to 65 inches thick. It is 1 to 10 percent coarse fragments. Carbonates are at a depth of 32 to 60 inches.

The Riddles soils that are mapped as a complex with Wooster soils are more acid in the lower part of the pedon than is definitive for the Riddles series. This difference, however, does not affect the use or behavior of the soils.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is dominantly silt loam, but it is loam in some pedons. It is medium acid to neutral where the soil has been treated with lime.

The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. It is loam, clay loam, or silty clay loam and the gravelly analogs. Reaction is strongly acid or medium acid in the upper part and strongly acid to slightly acid in the lower part.

The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 to 6. It is loam or sandy loam and the gravelly analogs. Reaction ranges from neutral to moderately alkaline.

Rittman Series

The Rittman series consists of deep, moderately well drained soils that formed in glacial till on uplands. Permeability is moderate above a fragipan in these soils and slow in the fragipan. The slope ranges from 2 to 18 percent.

Rittman soils are similar to Canfield and Wooster soils and commonly are adjacent to Wadsworth soils. Canfield and Wooster soils have less clay in the subsoil than Rittman soils, and Wooster soils are well drained. Wadsworth soils, unlike Rittman soils, are somewhat poorly drained and have low-chroma mottles immediately below the surface layer.

Typical pedon of Rittman silt loam, 2 to 6 percent slopes, about 4 miles south of Creston, in Canaan Township, about 1,490 feet west and 660 feet north of the southeast corner of sec. 23, T. 17 N., R. 13 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine and medium granular structure; friable; many fine and medium roots; 2 percent coarse fragments; slightly acid; abrupt smooth boundary.

BE—8 to 13 inches; yellowish brown (10YR 5/4) silt loam; weak fine subangular blocky structure; friable; common fine roots; thin patchy dark brown (10YR 4/3) silt coatings on faces of peds; few dark grayish brown (10YR 4/2) fillings in old worm channels; 1 percent coarse fragments; medium acid; clear smooth boundary.

Bt1—13 to 20 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct gray (10YR 6/1) and common fine faint yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; thin very patchy brown (10YR 5/3) clay films on faces of peds; few fine black (10YR 2/1) concretions (Fe and Mn oxides); 2 percent coarse fragments; strongly acid; clear smooth boundary.

Bt2—20 to 28 inches; dark yellowish brown (10YR 4/4) silty clay loam; many medium distinct gray (10YR 6/1) and common fine distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; 20 percent brittle; few fine roots; thin patchy dark yellowish brown (10YR 4/4) clay films on faces of peds; common medium black (10YR 2/1) concretions (Fe and Mn oxides); 4 percent coarse fragments; very strongly acid; clear wavy boundary.

Btx—28 to 42 inches; dark yellowish brown (10YR 4/4) clay loam; common medium distinct gray (10YR 5/1) mottles; moderate very coarse prismatic structure parting to weak thick platy; very firm; 80 percent brittle; few fine roots along prism faces; thick continuous gray (10YR 5/1) clay films on faces of peds; yellowish red (5YR 5/6) rind (1 to 3 mm thick) between the clay film and the prism interior; common fine very dark brown (10YR 2/2) concretions and stains (Fe and Mn oxides); 5 percent coarse fragments; very strongly acid grading to medium acid in the lower part; gradual wavy boundary.

B't—42 to 52 inches; dark yellowish brown (10YR 4/4) clay loam; common medium distinct gray (10YR 5/1) mottles; weak very coarse prismatic structure parting to weak very thick platy; very firm; 50 percent brittle; thick continuous gray (10YR 5/1) clay films on faces of peds; yellowish red (5YR 5/6) rind (1 mm thick) between the clay film and the prism interior; common fine very dark brown (10YR 2/2) concretions and stains (Fe and Mn oxides); 6 percent coarse fragments; medium acid; diffuse wavy boundary.

C—52 to 60 inches; dark yellowish brown (10YR 4/4) clay loam; weak very thick platy structure; very firm; few gray (10YR 5/1) seams; 7 percent coarse fragments; neutral.

The solum is 34 to 60 inches thick. The depth to the top of the fragipan ranges from 18 to 32 inches. The content of coarse fragments ranges from 1 to 10 percent above the Bx horizon and 2 to 15 percent in the fragipan and the underlying horizons.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. In unplowed areas there is an A horizon. In some pedons there is an E horizon. Where the soil has been limed, the Ap horizon is medium acid to neutral.

The Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 5. It is silty clay loam or clay loam. It is very strongly acid or strongly acid. The Btx horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. It is clay loam or silty clay loam. It is very strongly acid or strongly acid in the upper part and medium acid to neutral in the lower part.

The C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is silty clay loam, clay loam, silt loam, or loam. It is slightly acid to mildly alkaline, and in many pedons it has free carbonates.

Sebring Series

The Sebring series consists of deep, poorly drained soils that formed in silty lacustrine deposits on glacial lakebeds surrounded by glaciated uplands. Permeability is moderately slow. The slope is 0 to 2 percent.

Sebring soils are similar to Condit and Luray soils and commonly are adjacent to Fitchville, Glenford, and Luray soils. Unlike Sebring soils, Condit soils formed in glacial till, and they have more clay in the subsoil than Sebring soils. Fitchville soils are somewhat poorly drained and do not have dominant chroma of 2 or less below the A horizon. Glenford soils are moderately well drained and do not have low-chroma mottles below the surface layer. Luray soils are very poorly drained and have a mollic epipedon, which Sebring soils do not have.

Typical pedon of Sebring silt loam, about 2 miles east of Dalton, in Sugar Creek Township, about 2,575 feet east and 1,190 feet north of the southwest corner of sec. 1, T. 16 N., R. 11 W.

Ap—0 to 8 inches; dark gray (10YR 4/1) silt loam, gray (10YR 6/1) dry; weak fine granular structure; friable; many fine roots; 1 percent coarse fragments; neutral; abrupt smooth boundary.

A—8 to 13 inches; dark grayish brown (10YR 4/2) silt loam; many fine distinct grayish brown (10YR 5/2) mottles; weak fine subangular blocky structure; friable; common fine roots; common fine yellowish red (5YR 4/6) concretions (Fe and Mn oxides); 1 percent coarse fragments; slightly acid; clear smooth boundary.

BEg—13 to 17 inches; gray (5Y 5/1) silt loam; common fine distinct dark brown (7.5YR 4/4) mottles; weak medium subangular blocky structure; friable; few fine roots; thin very patchy gray (5Y 5/1) silt coatings on faces of peds; common fine yellowish red (5YR 4/6) stains (Fe and Mn oxides); 1 percent coarse fragments; medium acid; clear smooth boundary.

Btg1—17 to 23 inches; gray (N 5/0) silt loam; common fine distinct dark brown (7.5YR 4/4) mottles; moderate medium subangular blocky structure; firm; few fine roots; thin very patchy olive brown (2.5Y 4/4) and gray (N 5/0) clay films on faces of peds; common fine yellowish red (5YR 4/6) stains (Fe and Mn oxides); 1 percent coarse fragments; medium acid; clear smooth boundary.

Btg2—23 to 32 inches; gray (5Y 5/1) silt loam; common fine distinct dark brown (7.5YR 4/4) mottles; weak coarse subangular blocky structure; firm; few fine roots; thin very patchy gray (5Y 5/1) clay films on faces of peds; common fine yellowish red (5YR 4/6) stains (Fe and Mn oxides); 1 percent coarse fragments; slightly acid; clear smooth boundary.

Btg3—32 to 39 inches; yellowish brown (10YR 5/4) silty clay loam; many medium distinct gray (10YR 6/1) and strong brown (7.5YR 5/6) mottles; weak coarse subangular blocky structure; firm; few fine roots; thin patchy gray (10YR 6/1) clay films on faces of peds; common fine yellowish red (5YR 5/6) stains (Fe and Mn oxides); common fine very dark brown (10YR 2/2) concretions (Fe and Mn oxides); 2 percent coarse fragments; neutral; gradual wavy boundary.

C—39 to 50 inches; yellowish brown (10YR 5/4) silty clay loam; many medium distinct gray (10YR 6/1) and common fine faint yellowish brown (10YR 5/6) mottles; massive; firm; few fine very dark brown (10YR 2/2) concretions (Fe and Mn oxides); 5 percent coarse fragments; neutral; gradual smooth boundary.

Cg—50 to 58 inches; gray (N 5/0) very fine sandy loam; common fine distinct yellowish brown (10YR 5/6) mottles; massive; very friable; few fine very dark brown (10YR 2/2) concretions (Fe and Mn oxides); 1 percent coarse fragments; neutral; gradual smooth boundary.

C'—58 to 60 inches; olive brown (2.5Y 4/4) very fine sandy loam; common medium distinct gray (10YR 6/1) mottles; massive; very friable; 1 percent coarse fragments; neutral.

The solum is 30 to 55 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 1 or 2. It is commonly silt loam, but it is silty clay loam in some pedons. Where the soil has been limed, the Ap horizon ranges from medium acid to neutral.

The Bt horizon has hue of 10YR to 5Y or is neutral; value is 4 to 6, and chroma is 0 to 2 above a depth of 30 inches and 0 to 6 below that depth. The Bt horizon is silty clay loam or silt loam and has thin strata of loam or clay loam. It ranges from very strongly acid to medium acid in the upper part and medium acid to neutral in the lower part.

The C horizon has hue of 10YR to 5Y or is neutral; value is 4 or 5, and chroma is 0 to 6. The C horizon is silt loam, silty clay loam, clay loam, very fine sandy loam, or sandy loam. It ranges from slightly acid to mildly alkaline.

Tioga Series

The Tioga series consists of deep, well drained soils that formed in recent alluvium on flood plains. Permeability is moderate or moderately rapid. The slope is 0 to 2 percent.

Tioga soils are similar to Lobdell soils and commonly are adjacent to Lobdell and Orrville soils. Lobdell soils are moderately well drained, and Orrville soils are somewhat poorly drained. Unlike Tioga soils, Lobdell and Orrville soils have low-chroma mottles within 24 inches of the surface.

Typical pedon of Tioga silt loam, occasionally flooded, about 1.8 miles southwest of Creston, in Canaan

Township, about 800 feet east and 2,510 feet south of the northwest corner of sec. 11, T. 17 N., R. 13 W.

A1—0 to 4 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak medium and coarse granular structure; friable; many fine and medium roots; neutral; abrupt smooth boundary.

A2—4 to 9 inches; dark brown (10YR 4/3) silt loam; weak coarse granular structure; friable; common fine and medium roots; neutral; abrupt smooth boundary.

Bw1—9 to 34 inches; dark yellowish brown (10YR 4/4) loam; weak fine and medium subangular blocky structure; friable; common fine roots; thin patchy dark brown (10YR 4/3) silt coatings on faces of peds; neutral; clear smooth boundary.

Bw2—34 to 37 inches; dark yellowish brown (10YR 4/4) loam; common medium distinct grayish brown (10YR 5/2) mottles; weak coarse and medium subangular blocky structure; friable; few fine roots; thin patchy dark brown (10YR 4/3) silt coatings on faces of peds; medium acid; clear smooth boundary.

Bw3—37 to 48 inches; yellowish brown (10YR 5/4) loam; common medium distinct grayish brown (10YR 5/2) and few fine faint dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6) mottles; weak fine and medium subangular blocky structure; friable; medium acid; clear smooth boundary.

C1—48 to 50 inches; yellowish brown (10YR 5/4) silt loam; many fine and medium distinct gray (10YR 5/1) and common fine distinct dark brown (7.5YR 4/4) mottles; massive; firm; 2 percent coarse fragments; medium acid; clear smooth boundary.

C2—50 to 60 inches; dark grayish brown (10YR 4/2) stratified silt loam and fine sandy loam; few fine dark brown (10YR 4/3) mottles; massive; firm; 1 percent coarse fragments; medium acid.

The solum is 24 to 48 inches thick. The content of coarse fragments ranges from 0 to 15 percent in the B and C horizons.

The A horizon has hue of 10YR, value of 4, and chroma of 2 or 3. Typically it is silt loam, but in some pedons it is loam or fine sandy loam. It ranges from medium acid to neutral.

The B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. It is dominantly silt loam or loam but includes thin layers of sandy loam or fine sandy loam. The B horizon ranges from medium acid to neutral.

The C horizon is stratified and has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 to 4. It is silt loam, loam, sandy loam, or fine sandy loam. It ranges from medium acid to neutral.

Tiro Series

The Tiro series consists of deep, somewhat poorly drained soils that formed in silty and loamy water-deposited sediment and in the underlying glacial till on uplands. Permeability is moderate in the solum and moderately slow or slow in the substratum. The slope is 0 to 2 percent.

Tiro soils are similar to Bennington, Fitchville, and Haskins soils and commonly are adjacent to Bennington, Canfield, Rittman, and Wadsworth soils. Bennington and Haskins soils have less silt and more sand in the upper part of the subsoil than Tiro soils, and Fitchville soils formed in deeper lacustrine deposits. Canfield, Rittman, and Wadsworth soils have a fragipan, which Tiro soils do not have.

Typical pedon of Tiro silt loam, 0 to 2 percent slopes, about 1 mile west-northwest of Smithville, in Wayne Township, about 530 feet south and 725 feet west of the northeast corner of sec. 13, T. 16 N., R. 13 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; few fine roots; 1 percent coarse fragments; slightly acid; abrupt smooth boundary.

BEg—8 to 13 inches; grayish brown (2.5Y 5/2) silt loam; common fine distinct strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; friable; few fine roots; continuous light brownish gray (10YR 6/2) silt coatings on faces of peds; 1 percent coarse fragments; medium acid; clear smooth boundary.

Btg—13 to 21 inches; grayish brown (2.5Y 5/2) silt loam; few fine distinct reddish brown (5YR 4/4) mottles; moderate medium subangular blocky structure; friable; few fine roots; thin continuous light brownish gray (10YR 6/2) silt coatings on faces of peds; few fine very dark gray (10YR 3/1) stains (Fe and Mn oxides); thin patchy clay films on faces of peds and in pores; 1 percent coarse fragments; medium acid; clear smooth boundary.

Bt1—21 to 28 inches; yellowish brown (10YR 5/4) silt loam; many medium distinct light brownish gray (10YR 6/2), common medium distinct strong brown (7.5YR 5/6), and few fine distinct reddish brown (5YR 4/4) mottles; moderate medium subangular blocky structure; friable; few fine roots; thin continuous light brownish gray (10YR 6/2) silt coatings on faces of peds; few fine very dark gray (10YR 3/1) stains (Fe and Mn oxides); thin patchy clay films on faces of peds; 1 percent coarse fragments; medium acid; clear wavy boundary.

Bt2—28 to 34 inches; yellowish brown (10YR 5/4) silt loam; many medium distinct light brownish gray (10YR 6/2), common medium distinct strong brown (7.5YR 5/6), and few fine distinct dark brown (7.5YR 4/4) mottles; moderate medium subangular blocky structure; friable; few fine roots; medium continuous gray (10YR 6/1) silt coatings on faces of peds; few fine very dark grayish brown (10YR 3/2) stains (Fe and Mn oxides); thin patchy clay films on faces of peds; 2 percent coarse fragments; slightly acid; clear wavy boundary.

2BC—34 to 40 inches; dark yellowish brown (10YR 4/4) gravelly loam; many medium distinct light brownish gray (10YR 6/2) and few fine distinct strong brown (7.5YR 5/6) mottles; weak medium platy structure resulting from stratification; friable; 18 percent coarse fragments; slightly acid; clear smooth boundary.

3C—40 to 60 inches; dark yellowish brown (10YR 4/4) loam; many medium distinct light brownish gray (10YR 6/2) mottles; massive; firm; 5 percent coarse fragments; neutral.

The solum is 30 to 55 inches thick. The depth to the 2BC horizon ranges from 22 to 36 inches. The content of coarse fragments is 0 to 3 percent in the solum above the 2BC horizon, 0 to 20 percent in the 2BC horizon, and 3 to 10 percent in the C horizon.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 1 or 2. Reaction, where the soil has been limed, ranges from medium acid to neutral. In some pedons there is an E horizon.

The Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 6. It is silt loam or silty clay loam. It is very strongly acid to medium acid in the upper part and ranges to slightly acid in the lower part. In some pedons there is a 3Bt or a 3BC horizon.

The 3C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 4. It is loam, clay loam, or silty clay loam. It has free carbonates in some pedons.

Wadsworth Series

The Wadsworth series consists of deep, somewhat poorly drained soils that formed in glacial till on uplands. Permeability is moderate or moderately slow above a fragipan in these soils and slow or very slow in the fragipan. The slope ranges from 0 to 6 percent.

Wadsworth soils are similar to Ravenna soils and commonly are adjacent to Fitchville, Rittman, Sebring, and Tiro soils. Unlike Wadsworth soils, Fitchville, Sebring, and Tiro soils do not have a fragipan. Ravenna soils have less clay in the subsoil than Wadsworth soils. Rittman soils are moderately well drained and do not have low-chroma mottles immediately below the surface layer. Sebring soils are poorly drained and have more gray colors in the subsoil than Wadsworth soils.

Typical pedon of Wadsworth silt loam, 2 to 6 percent slopes, about 4 miles south of Creston, in Canaan Township, about 725 feet east and 2,250 feet north of the southwest corner of sec. 23, T. 17 N., R. 13 W.

Ap1—0 to 8 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak medium granular structure; friable; common fine roots; 2 percent coarse fragments; mildly alkaline; abrupt smooth boundary.

Ap2—8 to 11 inches; dark brown (10YR 4/3) silt loam; common medium distinct yellowish brown (10YR 5/8) and few medium distinct strong brown (7.5YR 5/8) mottles; weak thick platy structure parting to weak fine subangular blocky; friable; common fine roots; 2 percent coarse fragments; mildly alkaline; abrupt smooth boundary.

BE—11 to 15 inches; yellowish brown (10YR 5/6) silty clay loam; many medium distinct light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; friable; few fine roots; medium continuous light brownish gray (10YR 6/2) silt coatings on faces of peds; few fine distinct black (10YR 2/1) stains (Fe and Mn oxides); 2 percent coarse fragments; very strongly acid; clear smooth boundary.

Bt1—15 to 22 inches; yellowish brown (10YR 5/6) silty clay loam; common medium distinct strong brown (7.5YR 5/8) mottles; moderate medium prismatic structure parting to moderate medium and coarse subangular blocky; firm; few fine roots; thick continuous light brownish gray (10YR 6/2) silt coatings on faces of peds; thin clay films in pores; few fine distinct black (10YR 2/1) stains (Fe and Mn oxides); 2 percent coarse fragments; very strongly acid; clear smooth boundary.

Bt2—22 to 28 inches; yellowish brown (10YR 5/6) silty clay loam; common fine distinct light brownish gray (10YR 6/2) and strong brown (7.5YR 5/8) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; gray (10YR 6/1) thin patchy clay films and medium continuous silt coatings on faces of peds; many medium distinct black (10YR 2/1) stains; 2 percent coarse fragments; very strongly acid; clear smooth boundary.

Btx1—28 to 35 inches; dark brown (10YR 4/3) clay loam; common medium distinct strong brown (7.5YR 5/8) mottles; weak very coarse prismatic structure parting to weak medium platy; very firm, brittle; few fine roots along prism faces; gray (10YR 6/1) thin patchy clay films and medium continuous silt coatings on faces of peds; many medium prominent black (10YR 2/1) stains; 10 percent coarse fragments; strongly acid; clear smooth boundary.

Btx2—35 to 43 inches; dark brown (10YR 4/3) clay loam; common medium distinct strong brown (7.5YR 5/8) mottles; weak very coarse prismatic structure parting to weak medium platy; very firm, brittle; few fine roots along prism faces; gray (10YR 6/1) thin patchy clay films and medium continuous silt coatings on faces of peds; many medium distinct black (10YR 2/1) stains; 10 percent coarse fragments; very strongly acid grading to medium acid in the lower part; clear smooth boundary.

BC—43 to 52 inches; dark yellowish brown (10YR 4/4) clay loam; common medium distinct gray (10YR 5/1) mottles; weak coarse prismatic structure; firm, brittle; few fine distinct black (10YR 2/1) stains; 10 percent coarse fragments; slightly acid; clear smooth boundary.

C—52 to 60 inches; dark yellowish brown (10YR 4/4) loam; massive; firm; 7 percent coarse fragments; mildly alkaline.

The solum is 36 to 60 inches thick. The depth to the top of the fragipan ranges from 18 to 30 inches. The content of coarse fragments ranges from 1 to 4 percent above the fragipan and from 2 to 15 percent in the fragipan and the C horizon.

The Ap horizon typically has hue of 10YR, value of 4 or 5, and chroma of 1 to 3. Reaction, where the soil has been limed, ranges from medium acid to mildly alkaline. In some pedons there is an E horizon.

The Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 to 6. It is silty clay loam or clay loam. It ranges from extremely acid to medium acid. The Btx horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 to 6. It is dominantly clay loam or silty clay loam, but the range includes silt loam. The Btx horizon is very strongly acid to medium acid in the upper part and medium acid to neutral in the lower part.

The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 to 6. It is clay loam, silty clay loam, loam, or silt loam. It is mildly alkaline or moderately alkaline. It has free carbonates in some pedons.

Wallkill Series

The Wallkill series consists of deep, very poorly drained soils that formed in alluvium and in organic material over glacial lacustrine deposits. The soils are in depressions on uplands and flats on flood plains. Permeability is moderate in the alluvium and moderately rapid or rapid in the organic material. The slope is less than 2 percent.

Wallkill soils commonly are adjacent to Carlisle, Killbuck, Linwood, Luray, and Melvin soils. Unlike Wallkill soils, Carlisle and Linwood soils formed in organic material, and Killbuck, Luray, and Melvin soils formed in mineral material.

Typical pedon of Wallkill silt loam, about 3 miles south of Wooster, in Franklin Township, about 2,510 feet east and 395 feet north of the southwest corner of sec. 28, T. 15 N, R. 13 W.

Ap—0 to 10 inches; dark grayish brown (2.5Y 4/2) silt loam, light brownish gray (2.5Y 6/2) dry; few fine distinct dark yellowish brown (10YR 4/4) mottles; moderate medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

Bg—10 to 20 inches; grayish brown (2.5Y 5/2) silt loam; few fine distinct dark yellowish brown (10YR 4/4) mottles; weak fine subangular blocky structure; friable; common fine roots; few fine distinct very dark brown (10YR 2/2) concretions (Fe and Mn oxides); slightly acid; clear smooth boundary.

Ab—20 to 24 inches; black (10YR 2/1) and grayish brown (2.5Y 5/2) silt loam; common fine distinct olive brown (2.5Y 4/4) mottles; weak medium subangular blocky structure; friable; few fine roots; slightly acid; clear wavy boundary.

2Oa1—24 to 36 inches; black (10YR 2/1) broken face and rubbed sapric material; about 10 percent fiber, 1 percent rubbed; weak coarse subangular blocky structure; firm; few fine roots; 20 percent dark yellowish brown (10YR 4/4) sapric material mixed throughout; estimated mineral content 60 percent; medium acid; clear smooth boundary.

2Oa2—36 to 52 inches; very dark grayish brown (10YR 3/2) broken face and rubbed sapric material; about 10 percent fiber, 2 percent rubbed; massive; friable; estimated mineral content 50 percent; medium acid; clear wavy boundary.

3Cg—52 to 60 inches; greenish gray (5GY 5/1) silt loam; massive; firm; neutral.

The thickness of the alluvium over the organic material ranges from 16 to 40 inches. The organic layer beneath the mineral soil is more than 20 inches thick. In some pedons, the mineral horizons below the Ap horizon are as much as 20 percent gravel.

The Ap horizon has hue of 10YR or 2.5Y, value of 2 to 4, and chroma of 1 or 2. It ranges from strongly acid to neutral.

The Bg horizon has hue of 10YR to 5Y, value of 3 to 5, and chroma of 1 or 2. It is silt loam, loam, or silty clay loam. In some pedons it has thin subhorizons of fine sandy loam. The Bg horizon ranges from strongly acid to neutral. Some pedons have a Cg horizon immediately below the Bg horizon. Some pedons do not have an Ab horizon immediately above the organic layers.

The 2Oa horizon is dominantly sapric material, but thin layers of hemic material are present in some pedons. The 2Oa horizon has hue of 5YR to 2.5Y, value of 2 or 3, and chroma of 1 or 2. It ranges from medium acid to neutral.

The 3C horizon is silt loam, loam, or silty clay loam. It is coprogenous earth in some pedons.

Wooster Series

The Wooster series consists of deep, well drained, moderately slowly permeable soils on uplands. The soils formed mainly in glacial till, but in some places the till was covered by a thin mantle of loess. The slope ranges from 2 to 18 percent.

Wooster soils are similar to Canfield soils and commonly are adjacent to Canfield, Loudonville, Mechanicsburg, Ravenna, and Riddles soils. Canfield soils are moderately well drained, and Ravenna soils are somewhat poorly drained and have gray mottles above a fragipan. Unlike Wooster soils, the Loudonville, Mechanicsburg, and Riddles soils do not have a fragipan. Loudonville soils are moderately deep to bedrock.

Typical pedon of Wooster silt loam, in an area of Wooster-Riddles silt loams, 2 to 6 percent slopes, about 3 miles southeast of Wooster, in Franklin Township, about 2,150 feet east and 2,110 feet south of the northwest corner of sec. 23, T. 15 N., R. 13 W.

Ap—0 to 6 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; 1 percent coarse fragments; neutral; abrupt smooth boundary.

E—6 to 10 inches; light yellowish brown (10YR 6/4) silt loam; weak medium and thin platy structure parting to weak fine granular; friable; common roots; dark grayish brown (10YR 4/2) coatings in root channels; 1 percent coarse fragments; very strongly acid; gradual wavy boundary.

Bt1—10 to 16 inches; yellowish brown (10YR 5/6) silt loam; weak and moderate fine and medium subangular blocky structure; friable; common roots; dark grayish brown (10YR 4/2) coatings along root channels; 1 percent coarse fragments; very strongly acid; gradual wavy boundary.

Bt2—16 to 21 inches; yellowish brown (10YR 5/6) loam; moderate fine and medium subangular blocky structure; friable; common roots; thin patchy yellowish brown (10YR 5/4) clay films on faces of peds; 5 percent coarse fragments; very strongly acid; clear wavy boundary.

Bt3—21 to 27 inches; yellowish brown (10YR 5/4) loam; common medium distinct brownish yellow (10YR 6/6) mottles; moderate fine and medium subangular blocky structure; firm; common roots; medium continuous light yellowish brown (2.5Y 6/4) clay films on faces of peds; 10 percent coarse fragments; strongly acid; clear wavy boundary.

Btx1—27 to 38 inches; yellowish brown (10YR 5/4) gravelly loam; common fine and medium distinct yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) mottles; weak very coarse prismatic structure parting to weak medium subangular blocky; very firm, brittle; common roots; few fine black (10YR 2/1) concretions (Fe and Mn oxides); thin patchy dark yellowish brown (10YR 4/4) clay films on faces of peds; 20 percent coarse fragments; strongly acid; gradual smooth boundary.

Btx2—38 to 48 inches; yellowish brown (10YR 5/4) gravelly loam; few medium distinct grayish brown (2.5Y 5/2), light gray (5Y 7/2), and reddish yellow (7.5YR 6/8) mottles; weak very coarse prismatic structure parting to weak very thick platy; very firm, brittle; few fine black (10YR 2/1) concretions (Fe and Mn oxides); thin patchy strong brown (7.5YR 5/8) clay films on faces of peds; 25 percent coarse fragments; strongly acid; gradual smooth boundary.

Btx3—48 to 58 inches; yellowish brown (10YR 5/4) gravelly loam; common medium distinct reddish yellow (7.5YR 6/8) and grayish brown (2.5Y 5/2) mottles; weak very coarse prismatic structure parting to weak very thick platy; very firm, brittle; few fine black (10YR 2/1) concretions (Fe and Mn oxides); thick continuous grayish brown (2.5Y 5/2) clay films on faces of prisms; 17 percent coarse fragments; strongly acid; clear smooth boundary.

C—58 to 60 inches; yellowish brown (10YR 5/4) gravelly loam; massive; firm; 15 percent coarse fragments; very strongly acid.

The thickness of the solum ranges from 40 to 68 inches. The depth to the fragipan ranges from 20 to 36 inches. The content of coarse fragments is 2 to 20 percent above the Btx horizon and 5 to 25 percent in the Btx and C horizons.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is dominantly silt loam, but in some pedons it is loam. Reaction, where lime has been applied, ranges from medium acid to neutral.

The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. It is loam, silt loam, or clay loam and the gravelly analogs. Reaction ranges from very strongly acid to medium acid.

The Btx horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is loam, silt loam, or clay loam and the gravelly analogs. Reaction ranges from very strongly acid to medium acid.

The C horizon has hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 3 to 6. It is dominantly loam, but the range includes silt loam, sandy loam, and the gravelly analogs. Reaction ranges from very strongly acid to neutral.

Formation of the Soils

This section discusses the factors of soil formation, relates them to the formation of soils in Wayne County, and explains the processes of soil formation.

Factors of Soil Formation

Soil is a three-dimensional natural body capable of supporting plant growth. The nature of the soil at any given site is the result of the interaction of many factors. These factors can be grouped into five general categories: parent material, plants and animals, climate, relief, and time.

Parent Material

Parent material is the raw material that is acted upon by the other soil-forming factors. It mainly determines the soil texture, which in turn controls permeability and the available water capacity. The soils of Wayne County formed in different kinds of parent material. Many of the soils formed in material deposited by glaciers that covered the area thousands of years ago or by water that was formed as these glaciers melted. Other soils formed in material recently deposited by streams, in material that weathered from rock in place, or in material that formed from decaying plants.

Glacial till is material that was deposited by glacial ice. The glacial ice contained a variety of soil materials, which were left behind as the ice melted. Glacial till typically contains particles that range in size from fine clay to large stones. The smaller stones and pebbles have sharp angles, which indicate that the pebbles have not been rounded by water action. The mineral composition of till depends upon the nature of the area over which the ice passed before it reached the area where it deposited the till. Some boulders were carried for long distances, but most of the till material in Wayne County originated in what is now Ohio. The till in the northwestern part of the county has large quantities of clay and lime. Soils that formed in this till, for example, Bennington and Cardington soils, have a silty clay loam or clay loam subsoil and have natural lime below a depth of about 3 feet. Farther south the till generally has less shale and limestone and more sandstone. Soils that formed in this till, such as Canfield and Wooster soils, have a loam, silt loam, or gravelly loam subsoil and have no natural lime within a depth of 5 feet.

Soils that formed in glacial till generally are compact and make a good base for building foundations and roads because of the wide range in particle sizes.

Melt water deposits were laid down by melting glaciers. They are of two general kinds: lacustrine deposits laid down in still water and outwash deposits laid down by moving water. The size of particles that can be carried suspended in water depends on the speed at which the water is moving. When water slows to a given speed, all particles larger than a given size that are suspended in the water drop out. The speed of a stream slows where the stream flows into a still lake. The coarser sand and gravel particles are dropped immediately near the mouth of the stream, and the fine clay particles are carried far into the lake where they settle slowly from the still water.

Outwash deposits are not extensive in Wayne County. These deposits were laid down as melt water from the glaciers poured down the valleys. Because of the speed of the water, the minute silt and clay particles were washed away, and the sand and gravel were left behind. Soils that formed in these outwash deposits, such as Bogart and Chili soils, are gravelly and porous in the lower part of the subsoil and in the substratum.

Of greater extent in the county are soils that formed in lacustrine deposits. Fitchville, Glenford, and Luray soils, for example, formed in deposits laid down in lakes that existed after the glaciers melted. The largest of these lakes was in the Chippewa Creek Valley. Smaller lakes were scattered throughout the county.

In many places the speed of water did not remain constant during the period of deposition. When the speed of water changed, thin layers of material were deposited in which the dominant particle size differs from that in the layers above and below. This type of deposition is called stratification, and the individual layers are called strata. For example, in many areas of Fitchville and Luray soils, there are alternating thin strata of silt loam and silty clay loam. More drastic changes in material deposition are indicated by "two story" soils such as Haskins and Rawson soils. The lower part of these soils formed in loamy or clayey deposits laid down by glaciers or in still water, and the upper part formed in loamy deposits laid down by moving water.

Alluvium is soil material deposited by streams. Its texture is extremely variable because the speed and duration of floodwater vary considerably within small

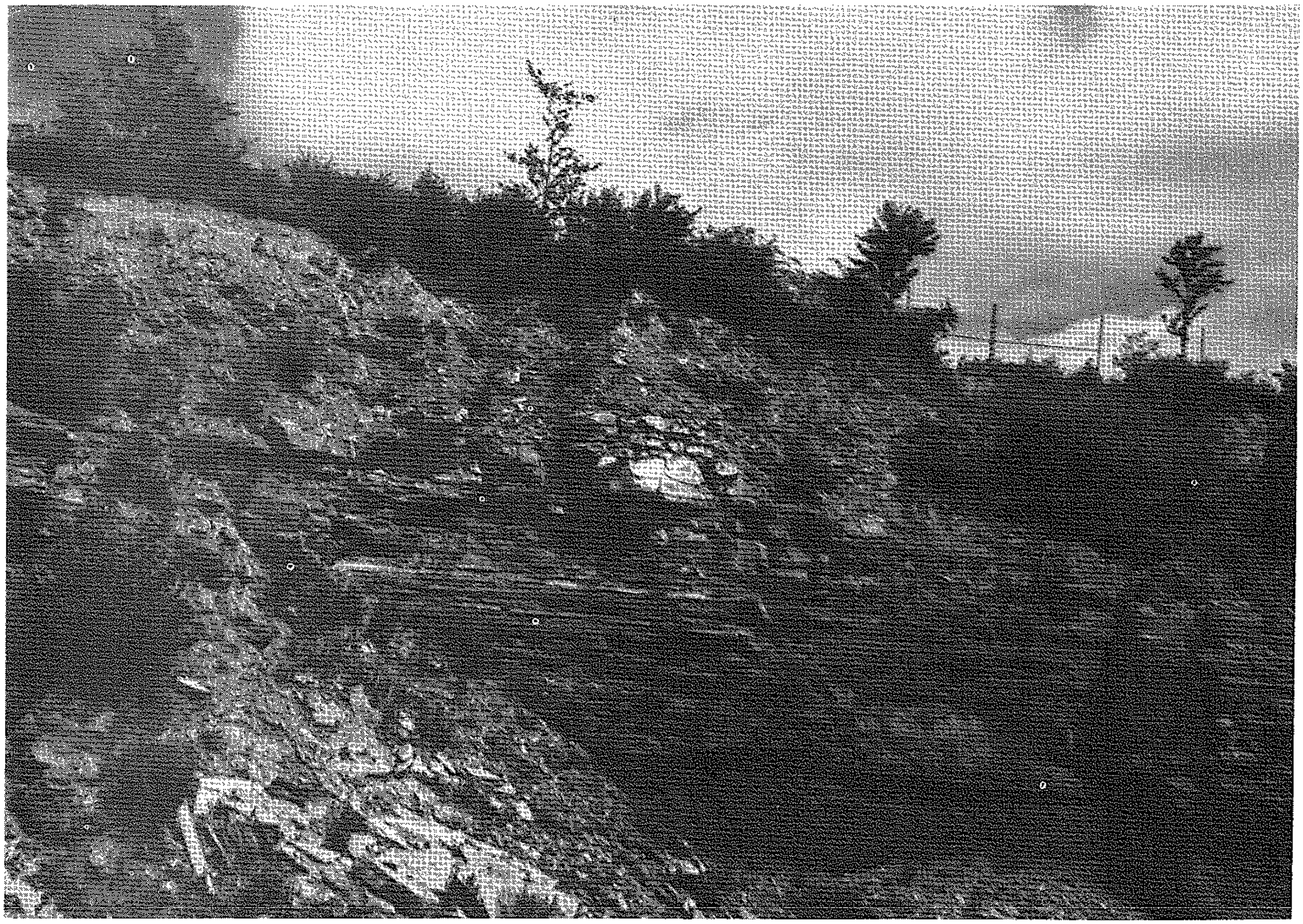

Figure 8.—This deep, vertical cut into bedrock is in an area of Mechanicsburg soils. The lower part of these soils formed in residuum of siltstone and fine-grained sandstone.

areas. Soil horizons are poorly expressed because the soil-forming process starts over again each time that new material is deposited. There is a buried surface layer in many areas, and the soils are highly stratified. The source of most alluvium is other soils farther upstream in the watershed. Lobdell, Melvin, Orrville, and Tioga soils formed in alluvium.

Weathered rock is an important parent material. The bedrock in Wayne County is sandstone, siltstone, and shale. Sandstone weathers to sandy loam, loam, fine sandy loam, or very fine sandy loam. Dekalb soils formed in the residuum of sandstone. In general, the soils that formed in weathered sandstone are well drained and are low in clay content. Siltstone, shale, and fine-grained sandstone commonly weather to silt loam. Berks soils and the lower part of Mechanicsburg soils formed in the residuum of these types of rock (fig. 8).

Carlisle soils and the upper part of Linwood soils formed in the residue of decomposed plant material. These soils are naturally wet soils, in low areas, that support luxuriant plant growth. When the plants died, the wet condition prevented oxidation and slowed decomposition, and the residue accumulated. Carlisle and Linwood soils are very dark because their original material was organic.

Plants and Animals

The type of vegetation under which a soil formed influences the color, structure, and organic matter content of the soil. Because grass is more efficient than trees in returning organic matter to the soil, soils that formed under a grass cover generally are darker than those that formed under a forest cover. Grass vegetation also promotes granular structure in the surface soil.

Most of the soils in Wayne County formed under hardwood forest. Alexandria, Berks, Riddles, and Wooster soils, for example, formed under a forest consisting mainly of hardwoods such as red oak, white oak, and black oak. Most of the poorly drained and very poorly drained soils, such as Sebring and Luray soils, formed under swamp forest vegetation.

Bacteria and fungal micro-organisms in the soil aid in breaking down plant residue. The type of organic residue that is left depends to some extent on the type of organism involved in the breakdown. Generally speaking, fungi are more active in acid soils and bacteria in alkaline soils.

Earthworms, burrowing insects, and small animals are constantly mixing the soil. Because of their burrowing, the soil is more porous and water passes more rapidly through the soil. Earthworms help to incorporate organic matter into the soil. Leaf fall on a soil well populated with earthworms generally has been incorporated into the soil by the time the soil warms up in spring. Part of the leaf fall of two or three years past remains undecomposed on the surface on some soils in which the earthworm population is low.

Man has accelerated erosion by clearing and cultivating the land. Cultivation also influences soil structure and tends to lower the organic matter content. Large areas of such soils as Luray soils have been artificially drained. Future soil development in such areas will take place under drier conditions than those under which the present soils developed. Bethesda and Fairpoint soils are in areas that have been drastically disturbed by surface mining. These soils are a mixture of rock fragments and of partly weathered fine-earth material that was in or below the profile of the original soil.

The change from the native forest cover to cultivated crops can also be expected to influence future soil development. The addition of lime and fertilizer tends to change the chemical and biological regime of the soil.

Climate

Climate can be a factor in soil formation in an area the size of Wayne County; however, none of the soil differences in the county can be directly attributed to differences in climate.

Relief and Landforms

Relief and the parent material determine the natural drainage of the soils in Wayne County. Relief determines the amount of runoff and the depth to the water table; for example, soils on the steeper slopes have better drainage than those in flat areas. Because of relief, different kinds of soil can form in the same kind of original material. For example, Glenford and Luray soils formed in silty lacustrine deposits. Glenford soils are in positions where the water table generally is at a depth of more than 24 inches. Water passes readily through the moderately well drained Glenford soils. Luray soils, however, are in low, nearly level areas, where the water table is close to the surface. The soil material is permeable enough to permit water to pass through it, but because water tends to collect in these areas, Luray soils are very poorly drained.

Relief varies considerably in Wayne County. In the northern part of the county, the most extensive landform is a nearly level to undulating till plain. Relief is stronger in the central and southern parts of the county, where the glacier had less of a leveling effect on the rock beneath. The proportion of well drained soils is considerably higher in the steeper southern part of the county than in the more level northern part, where there are poorly drained and somewhat poorly drained soils.

Time

The length of time for which the original material has been exposed to the processes of soil development has an effect on the nature of the soil. The youngest soils in the county are the soils that formed in recent stream deposits. Soils such as Lobdell and Orrville soils, which formed in recent deposits, have less well defined horizons than those of older soils.

Processes of Soil Formation

There are four general kinds of processes of soil formation: additions, removals, transfers, and transformations. These processes occur in all soils, but their intensity differs widely in different soils.

The best example of addition in Wayne County is the accumulation of organic matter, which is responsible for the dark color of the surface layer. When the original material was laid down, the top layer was no darker than the rest. The organic residue of the plants that have grown on the soil has darkened the surface layer.

Removal has taken place in many Wayne County soils, the original material of which was limy. But lime has now been lost from the upper 3 to 6 feet in most of the soils because of the leaching effect of water moving through the soil.

Water is the carrier for most transfers that take place during soil development. In many Wayne County soils, clay has been translocated from the A horizon to the B horizon. The A horizon and especially the E horizon are zones of eluviation or loss. The B horizon is a zone of illuviation or gain. In soils like Cardington, Loudonville, and Wooster soils, the B horizon has more clay than the original material, and the A horizon has less. In some soils, the B horizon has thin films of clay lining pores and on the faces of peds. This clay has been moved from the A to the B horizon.

Most of the transformations in the soils in Wayne County involve clay minerals; therefore, they are not easily observed.

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Glossary

Ablation till. Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

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.

Air drainage. The downslope flow of air induced by cooling of the earth's surface at night; at a given site, the condition of having sufficient slope and relief to provide air outlets and convection currents, which prevent "dead" air and frost pockets.

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.

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—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Basal till. Compact glacial till deposited beneath the ice.

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to flooding.

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.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a fragment.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 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.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation tillage. A tillage system that does not invert the soil and that leaves 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.

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.

Deferred grazing. Postponing grazing or resting grazingland for a prescribed period.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

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.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, and clay.

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 37.5 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

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 melt water.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits (geology). Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial melt water. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Graded stripcropping. Growing crops in strips that grade toward a protected waterway.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, alluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Arabic numeral 2 precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

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 (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

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. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Muck. Dark colored, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Open space. A relatively undeveloped green or wooded area provided mainly within an urban area to minimize feelings of congested living.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash, glacial. Stratified sand and gravel produced by glaciers and carried, sorted, and deposited by glacial melt water.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

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 drains. Artificial drains placed entirely around the perimeter of a septic tank absorption field to lower the water table.

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.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size 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 underlying material. 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.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

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.

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.

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 insure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

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 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. 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, are in soils in extremely small amounts. They are essential to plant growth.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial melt water. 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.

Water bar. A shallow trench and a ridge of earth constructed at an angle across a road or trail to intercept and divert surface runoff and reduce 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.