SOIL SURVEY OF

ASHLAND COUNTY, OHIO

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

HOW TO U

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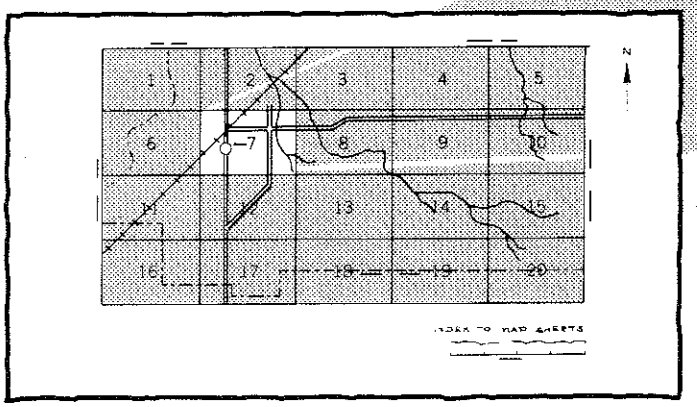

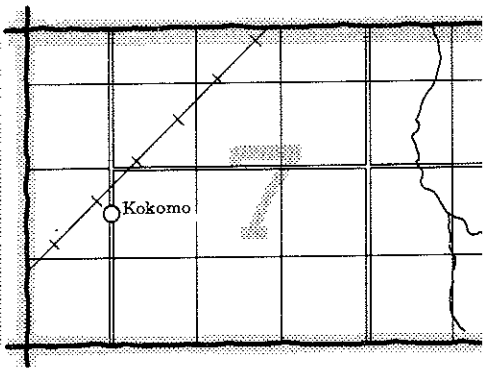

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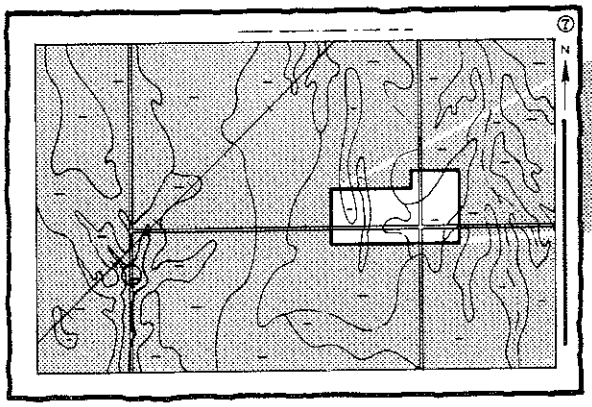

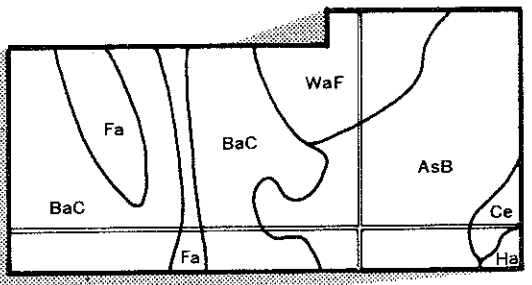

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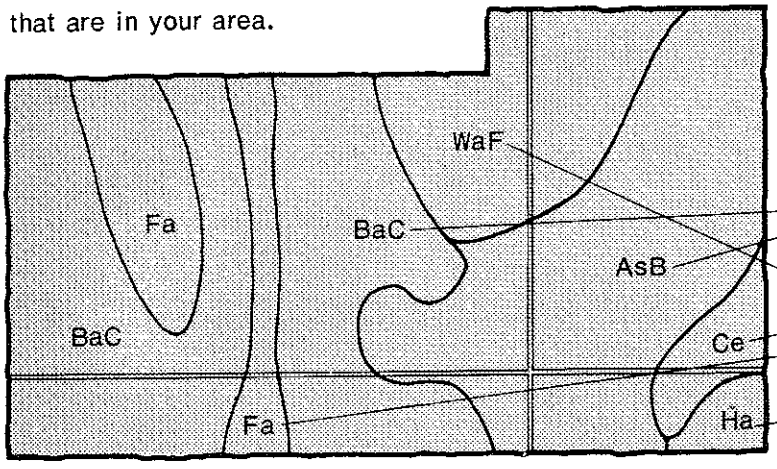

Symbols

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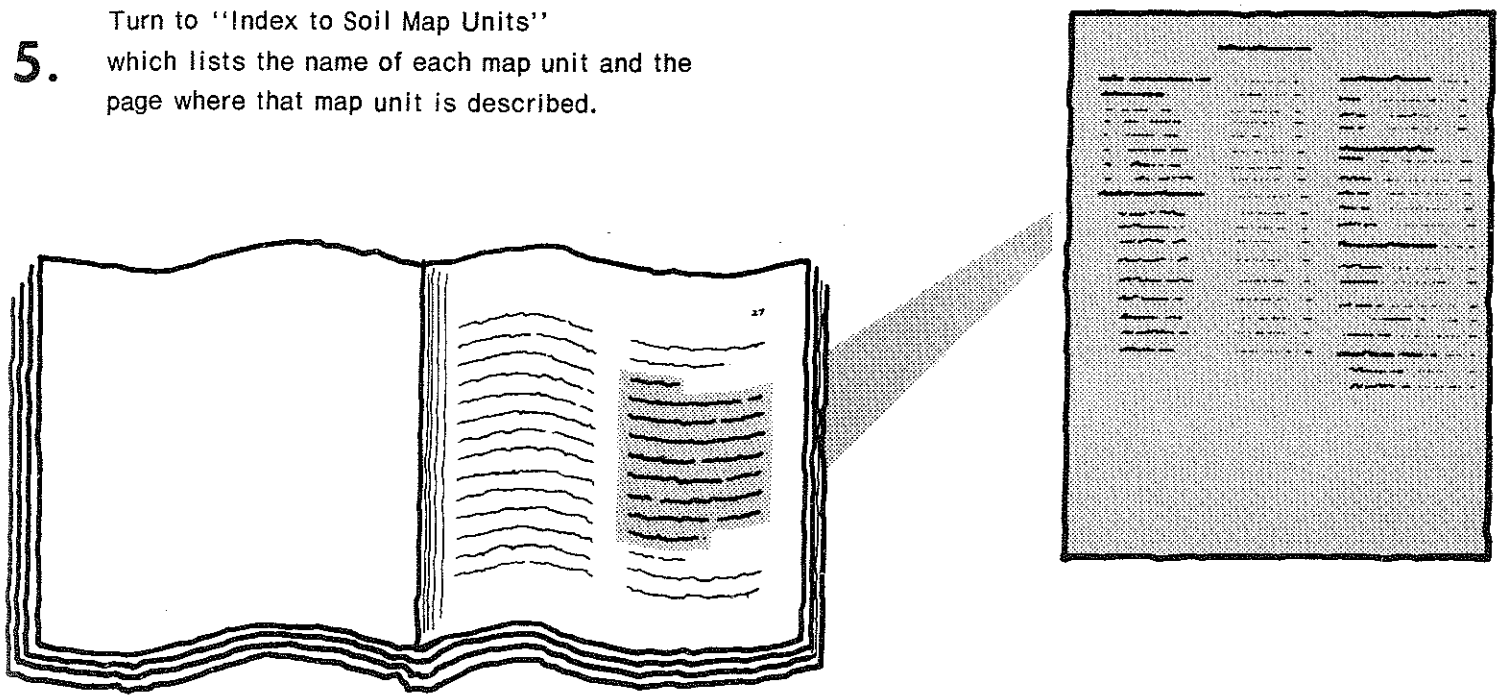
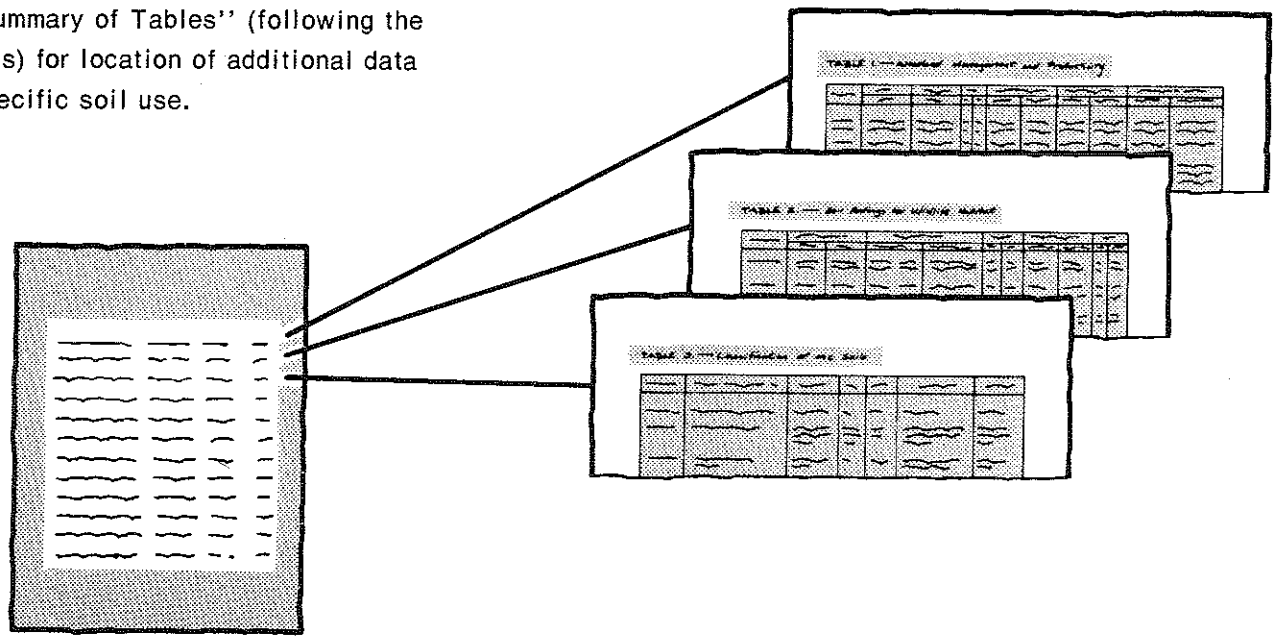
HIS SOIL SURVEY

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



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



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

This is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and agencies of the States, usually the Agricultural Experiment Stations. In some surveys, other Federal and local agencies also contribute. 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.

Major fieldwork for this soil survey was done in the period 1970-1975. Soil names and descriptions were approved in 1976. This survey was made cooperatively by the Soil Conservation Service and the Ohio Department of Natural Resources, Division of Lands and Soil; and the Ohio Agricultural Research and Development Center. It is part of the technical assistance furnished to the Ashland Soil and Water Conservation District. It was further subsidized by the Ashland County Board of Commissioners.

Soil maps in this survey may be copied without permission, but any enlargement of these maps could cause misunderstanding of the detail of mapping and result in erroneous interpretations. Enlarged maps do not show small areas of contrasting soils that could have been shown at a larger mapping scale.

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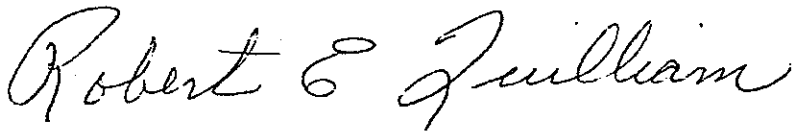
Foreword

This soil survey contains much information useful in land-planning programs in Ashland County, Ohio. Of prime importance are the predictions of soil behavior for selected land uses. Also highlighted are limitations or hazards to land uses that are inherent in the soil, improvements needed to overcome these limitations, and the impact that selected land uses will have on the environment.

This soil survey has been prepared for many different users. Farmers, ranchers, foresters, and agronomists can use it to determine the potential of the soil and the management practices required for food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use it to plan land use, select sites for construction, develop soil resources, or identify any special practices that may be needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the soil survey to help them understand, protect, and enhance the environment.

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

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map; the location of each kind of soil is shown on detailed soil maps. Each kind of soil in the survey area is described, and much information is given about each soil for specific uses. Additional information or assistance in using this publication can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.



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State Conservationist
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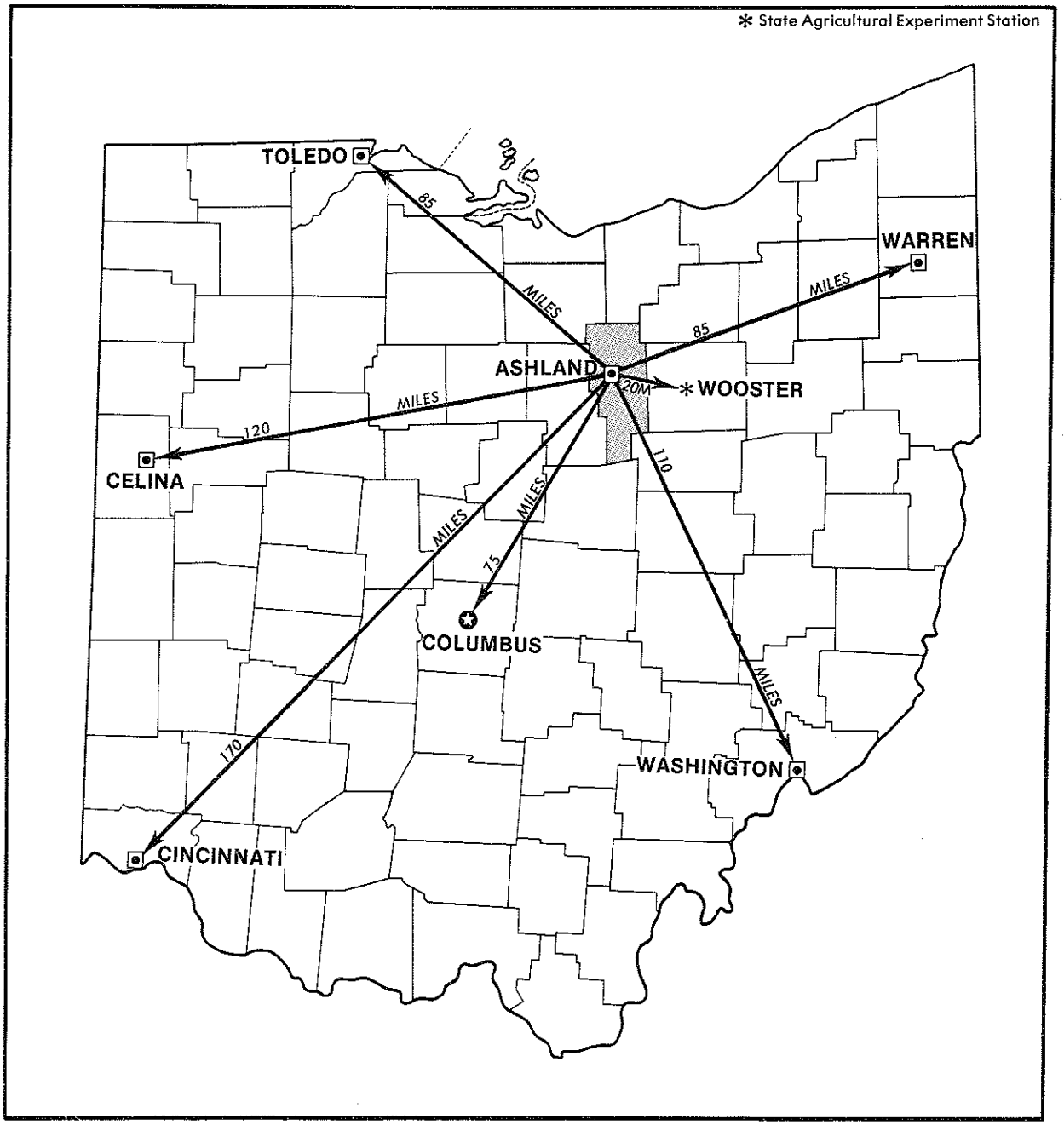

Location of Ashland County, Ohio.

SOIL SURVEY OF ASHLAND COUNTY, OHIO

By C. E. Redmond and D. L. Brown, Soil Conservation Service. Fieldwork by C. E. Redmond, D. L. Brown, T. E. Graham, and W. A. Rains, 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 Ohio Agricultural Research and Development Center

General nature of the county

This section gives general information about the county. It discusses physiography, relief, drainage, settlement, natural resources, farming, transportation and industry, community facilities, and climate.

Physiography, relief, and drainage

Ashland County is a county of contrasts. The northern part consists of till plains and moraines that have low to moderate relief. In this part of the county, glaciers leveled the bedrock hills and filled the valleys. Most of the soils in this part of the county formed in material that was laid down by the glaciers. Slopes are mostly gentle, and many areas need artificial drainage for crops.

Farther south the glaciers thinned out, and the effects of leveling are less pronounced. The soils, compared to those in the northern part of the county, have more material that weathered from the underlying bedrock and less material that was transported by glaciers. Slopes are steeper, and the soils are better drained. Erosion control is the main soil management problem.

The extreme southern part of the county was not glaciated. Here, relief is very strong, and the rock hills retain their original form.

Valleys in the southern and central parts of the county carried large volumes of glacial melt water, and extensive gravel deposits were laid down by the swiftly moving water. The Clear Fork of the Mohican River cut a spectacular gorge through bedrock hills in Hanover Township. The Jerome Fork Valley held a large lake in past glacial times and has extensive silt and muck deposits in the still water.

The highest elevation, about 1,420 feet, is a conical hill just west of Hayesville, in the southwest quarter of sec. 16, Vermillion Township. The lowest elevation, about 905 feet, is the place where the Mohican River leaves the county.

Most of Ashland County is drained by the Black, Clear, Jerome, Lake, and Muddy Forks of the Mohican River and their tributaries. The Mohican River is part of the Muskingum Watershed. The water from the Mohican River and from Jelloway Creek, which drains a small area in extreme southern Hanover Township, eventually reaches the Gulf of Mexico via the Ohio and Mississippi Rivers. A strip 4 to 8 miles wide across the northern end of the county drains into Lake Erie through the Vermillion and Black Rivers and their tributaries. Water draining into these streams reaches the Atlantic Ocean via the St. Lawrence River.

Drainage by natural streams is adequate in much of the county. Artificial drainageways are most needed in the area draining to the Black River and in the wider parts of the Jerome Fork Valley.

Settlement of the county

The area that is now Ashland County was originally inhabited by several tribes of Indians, the Wyandots, Ottawas, Mohicans, and Mingos (*6*).

Early settlers coming to the county were New Englanders, French, Alsatians, and Pennsylvania-Germans. The first settlement was made by William Montgomery in 1815. This settlement was named Uniontown and later renamed Ashland in 1822 (*4*). Ashland is the county seat and the largest city in the county.

Ashland County was originally part of Wayne County (*5*). The total population of the county was 23,881 in 1915. It had increased to 29,785 by 1940, 33,040 by 1950, and 43,303 by 1970. The population of Ashland was 1,264 in 1850, 4,087 in 1900, 14,287 in 1950, and 19,872 in 1970. In 1974, the population of Loudonville was 1,184, Hayesville 506, Perrysville 752, and Jeromesville 559.

Natural resources

Soil is the most important natural resource in the county. The crops grown on farms are marketable as grain or through animals as meat and milk.

In most of the county, buried valley deposits of sand and gravel are the source of the water supply. There are two large buried valleys in Ashland County. One is the valley of the Jerome Fork from Savannah to Lake Fork. The other is in the valley of the Black Fork from Mifflin to Loudonville. Several other buried valleys yield ground water but to a lesser extent.

The most important economic minerals in Ashland County are oil and natural gas. Less important are sand, gravel, and shale.

Farming

The first settlers in Ashland County grew large quantities of timothy for sale in the more populated areas because horses were the main source of transportation. Wheat and oats were grown in larger quantities than now.

In 1969, the value of farm products from the county exceeded 14 million dollars.

According to the U.S. Census of Agriculture, there were 1,476 farms in Ashland County in 1969. The average size of a farm was 139 acres. The county covers 271,104 acres, and of this, 205,255 acres was in farms in 1969. Dairy farms made up 52 percent of all farming.

Cash grain and general farming predominate in the northern part of the county. Soybeans and corn are the main cash crops. Corn, oats, and wheat are fed to beef cattle and hogs. Dairy farming is the main type of farming in central and southern Ashland County.

Because of the proximity to Interstate 71 from Cleveland to Cincinnati, much of the land is being sold and then developed as small tracts of 5 to 20 acres or more by people employed in industry or commerce who want a second home. This trend will likely continue on the fringes of the larger towns in the county.

Transportation and industry

The Penn Central, Erie Lackawanna, and Baltimore and Ohio Railroads provide freight service to Ashland, Loudonville, Perrysville, Sullivan, and other towns in the county. Interstate Highway 71, the main link between Cleveland and Columbus, passes through Ashland County within 4 miles of the city of Ashland. Other main highways are U.S. Route 30, passing through the center of the county, U.S. Route 224, across the northern townships, and U.S. Route 250, which runs diagonally from northwest to the east-central part of the county. Loudonville is served by State Route 3.

Several large factories in the county produce rubber products, chemicals, and pumps and related machinery. Loudonville has a factory that manufactures buses and rail cars. In addition to Ashland and Loudonville, several other communities have facilities for handling grain, cattle, and other agricultural products.

Community facilities

High schools are available in all parts of the county. Technical and vocational training is offered at high school and college levels. A liberal arts college and a seminary are in Ashland.

Mohican State Park in southern Ashland County offers year-round facilities for recreation. Canoeing facilities are available to the public in the Loudonville-Perrysville area.

Because of the excellent highway system across the county, the nearby metropolitan areas are readily available.

Climate

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

In winter the average temperature is 28 degrees F, and the average daily minimum temperature is 20 degrees. The lowest temperature on record, which occurred at Ashland on January 24, 1963, is -20 degrees. In summer the average temperature is 70 degrees, and the average daily maximum temperature is 81 degrees. The highest recorded temperature, which occurred on September 3, 1953, is 100 degrees.

Growing degree days, shown in table 1, are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

Of the total annual precipitation, 22 inches, or 60 percent, usually falls in April through September, which includes the growing season for most crops. In 2 years out of 10, the rainfall in April through September is less than 18 inches. The heaviest 1-day rainfall during the period of record was 8.06 inches at Ashland on July 5, 1969. Thunderstorms occur on about 40 days each year, and most occur in summer.

Average seasonal snowfall is 32 inches. The greatest snow depth at any one time during the period of record was 18 inches. On the average, 21 days have at least 1 inch of snow on the ground, but 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 percentage of possible sunshine is 65 in summer and 40 in winter. Occasionally,

there are tornadoes and severe thunderstorms. These storms are usually local and of short duration.

Climatic data in this section were specially prepared for the Soil Conservation Service by the National Climatic Center, Asheville, North Carolina.

How this survey was made

Soil scientists made this survey to learn what kinds of soil are in the survey area, where they are, and how they can be used. The soil scientists went into the area knowing they likely would locate many soils they already knew something about and perhaps identify some they had never seen before. They observed the steepness, length, and shape of slopes; the size of streams and the general pattern of drainage; the kinds of native plants or crops; the kinds of rock; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material, which has been changed very little by leaching or by the action of plant roots.

The soil scientists recorded the characteristics of the profiles they studied, and they compared those profiles with others in counties nearby and in places more distant. Thus, through correlation, they classified and named the soils according to nationwide, uniform procedures.

After classifying and naming the soils, the soil scientists drew the boundaries of the individual soils on aerial photographs. These photographs show woodlands, buildings, field borders, roads, and other details that help in drawing boundaries accurately. The soil map at the back of this publication was prepared from aerial photographs.

The areas shown on a soil map are called map units. Some map units are made up of one kind of soil, others are made up of two or more kinds of soil, and a few have little or no soil. Map units are described under "General soil map for broad land use planning" and "Soil maps for detailed planning."

While a soil survey is in progress, samples of soils are taken for laboratory measurements and for engineering tests. The soils are field tested, and interpretations of their behavior are modified during the course of the survey. New interpretations are added to meet local needs, mainly through field observations of different kinds of soil in different uses under different levels of management. Also, data are assembled from other sources, such as test results, records, field experience, and state and local specialists. For example, data on crop yields under defined practices are assembled from farm records and from field or plot experiments on the same soils.

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

General soil map for broad land use planning

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

The general soil map provides a broad perspective of the soils and landscape in the survey area. It provides a basis for comparing the potential of large areas for general kinds of land use. Areas that are, for the most part, suited to certain kinds of farming or to other land uses can be identified on the map. Likewise, areas of soils having properties that are distinctly unfavorable for certain land uses can be located.

Because of its small scale, the map does not show the kind of soil at a specific site. Thus, it 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 kinds of soil in any one map unit differ from place to place in slope, depth, stoniness, drainage, or other characteristics that affect their management.

The map units in this survey have been grouped into four general kinds of areas for broad interpretive purposes. Each of the groups and the map units in each group are described on the following pages.

Deep soils that formed in glacial till

The soils in this group make up about 74 percent of the county. They are somewhat poorly drained to well drained and mostly gently sloping to moderately steep on glacial till plains. The steeper areas lie along the major drainageways. These soils formed in glacial till. Farming is the major land use. Erosion is the main hazard if crops are grown.

1. Mahoning-Ellsworth

Nearly level to steep, somewhat poorly drained and moderately well drained soils that have a moderately fine textured subsoil; on till plains and moraines

The soils of this map unit are on an end moraine in the extreme northern part of the county. The moraine is 30 to 50 feet above the surrounding area. The south side is gently sloping and has few natural drainageways;

the north side is dissected by many narrow steep-sided valleys.

This map unit makes up about 4 percent of the county. It consists of 45 percent Mahoning soils, 25 percent Ellsworth soils, and 30 percent minor soils. Mahoning soils are nearly level to gently sloping and are mostly on the south side of the moraine. They are somewhat poorly drained and need artificial drainage for the successful production of most crops. The Ellsworth soils on the convex hilltops are gently sloping; those on the sides of small stream valleys are sloping to steep. The Ellsworth soils are moderately well drained. The hazard of erosion is severe if the soils are cultivated. The soils are wet for brief periods but generally do not need artificial drainage.

The minor soils include the poorly drained Condit soils in depressions and at the head of small natural drainageways and Shoals soils on bottoms of narrow streams.

A few large dairy, beef, and cash-grain farms take up most of the acreage of this map unit. There are also some smaller part-time farms. Intensive management is needed for successful farming. Removal of excess water and control of erosion are major management problems. Because of the proximity of the area to urban centers to the north and east, farmland is being converted to nonfarm uses. Wetness and slow permeability of most soils of this unit severely limit use of the soils as septic tank absorption fields; this is a major limitation for the development of homesites.

2. Bennington-Cardington

Nearly level and gently sloping, somewhat poorly drained and moderately well drained soils that have a moderately fine textured subsoil; on till plains

This map unit is on till plains of low relief in the northern part of the county. The landscape consists of low knolls and ridges separated by flats and a few higher hills. Slopes are short and irregular and are less than 12 percent. Most drainage courses are poorly defined.

This map unit makes up about 16 percent of the county. It consists of about 65 percent Bennington soils, 25 percent Cardington soils, and 10 percent minor soils. Bennington soils are on flats and low knolls and have slopes of less than 6 percent. They are somewhat poorly drained and need to be artificially drained for the successful growth of most crops. Cardington soils are on the higher knolls and have slopes of 2 to 12 percent. They are moderately well drained, and the hazard of erosion is moderate to severe if they are cultivated. The soils are excessively wet for brief periods but generally will produce crops without artificial drainage.

The minor soils are the poorly drained Condit soils and the very poorly drained Pewamo soils, both of which are on flats and in closed depressions.

Most of the acreage of this map unit is used as farmland, mainly for dairy, beef, and cash-grain farming. Removal of excess water is the main management problem, and the soils are productive only if adequately drained. Subsurface drains can be installed if outlets are available. Adequate outlets are not available in many places. Excessive wetness and moderately slow permeability are limitations for many nonfarm uses, such as building sites and septic tank absorption fields.

3. Cardington-Bennington

Gently sloping and sloping, moderately well drained and somewhat poorly drained soils that have a moderately fine textured subsoil; on till plains and moraines

This map unit is on till plains that are dissected by stream valleys. The landscape consists of gently sloping hilltops and narrow, steep-sided valleys. Slopes are of moderate length and complexity.

This map unit makes up 11 percent of the county. It consists of about 60 percent Cardington soils, 20 percent Bennington soils, and 20 percent minor soils. Cardington soils are on convex hilltops and on side slopes of small stream valleys. They are moderately well drained; slopes are 2 to 12 percent. The hazard of erosion is moderate to severe if the soils are cultivated. There are periods of excessive wetness, but in most places crops can be grown without artificial drainage. Bennington soils are in concave areas of the wide hilltops; their slope is less than 6 percent. They are somewhat poorly drained, and most areas need to be artificially drained if crops are grown. Suitable outlets for tile drains are available in most parts of this map unit.

The minor soils are the Alexandria soils on steep valley sides and Lobdell soils on the bottom of narrow streams.

Most of the acreage of this map unit is used as farmland, mainly for dairy, beef, and cash-grain farming. The soils are productive if properly managed. Control of erosion is the main management problem. Wetness is a moderate limitation especially on the Bennington soils. The wetness is more limiting for nonfarm uses, such as housing, than for farming. Permeability of the soils is too slow for their successful use as a septic tank absorption field. Some residential development has taken place, but the slow permeability is a limitation.

4. Rittman-Wadsworth

Nearly level to moderately steep, moderately well drained and somewhat poorly drained soils that have mainly a moderately fine textured subsoil and a fragipan; on till plains

This map unit is on till plains in the central part of the county. Away from the large stream valleys, the relief is low. There are low knolls and ridges that are separated by flats and depressions. Next to the large valleys, tribu-

tary streams have cut narrow, steep-sided valleys into the till plain and produced a landscape of gently sloping hilltops separated by deep valleys.

This map unit occupies about 10 percent of the county. Rittman soils make up about 70 percent of the unit, Wadsworth soils 20 percent, and other soils 10 percent. The proportion of Wadsworth soils is high in the nearly level and gently sloping areas away from the major stream valleys.

Rittman soils are moderately well drained. They are gently sloping and moderately sloping soils on hilltops and on side slopes of small valleys. Their slopes range from 2 to 18 percent but most commonly from 2 to 12 percent. These soils have a dense layer, or fragipan, in the lower part of the subsoil. This layer restricts water and roots. If Rittman soils are used for crops, the hazard of erosion is moderate to severe. The soils are excessively wet for brief periods; randomly spaced tile will remove water from the wet spots.

Wadsworth soils are somewhat poorly drained. They occupy flats and low knolls. Their slopes are less than 6 percent. They require artificial drainage for successful growth of most crops. Like Rittman soils, they have a fragipan that interferes with drainage.

The minor soils are the poorly drained Condit soils in closed depressions and the well drained Wooster soils on the sides of steep valleys.

The combined problems of erosion and wetness make farming difficult on the soils of this map unit. There are only a few full-time commercial farms. Most of the land is used for small part-time farms and rural residences. Most of the city of Ashland is within this map unit.

In the Rittman and the Wadsworth soils, permeability is too slow for successful use of these soils as septic tank absorption fields. Severe wetness limits both soils for use as building sites. Many buildings have been constructed, however, because the location is convenient.

5. Canfield-Wooster-Ravenna

Nearly level to sloping, well drained to somewhat poorly drained soils that have a medium textured subsoil and a fragipan; on till plains

This map unit is on till plains that have low to moderate relief. The landscape consists of broad, gently sloping uplands that have a few closed depressions and some steep-sided stream valleys. Most of the slopes are long and uniform.

This map unit makes up about 14 percent of the county. It consists of about 45 percent Canfield soils, 30 percent Wooster soils, 10 percent Ravenna soils, and 15 percent minor soils.

Canfield soils occupy the greater part of the broad, gently sloping uplands. They are moderately well drained, and their slope ranges from 2 to 12 percent. They have a fragipan in the subsoil that restricts water movement and root growth. In most places their natural drainage is adequate for farming, but tile drains are needed to remove water from wet spots. Erosion is a hazard if the soils are cultivated.

Wooster soils are well drained. Most Wooster soils in this map unit are on the side slopes of stream valleys, and their slope ranges from 6 to 18 percent. Natural drainage is adequate. The hazard of erosion is severe. The soils have a fragipan that is not so dense as that in Canfield soils.

Ravenna soils are somewhat poorly drained. They are on flats and in depressions and drainageways on the uplands. Their slopes are less than 6 percent. Ravenna soils need artificial drainage for the successful growth of most crops. They have a dense fragipan that slows the movement of water and makes artificial drainage difficult.

The minor soils in this map unit are the Condit soils in closed depressions and the Shoals and Lobdell soils on narrow flood plains.

Nearly all of the acreage of this map unit is used as farmland. Dairy farms predominate, but there are grain and beef farms. The soils are productive if properly managed. Problems in soil management include drainage of wet spots, control of erosion, and maintenance of fertility. Land is being converted to housing developments at a moderate to rapid rate, especially in the area just south of Ashland. Permeability of these soils is too slow for their successful use as septic tank absorption fields.

6. Wooster-Canfield

Gently sloping to very steep, well drained and moderately well drained soils that have a medium textured subsoil and a fragipan; on till plains

This map unit is on till plains of moderate to high relief. The landscape consists of gently sloping to sloping hilltops separated by valleys that have moderately steep to very steep side slopes. The shape of the land surface is about the same as that of the bedrock. The depth to rock is more than 40 inches in most places.

This map unit makes up 19 percent of the county. It is about 65 percent Wooster soils, 12 percent Canfield soils, and 23 percent minor soils. Wooster soils are on convex hilltops and on sloping to very steep hillsides. They are well drained, but they have a fragipan (compact layer) that somewhat restricts the movement of water and growth of roots. They have good natural drainage. The hazard of erosion is moderate to very severe, depending on the slope. Canfield soils are on concave hilltops. They are moderately well drained. Slopes are 2 to 12 percent. Canfield soils are excessively wet for brief periods but generally do not need artificial drainage for use as cropland. They have a fragipan that is more dense and restrictive than that in the Wooster soils.

The minor soils are the Ravenna soils in upland depressions, Loudonville and Lordstown soils that have rock within a depth of 40 inches, and Shoals and Lobdell soils in bottoms of narrow streams.

Land use in this map unit is limited mainly by the slope. Soils on the gently sloping and sloping hilltops are very productive. The hazard of erosion is their main limitation. Contour stripcropping and minimum tillage are suitable practices for control of erosion. The steep soils on valley sides are subject to severe erosion if cultivated and are better suited to use as pasture or woodland. In this map unit there are some very productive dairy farms. On these farms, the more gently sloping soils are used as cropland and the steeper soils as pasture. Permeability of the soils is too slow for their use as septic tank absorption fields.

Moderately deep soils that formed mainly in residuum derived from sandstone and siltstone

The soils in this group make up about 5 percent of the county. They are moderately deep and well drained and are mostly moderately steep to very steep. They are used mainly as pasture and woodland. Slope and moderate depth to bedrock are the principal limitations.

7. Lordstown-Berks

Gently sloping to very steep, well drained soils that have bedrock at a depth of 20 to 40 inches; on ridgetops and hillsides

This map unit is in the part of the county in which there is little or no glacial material. The landscape consists of sandstone hills that have gently sloping to sloping tops and moderately steep to very steep sides. This area is very scenic.

This map unit consists of about 60 percent Lordstown soils, 15 percent Berks soils, and 25 percent other soils. The Lordstown and Berks soils are well drained. They formed mainly in weathered thin bedded sandstone and are underlain by rock at a depth of 20 to 40 inches. Lordstown soils range from moderately steep to very steep. Berks soils are mainly steep or very steep. They have a very stony subsoil.

The principal minor soils are the sandy Schaffenaker soils on high ridges, the more clayey Coshocton soils on high hills, Lobdell and Shoals soils in narrow stream bottoms, and Loudonville soils in areas where a thin covering of glacial till is over the bedrock.

Much of the area is wooded or is idle, and a large acreage is publicly owned. Recreation is a major land use. Mohican State Forest and State Park occupy a large acreage, and there are several church camps and private camping and hunting areas. There are only a few farms and orchards.

The soils of this map unit are suited to trees. Some of them, however, are steep enough to make logging difficult. The soils are not well suited to crops because of slope and shallowness to rock. The most likely change in land use is an increase in acreage in recreation uses.

Deep soils that formed in alluvium

The soils in this group make up about 9 percent of the county. They are nearly level and are very poorly drained to moderately well drained; they are on flood plains. They formed in medium textured alluvium. The soils are used mainly for farming, for which they have good potential. Flooding is a hazard where the soils are used for farming or as sites for buildings.

8. Shoals-Lobdell

Nearly level, somewhat poorly drained and moderately well drained soils that have a medium textured subsoil; on flood plains

This map unit is on flood plains of streams in all parts of the county. The streams overflow, but the frequency and duration of flooding varies considerably. Most of the areas are nearly level.

This map unit is made up of about 30 percent Shoals soils, 15 percent Lobdell soils, and 55 percent other soils. Lobdell soils are moderately well drained. They are in the higher parts of wide valleys and in the narrow valleys of small, swift flowing streams. Shoals soils are somewhat poorly drained. They are on broad flats in the wide valleys and in narrow valleys. Natural drainage of the Lobdell soils is adequate for farming. Shoals soils have a seasonal high water table that remains long enough to slow the growth of most crops.

The minor soils make up about half of this map unit. The Holly, Killbuck, Algiers, Orrville, and Sloan soils are on flood plains. The Fitchville, Sebring, Luray, Carlisle, and Linwood soils are in closed depressions along the sides of the flood plains, and they are somewhat less subject than the others to overflows and ponding.

The soils of this map unit are potentially productive. Wetness is the principal limitation. All the soils are subject to flooding or ponding. The water can damage crops and also the installations for artificial drainage. Some of the soil areas are in narrow, inaccessible valleys, and others are so cut up by old stream channels that they cannot be farmed conveniently. Land use is mainly cropland or pasture. Nonfarm uses are severely limited by the hazard of flooding.

Deep soils that formed in glacial outwash and till

The soils in this group make up about 12 percent of the county. They are well drained to moderately well drained and mostly nearly level to steep. These soils formed in glacial outwash and till on terraces and moraines. The nearly level to gently sloping soils are used for farming and special crops. They have good potential for these uses. Erosion is a hazard where cultivated crops are grown.

9. Chili-Wheeling-Bogart

Nearly level to very steep, well drained and moderately well drained soils that have mainly a medium textured subsoil underlain by gravel; on terraces and kames

This map unit is mainly on broad, nearly level and gently sloping terraces and kames along the sides of the major stream valleys. Sandy and gravelly soil material was deposited to form kames and terraces when huge volumes of glacial melt water flowed through the valleys. In some areas, slopes are short and irregular, and the landscape consists of small sloping to very steep conical hills separated by draws and closed depressions. In other areas, the slopes are extremely complex.

This map unit makes up about 10 percent of the county. It consists of about 40 percent Chili soils, 20 percent Wheeling soils, 15 percent Bogart soils, and 25 percent minor soils. Chili soils are well drained and have moderately rapid permeability. They have considerable gravel in and below the subsoil. The slope range is wide, but most commonly slopes are 2 to 12 percent. Chili soils are in all parts of the landscape. Wheeling soils are well drained. They have little gravel on the surface and in the upper part of the subsoil but have sandy and gravelly soil material at a depth of 20 to 40 inches. Slopes are 1 to 12 percent. Wheeling soils are most extensive in the smoother parts of the landscape. Bogart soils are moderately well drained. They are excessively wet for brief periods but generally are adequately drained for farming. Bogart soils have slopes of 0 to 6 percent. They are in varied positions on the landscape but are typically lower on the landscape than Chili or Wheeling soils.

The minor soils include the very gravelly Conotton soils on steep slopes, Oshtemo soils on gentle to moderate slopes, and some wet soils in small closed depressions.

In all but the steepest and roughest areas, the soils of this map unit are used as farmland. Dairy farms predominate, and much of the acreage is in forage crops. The soils are moderately to highly productive. They are well suited to no-till corn and alfalfa. Drought is a hazard in the more gravelly areas. Erosion is less of a hazard on these soils than on most other soils that have the same slope. Maintaining the fertility and the content of organic matter and lime in the soil is the main management concern.

The soils making up this map unit have good potential for nonfarm uses. Septic tank absorption fields work well on these soils, and homesites are free of wetness problems. Some gravel deposits have commercial value.

10. Wooster-Chili

Moderately steep to steep, well drained soils that have a medium textured subsoil; on end moraines

This map unit is on a large end moraine that marks the farthest advance of glaciers in Ashland County. In this area, ice and water deposited soil materials in a very complex pattern. The landscape consists of rounded hills that have moderate to steep, very irregular slopes. Drainage courses are few, and most drainage is into closed depressions that drain underground.

This map unit makes up 2 percent of the county. It consists of about 55 percent Wooster soils, 35 percent Chili soils, and 10 percent minor soils. In about half the area the pattern of the two major soils is so complex that the soils could not be mapped separately on the detailed soil maps. Wooster soils are well drained. They formed in loamy glacial till deposits. The fragipan, which is a characteristic of Wooster soils, is very weak in areas of this map unit. Chili soils formed in outwash deposits. They are well drained and have gravel in and below the subsoil.

The minor soils are the moderately well drained Canfield soils on concave slopes, the steep very gravelly Conotton soils, and Lobdell and Shoals soils in narrow stream valleys.

Most areas of this map unit are used for farming. Dairy farms predominate, and there is much acreage in hay and pasture crops. Erosion is a severe hazard if the soils are used for cultivated crops, and the control of erosion is a major management problem. The use of hay crops and minimum tillage are practical ways of controlling erosion. Stripcropping is not practical in most of the areas because of the irregular slopes.

This map unit has good potential for residential development. In most areas, permeability is adequate for a septic tank absorption field. Wetness problems are minimal. The main management concerns are erosion during construction and downslope seepage of effluent. Some of the gravel deposits have commercial value.

Soil maps for detailed planning

The map units shown on the detailed soil maps at the back of this publication represent the kinds of soil in the survey area. They are described in this section. The descriptions together with the soil maps can be useful in determining the potential of a soil and in managing it for food and fiber production; in planning land use and developing soil resources; and in enhancing, protecting, and preserving the environment. More information for each map unit, or soil, is given in the section "Use and management of the soils."

Preceding the name of each map unit is the symbol that identifies the soil on the detailed soil maps. Each soil description includes general facts about the soil and a brief description of the soil profile. In each description, the principal hazards and limitations are indicated, and the management concerns and practices needed are discussed.

The map units on the detailed soil maps represent an area on the landscape made up mostly of the soil or soils for which the unit is named. Most of the delineations shown on the detailed soil map are phases of soil series.

Soils that have profiles that are almost alike make up a *soil series*. Except for allowable differences in texture of the surface layer or of the underlying substratum, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement in the profile. A soil series commonly is named for a town or geographic feature near the place where a soil of that series was first observed and mapped. The Loudonville series, for example, was named for the town of Loudonville in Ashland County, Ohio.

Soils of one series can differ in texture of the surface layer or in the underlying substratum and in slope, erosion, stoniness, salinity, wetness, or other characteristics that affect their use. On the basis of such differences, a soil series is divided into phases. The name of a *soil phase* commonly indicates a feature that affects use or management. For example, Loudonville silt loam, 6 to 12 percent slopes, is one of several phases within the Loudonville series.

Some map units are made up of two or more dominant kinds of soil. Such map units are called soil complexes and undifferentiated groups.

A *soil complex* consists of areas of two or more soils or of one soil and a miscellaneous area that are so intricately mixed or so small in size that they cannot be shown separately on the soil map. Each area includes some of each of the two or more dominant soils, and the pattern and proportion are somewhat similar in all areas. Chili-Wooster complex, 6 to 12 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils that could be mapped individually but are mapped as one unit because there is little value in separating them. The pattern and proportion of the soils are not uniform. An area shown on the map has at least one of the dominant (named) soils or may have all of them. Chili and Connoton gravelly loams, 12 to 18 percent slopes, is an undifferentiated group in this survey area.

Most map units include small, scattered areas of soils other than those that appear in the name of the map unit. Some of these soils have properties that differ substantially from those of the dominant soil or soils and thus could significantly affect use and management of the map unit. These soils are described in the description of each map unit. Some of the more unusual or strongly contrasting soils that are included are identified by a special symbol on the soil map.

Most mapped areas include places that have little or no soil material and support little or no vegetation. Such places are called *miscellaneous areas*; they are delineated on the soil map and given descriptive names. Pits, gravel, is an example. Some of these areas are too small to be delineated and are identified by a special symbol on the soil map.

The acreage and proportionate extent of each soil are given in table 4, and information on properties, limitations, capabilities, and potentials for many soil uses is given for each kind of soil in other tables in this survey. (See "Summary of tables.") Many of the terms used in describing soils are defined in the Glossary.

The symbol at the beginning of each map unit description is the same as the symbol identifying it throughout the survey, including the maps.

Soil descriptions

AdD2—Alexandria silt loam, 12 to 18 percent slopes, eroded. This is a moderately steep, deep, well drained soil on the side slopes of stream valleys cut into till plains. Most areas are long and narrow, and they range in size from 5 to 30 acres. On the side slopes of wider valleys, the entire map unit slopes in one direction. In the narrow valleys, both side slopes are included in one mapped area.

Typically, the surface layer is dark brown, friable silt loam about 7 inches thick. In many areas it has small chunks of yellowish brown silty clay loam. The subsoil is firm and very firm silty clay loam about 38 inches thick. In the upper part it is yellowish brown, in the middle part it is dark yellowish brown and mottled, and in the lower part it is yellowish brown and mottled. The substratum, to a depth of about 60 inches, is brown, firm silty clay loam glacial till. In some places the surface layer is yellowish brown silty clay loam.

Included in mapping are many seep areas and areas that have small springs. In these areas the soil is grayer and more mottled than is typical. Also included are areas of the moderately well drained Cardington soils in the lower part of most slopes.

This soil has moderate or moderately slow permeability and high available water capacity. Runoff is very rapid. The organic-matter content is low. Tilth is fair to poor.

This soil is used mainly as cropland, pasture, or woodland. It has good potential for hay, pasture, and trees. It has fair potential for most engineering uses.

The hazard of erosion is very severe if this soil is cultivated. Controlling erosion is a major management concern where crops are grown. Growing hay and pasture crops is a method of controlling erosion. Contour farming aids in controlling erosion on cropland.

This soil is well suited to the hay and pasture crops common to the area. The good natural drainage is favorable for alfalfa. Pastures can be grazed early in spring, and pasture plants grow well during the dry part of summer. The slope does not limit intensive pasture management.

This soil is suitable for use as woodland. Many of the common trees grow well. Competition from grasses and shrubs is a major problem in establishing new plantings of trees.

For engineering purposes, the soil is firm and compact. There are good pond sites where the soil is on both sides of a small valley.

This soil commonly is too clayey to make good roadfill. The good natural drainage is favorable for building sites, but the moderately steep slope is a limitation. Erosion is a hazard during construction. The permeability of this soil is considerably slower than that needed on a site for a septic tank absorption field. Downslope seepage of effluent is a hazard.

Capability subclass IVe; woodland suitability subclass 2r.

AdE—Alexandria silt loam, 18 to 25 percent slopes. This is a steep, deep, well drained soil on the side slopes of valleys cut into till plains. Few areas are more than 400 feet wide, and some are more than a half mile long. Some areas include only one side of a valley, and they slope in one direction. Others include the two sides of a small valley.

Typically, the surface layer is very dark grayish brown and pale brown, friable silt loam about 4 inches thick. The subsoil is firm and very firm silty clay loam about 38 inches thick. In the upper part it is yellowish brown, in the middle part it is dark yellowish brown, and in the lower part it is yellowish brown. The substratum, to a depth of about 60 inches, is brown, firm, silty clay loam glacial till.

Some areas included in mapping are eroded and have a surface layer that is lighter colored than is typical. Also included are gullied areas in which the surface layer is silty clay loam.

This soil has moderate or moderately slow permeability and high available water capacity. Runoff is very rapid. The organic-matter content is moderate.

Most areas of this soil are used as permanent pasture or woodland. The soil has good potential for pasture and trees and poor potential for many engineering uses.

The slope generally is too steep for cultivated crops, although a few very small areas are parts of cultivated fields. The hazard of erosion is very severe if this soil is cultivated.

This soil is well suited to a variety of pasture plants, but slope limits some of the operations for seeding and management. Pastures can be grazed early in spring, but the plants do not grow well during the dry part of summer.

This soil is suitable for use as woodland. A wide variety of trees common in the area can grow well. Erosion is a hazard during logging operations. Competition by shrubs and grasses is severe if trees are planted in open fields.

For engineering purposes this soil is firm and compact; it makes good material for foundations and good fill for dams. If the steep slopes are excavated, however, there are hazards of erosion and sedimentation. The steep slope and very severe hazard of erosion severely limit the use of this soil as sites for buildings. The slope is too steep for use of the soil as a septic tank absorption field.

Capability subclass IVe; woodland suitability subclass 2r.

AdF—Alexandria silt loam, 25 to 50 percent slopes. This is a very steep, deep, well drained soil on the side slopes of valleys cut into till plains. Few areas are more than 400 feet wide. Some are nearly a mile long. In general, these long, narrow areas are parallel to the streams, but they bend and fork where a tributary stream enters. Most mapped areas are on one side of a valley, and they slope in only one direction. A few consist of the two opposite slopes of a narrow valley.

Typically, the surface layer is very dark grayish brown and pale brown, friable silt loam about 4 inches thick. The subsoil is firm and very firm silty clay loam about 38 inches thick. In the upper part it is yellowish brown, in the middle part it is dark yellowish brown, and in the lower part it is yellowish brown. The substratum, to a depth of about 60 inches, is brown, firm silty clay loam glacial till.

In a few areas the surface layer is yellowish brown silty clay loam. Small gullies are in some severely eroded areas. The mapping includes some nearly vertical banks, and some of the banks have shale exposed in their lower part. Also included on sides of the valley are small seep spots and areas that have springs. The soils around these spots are grayer and more mottled than typical.

This soil has moderate or moderately slow permeability and high available water capacity. Runoff is very rapid. The organic-matter content is moderate.

Most areas of this soil are used as permanent pasture or woodland. The slope is too steep for cultivation. This soil has good potential for pasture and trees and poor potential for most engineering uses.

The steep slope limits practices for improvement of pastures. Pastures can be grazed early in spring, but the plants do not grow well during the dry part of summer.

This soil is suitable for use as woodland. A wide variety of trees common in the area can be grown. Competition from shrubs and grasses is severe if trees are planted in open fields. The slope limits intensive practices for woodland improvement and makes logging difficult. There is a hazard of erosion when logging is done.

This soil is firm and compact; it is good material for foundations and good fill for dams. Any construction, however, results in a very severe hazard of erosion. The very steep slope and the very severe hazard of erosion severely limit the use of this soil for building sites. The

slope is too steep to allow use of the soil as a septic tank absorption field.

Capability subclass IVe; woodland suitability subclass 2r.

Ag—Algiers silt loam. This is a nearly level, deep, somewhat poorly drained to moderately well drained soil. It is on flood plains where tributary streams have deposited light-colored soil material over dark-colored soil in the main valley. Areas of this soil are in high parts of the flood plains. Typically, they are bounded by a terrace or upland on the upper side and by a wetter flood plain below. The slope is mostly 1 to 2 percent and smooth. Most areas are roughly fan shaped or elongated, and they range from 5 to 50 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 11 inches thick. The substratum, about 13 inches thick, is brown, mottled, friable silt loam. Next is the buried former surface layer, which is very dark grayish brown, firm silty clay loam about 8 inches thick. The subsoil of that buried soil, about 13 inches thick, is very dark brown and grayish brown, mottled, firm silty clay loam. The substratum, to a depth of about 60 inches, is grayish brown, mottled, friable silt loam.

The depth to natural lime is at least 3 feet. Included in mapping are small areas of the wetter Killbuck, Holly, and Sloan soils in depressions and in abandoned stream channels. A few areas in upland draws, which are never flooded but otherwise are like the Algiers soils, are also included.

This soil has moderate permeability and high available water capacity. Runoff is slow. The water table is at a depth of 6 to 18 inches in the wettest time of year. The soil is subject to flooding or overwashing but is rarely ponded. Its organic-matter content is moderate. Tilth is good.

This soil is used mainly as cropland and permanent pasture. Wetness is a moderate hazard if the soil is farmed.

This soil has good potential for crops and for hay and pasture. It has poor potential for most engineering uses. Subsurface drains are effective in removing excess water. The soil is productive when drained and is suited to all the common crops. There is a continuing hazard of damage by floods to crops and to drainage installations.

This soil is well suited to pasture. Plant growth is fairly good during the dry part of summer. The soil is soft early in spring, and grazing at that time is likely to damage the pasture plants. Most pastured areas are not drained and commonly are too wet for alfalfa.

This soil is suitable for use as woodland. Trees that tolerate wetness will grow. Grass and shrubs give severe competition to trees in new plantings, and young trees are subject to damage by floods.

For engineering purposes this soil provides fair to poor foundation material, dam fill, and roadfill. There are some natural pond sites, and excavated ponds are likely to hold water. Dams are in danger of damage by floods.

The hazard of flooding on this soil limits severely its use as sites for buildings. The hazard of flooding and the seasonal wetness are severe limitations for use of the soil as a septic tank absorption field.

Capability subclass IIw; woodland suitability subclass 2w.

BnA—Bennington silt loam, 0 to 2 percent slopes. This is a nearly level, deep, somewhat poorly drained soil on till plains. It is on broad flats and in elongated natural drainageways that typically are in or near the lowest part of the landscape. Most areas are very irregular in shape and range from 5 to 200 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. Below that, the soil is yellowish brown, mottled, firm silty clay loam 4 inches thick. The subsoil is mottled, firm silty clay loam about 35 inches thick. In the upper part it is dark yellowish brown, and in the lower part it is brown. The substratum, to a depth of about 60 inches, is dark brown, mottled, firm silty clay loam glacial till.

Included in mapping are many small areas of the poorly drained Condit soils and the very poorly drained Pewamo soils. These wetter soils make up 5 to 15 percent of most mapped areas.

This soil has slow permeability and high available water capacity. Runoff is slow. The organic-matter content is low. Tilth is good. The water table is at a depth of 6 to 18 inches during the wettest time of year.

This soil is used as cropland and pasture. It has good potential for crops, hay, and pasture and poor potential for most engineering uses.

Wetness is a moderate limitation if this soil is farmed. Subsurface drains work well, but many of the areas do not have natural outlets. Open ditches will provide outlets from such areas. Because this soil is nearly level, erosion is not a major hazard. Row crops commonly are grown for several years in succession.

This soil is suited to pasture. Grazing early in spring is likely to damage the pasture plants. Pasture plants grow rather well during the dry part of summer.

Most woodlots on this soil are dominated by trees that tolerate clayey, somewhat wet soils. Competition from grasses and shrubs is severe in new plantings.

For engineering purposes this soil is firm and compact. It is good as foundation material and as fill for dams. Commonly it is too clayey to be good roadfill. Ponds dug in the soil generally hold water. The natural wetness of this soil limits its use as sites for buildings. Because the water table is seasonally high, some form of artificial drainage is needed during construction. Permeability of this soil is slower than that needed on a site for a septic tank absorption field. The seasonally high water table and occasional ponding also interfere with the operation of a septic tank.

Capability subclass IIw; woodland suitability subclass 2c.

BnB—Bennington silt loam, 2 to 6 percent slopes. This is a gently sloping, deep, somewhat poorly drained soil on till plains. It is on low knolls that have short, irregular slopes. Most areas are very irregular in shape and range from 5 to 400 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The subsurface layer, about 4 inches thick, is yellowish brown, mottled, firm silty clay loam. The subsoil is dark yellowish brown and brown, mottled, firm silty clay loam about 35 inches thick. The substratum, to a depth of about 60 inches, is dark brown, mottled, firm glacial till that is silty clay loam.

Many cultivated areas are eroded. The degree of erosion differs considerably within a short distance, and the color of the surface layer in a cultivated field typically is variable. In the eroded areas, chunks of yellowish brown silty clay loam are in the surface layer, and in some places the entire plow layer is brown or yellowish brown. The more eroded spots are typically on the higher and steeper knolls.

Included in mapping are small areas of the wetter Condit and Pewamo soils. These soils make up 10 to 15 percent of most of the larger mapped areas; they are in low spots between the knolls. Also included are areas of the moderately well drained Cardington soils on some of the higher knolls.

This soil has slow permeability and high available water capacity. Runoff is medium. The organic-matter content is moderate. Tilth is good. The water table is at a depth of 6 to 18 inches in the wettest time of year.

Most areas of this soil are used as cropland or improved pasture. The soil has good potential for cultivated crops, hay, and pasture and poor potential for most engineering uses.

The hazard of erosion is moderate if this soil is farmed. In eroded areas, the soil commonly has poor tilth and a lower content of organic matter than that of the typical soil. The slopes commonly are too short and irregular to permit practices, such as contour farming, to control erosion. Erosion can best be controlled by growing hay and by using mulch on cropland. Use of this soil is limited by wetness and by erosion. Subsurface drains can remove excess water.

The soil is suited to pasture. Grazing early in spring can damage the pasture plants. Pasture plants grow well during the dry part of summer.

This soil is suitable for use as woodland. Trees that tolerate clayey, somewhat wet soils grow best. Weeds and shrubs compete severely with planted tree seedlings.

This soil is firm and compact and thus suitable for engineering purposes. It is good foundation material and good fill for dams. Commonly, it is too clayey to be good roadfill. Ponds dug in the soil generally hold water.

The natural wetness of this soil is a severe limitation for its use as sites for buildings. The water table is seasonally high, and some artificial drainage is needed during construction. The permeability is slower than that needed for a septic tank absorption field. The seasonally high water table interferes with operation of a septic tank.

Capability subclass IIe; woodland suitability subclass 2c.

BrD—Berks channery silt loam, 12 to 18 percent slopes. This is a moderately steep, moderately deep, well drained soil on the upper side slopes of hills. It is underlain by bedrock. It is typically below a less sloping ridgetop and above a steeper slope. Most areas are elongated and are 5 to 30 acres in size.

Typically, the surface layer is very dark grayish brown, very friable channery silt loam about 3 inches thick. The subsoil, about 33 inches thick, is brown and yellowish brown, very friable channery and very channery silt loam; it is about 50 percent thin, flat sandstone fragments. Sandstone bedrock is at a depth of about 36 inches.

Included in mapping are small areas of the less stony Lordstown soils and areas of soils that have solid rock within a depth of 20 inches. There are a few springs and a few rock outcrops in these areas.

This soil has moderate or moderately rapid permeability and a very low available water capacity. Runoff is very rapid. The organic-matter content is very low, and tilth is poor.

Most areas of this soil are wooded; a few small areas are used as cropland, pasture, or orchard. This soil has good potential for pasture plants and trees and poor potential for most engineering uses.

This soil is poorly suited to crops. The hazard of erosion is very severe. Because of the rock fragments, only about half the volume of soil holds nutrients and water for plants. The rock fragments are not large enough to interfere with tillage, but they commonly cover enough of the surface that a good stand of hay or small grain is not possible. Contour stripcropping is used on most of the few cultivated areas. Additions of organic matter are especially beneficial in maintaining productivity.

This soil is suitable for use as pasture. The good natural drainage permits grazing early in spring. Most pasture plants common to the area will grow well.

This soil is suitable for use as woodland. Trees do not grow as fast as on soils that have a greater available water capacity. Most trees common in the area will grow. The soil is also suited to fruit trees.

This soil is too shallow and has too many rock fragments to be good fill material for dams and roads. Pond sites are few because water commonly seeps very rapidly through cracks in the underlying rock.

Because of good natural drainage, the soil is favorable for use as sites for buildings, but the slope and moderate

depth to rock limit excavations for basements and utility lines.

This soil is very poorly suited to use as a septic tank absorption field because of the slope and moderate depth to rock. Effluent commonly seeps rapidly through cracks in the rock and can contaminate local water supplies.

Capability subclass IVe; woodland suitability subclass 3f.

BsG—Berks-Rock outcrop complex, 30 to 60 percent slopes. This map unit consists of very steep, shallow to moderately deep, well drained soils that are on hillsides and are underlain by bedrock. The areas lie below less sloping hillsides and above flood plains and terraces. The slope is in one direction. The areas are elongated and are 10 to 80 acres in size.

Berks channery silt loam makes up about 50 percent of most of the mapped areas. Typically, the surface layer of this soil is very dark grayish brown, very friable channery silt loam about 3 inches thick. The subsoil, about 25 inches thick, is brown and yellowish brown, very friable channery and very channery silt loam. The upper part of the subsoil is about 30 percent thin, flat sandstone fragments; the fragments are larger, thicker, and more numerous at increasing depths, and bedrock that is mostly solid is at a depth of about 28 inches.

In 20 percent of this map unit, the surface layer, which is 6 to 20 inches thick, is loam or silt loam and is underlain by solid bedrock. A Lordstown soil, which is similar to the Berks soil but has fewer rock fragments in the upper 20 inches, makes up 20 percent of most areas. Rock outcrop makes up the remaining 10 percent.

Included in mapping are areas that have a few springs and a few piles of rock rubble and boulders along the base of slopes. Water from springs high on the slopes has cut chutelike watercourses into the rock.

The Berks soil has moderate or moderately rapid permeability and a very low available water capacity. Runoff is very rapid. The root zone is moderately deep, and the organic-matter content is very low.

This map unit has little potential for uses other than woodland. The slope is too steep for use as cropland or pasture and for most nonfarming uses. Most areas are woodland.

Trees do not grow well because of the very low available water capacity. The volume of soil over bedrock commonly is not enough to support large trees. The slope limits many practices for woodland improvement and for harvesting trees. Many of the large wooded areas are scenic.

Capability subclass VIIe; woodland suitability subclass 3f.

BtA—Bogart gravelly loam, 0 to 2 percent slopes. This is a nearly level, deep, moderately well drained soil on terraces, alluvial fans, and outwash plains. It typically lies below areas of well drained gravelly soils and above flood plains. It occupies the entire area of some small terraces and the nearly level parts of some large areas of gravelly soil. The areas of this soil are irregular in shape and are 5 to 20 acres in size.

Typically, the surface layer is dark grayish brown, friable gravelly loam about 10 inches thick. The subsoil is about 40 inches thick. In the upper part it is brown gravelly loam and yellowish brown, mottled, friable loam. In the lower part it is dark yellowish brown or yellowish brown, mottled very friable gravelly loam, gravelly sandy loam, or gravelly sandy clay loam. The substratum, to a depth of about 60 inches, is dark yellowish brown, loose gravelly loamy sand.

Included in mapping are small areas of the somewhat poorly drained Jimtown soils in concave spots and seep areas. Also included are sizeable areas of the well drained Chili soils, typically next to escarpments where lateral drainage is rapid.

This soil has moderate or moderately rapid permeability in the subsoil and rapid permeability below the subsoil. The available water capacity is low to moderate. Runoff is slow. The content of organic matter, lime, and plant nutrients is naturally low, but crops respond well to additions of these materials.

Most areas of this soil are used as cropland, although a small acreage is used as pasture. The soil has good potential for crops, hay, pasture plants, and trees. It also has good potential for many engineering uses.

Sometimes the supply of available water is not enough for growth of crops. Roots do not penetrate the gravelly layers in and below the subsoil during long dry periods. Natural drainage is adequate for farming, although randomly spaced tile lines are useful to drain the included areas of wet soils. Because the soil is nearly level, there is no hazard of erosion. Drought is a problem, and maintaining fertility and the content of lime and organic matter is the main management need. The soil is suitable for irrigation.

This soil is suitable for pasture. Pastures can be grazed early in spring, but growth is slow during the dry part of summer. Deep-rooted legumes grow fairly well during dry periods.

This soil is not used much as woodland. A wide variety of trees common in the area will grow well. Shrubs and grass compete severely with newly planted trees. The soil is suited to fruit trees, but most of the areas are in valleys that have poor air drainage, and for that reason they are not favorable orchard sites.

This soil has fair compaction characteristics for engineering purposes. It is fair foundation material when dry but is unstable when wet. It commonly is too porous to be good fill for dams but is fair roadfill. Ponds dug in the soil are not likely to hold water because the soil and the substratum are porous. Most of the gravel in this soil is mixed with too much silt and clay to be of commercial value.

This soil has moderate limitations for use as sites for buildings that do not have basements and severe limitations for those that have basements. There are periods of excessive wetness late in winter and early in spring. Permeability is adequate for a septic tank absorption field. There are, however, periods of excessive wetness, when the water interferes somewhat with absorption of effluent.

Capability subclass IIs; woodland suitability subclass 1o.

BtB—Bogart gravelly loam, 2 to 6 percent slopes. This is a gently sloping, deep, moderately well drained soil on terraces, outwash plains, and alluvial fans. It occupies the entire area of some small terraces and the low, gently sloping parts of large terraces. The areas are variable in shape and are 2 to 50 acres in size.

Typically, the surface layer is dark grayish brown, friable gravelly loam about 10 inches thick. The subsoil is about 40 inches thick. In the upper part it is brown and yellowish brown, mottled, friable loam. In the lower part it is dark yellowish brown or yellowish brown, mottled, very friable gravelly loam, gravelly sandy loam, or gravelly sandy clay loam. The substratum, to a depth of about 60 inches, is dark yellowish brown, loose gravelly loamy sand.

On a few of the higher knolls, this soil is eroded and has a brown or yellowish brown plow layer. The depth to natural lime is more than 5 feet except in a few places in Lake Fork Valley.

Included in mapping are small areas of the somewhat poorly drained Jimtown soils in low spots and seepy areas. Also included are small areas of the well drained Chili soils on high knolls and convex areas.

This soil has moderate or moderately rapid permeability in the subsoil and rapid permeability below the subsoil. The available water capacity is low to moderate. Runoff is slow. The soil naturally has a low content of organic matter, lime, and plant nutrients, but crops respond to additions of these materials. The water table is at a depth of 18 to 36 inches for brief periods during the wettest time of year. Most of these periods of a high water table do not occur during the growing season.

Most areas of this soil are used as cropland, although some are used as pasture or woodland. This soil has good potential for crops, hay, pasture, and trees. It also has good potential for many engineering uses.

Erosion is a moderate hazard if this soil is cultivated. There are times when the available water is insufficient for crops. The soil is well suited to minimum tillage, and that practice generally is enough to control erosion. Crops respond to adequate liming and fertilizing, and additions of organic matter are beneficial. Natural drainage generally is adequate for farming, but randomly spaced subsurface drains are needed to remove water from the seepy areas and other included areas. This soil is suitable for irrigation.

This soil is suitable for pasture. Pastures can be grazed early in spring, but they do not grow well through the dry part of summer. Deep-rooted legumes, such as alfalfa, grow better than grasses during the dry periods. The slope does not limit intensive pasture management.

The woodlots on this soil are small. A wide variety of trees common in the area will grow well. Grasses and shrubs compete severely with newly planted trees. The soil is well suited to fruit trees, but most areas are not good sites for orchards because they are in valleys where air drainage is poor.

For engineering purposes, this soil has fair compaction characteristics. It is fair foundation material when dry but is unstable when wet. It is too porous to be good dam fill but is fair roadfill. Ponds dug in the soil commonly are not likely to hold water because the soil and the substratum are porous. Most of the gravel in this soil is mixed with too much silt and clay to be of commercial value.

This soil has moderate limitations for use as sites for buildings that do not have basements and severe limitations for those that have basements. There are periods of seasonal wetness. The soil has permeability adequate for a septic tank absorption field. The excessive wetness during some periods, however, interferes with absorption of effluent.

Capability subclass IIe; woodland suitability subclass 1o.

BvA—Bogart silt loam, 0 to 2 percent slopes. This is a nearly level, deep, moderately well drained soil. It occupies the entire area of small, fan-shaped terraces, 2 to 10 acres in size, that extend from a steep valley side to a low escarpment that separates the terraces from the flood plain of a stream. Some areas are on the low part of broad terraces. Most of these areas are in elongated troughs between more sloping, well drained gravelly soils. These areas are as much as 40 acres in size, and some are a half mile long.

Typically, the surface layer is dark grayish brown, friable silt loam about 9 inches thick. The subsoil is about 39 inches thick. In the upper part it is yellowish brown, mottled, firm silt loam. In the lower part it is yellowish brown, mottled, very friable gravelly loam and gravelly sandy loam. The substratum, to a depth of about 60 inches, is dark yellowish brown, loose gravelly loamy sand.

Included in mapping are small areas of the somewhat poorly drained Jimtown soils in concave spots and in places that receive considerable seepage. Also included are areas of a deep loamy soil that has little gravel within a depth of 40 inches.

This soil has moderate or moderately rapid permeability in the subsoil and rapid permeability below the subsoil. The available water capacity is moderate. Runoff is slow. The content of organic matter is moderate. Tilth is good. The water table is at a depth of 18 to 36 inches in the wettest time of the year. Periods of excessive wet-

ness are brief, and most of them do not occur during the growing season.

Most areas of this soil are used as cropland. This soil has good potential for crops, hay, pasture, and trees. It also has good potential for most engineering uses.

This soil has few limitations. Natural drainage is generally adequate for farming, although randomly spaced subsurface drains may be needed to drain the wet areas that are included. Typically, the rooting zone is not restricted, but roots may not develop in the gravelly layers during dry periods. Maintaining a good level of lime and of soil fertility is the main management need. The soil is suitable for irrigation.

Few areas of this soil are used as pasture because other crops produce a greater return. A wide variety of pasture crops, including alfalfa, will grow well. Very intensive pasture management can be practiced, and good growth can be expected.

This soil is not used extensively as woodland, though many desirable trees will grow.

For engineering purposes this soil compacts fairly well. It is good foundation material when dry but is unstable when wet. It is generally too porous to be used as fill for dams. The material below a depth of about 30 inches is fair roadfill. The soil has some gravel, but there are few deposits of commercial value. There are few natural pond sites. Excavated ponds are not likely to hold water because the soil is porous.

This soil has moderate limitations for use as sites for buildings that do not have basements and severe limitations for those that have basements. There are periods of seasonal wetness. Permeability is adequate for a septic tank absorption field. There is a hazard of polluting ground water when effluent is discharged into the gravelly substratum.

Capability class I; woodland suitability subclass 1o.

BvB—Bogart silt loam, 2 to 6 percent slopes. This is a gently sloping, deep, moderately well drained soil on terraces 2 to 20 acres in size. On larger terraces, 5 to 50 acres in size, this soil is in sloping troughs and on low knolls. Some of these larger areas are high on the landscape, and many are elongated.

Typically, the surface layer is dark grayish brown, friable silt loam about 9 inches thick. The subsoil is about 39 inches thick. In the upper part it is yellowish brown, mottled, firm loam. In the lower part it is yellowish brown, mottled, very friable gravelly loam and gravelly sandy loam. The substratum, to a depth of about 60 inches, is dark yellowish brown, loose gravelly loamy sand.

Included in mapping are small areas of the somewhat poorly drained Jimtown soils in depressions, low spots, and small natural drainageways. Also included are areas of the well drained Wheeling soils on higher knolls and areas of a deep loamy soil that has little gravel within a depth of 40 inches.

This soil has moderate or moderately rapid permeability in the subsoil and moderately rapid or rapid permeability below the subsoil. The available water capacity is moderate. Runoff is medium. The organic-matter content is low to moderate. Tilth is good. The water table is at a depth of 18 to 36 inches during the wettest time of the year. Most periods of excessive wetness are brief and do not occur during the growing season.

Most areas of this soil are used as cropland. This soil has good potential for crops, hay, pasture, and trees. It also has good potential for most engineering uses.

The hazard of erosion is moderate where this soil is cultivated, but erosion generally can be controlled by contour cultivation. Natural drainage generally is adequate for farming, but randomly spaced subsurface drains are needed in the included areas that are wet. Crops may not get enough water during a long dry period, but such periods are rare. Liming and fertilizing are needed to achieve above average yields. The soil is suitable for irrigation.

This soil is suitable for pasture. Most of the common pasture plants, including alfalfa, will grow well. Pastures can be grazed rather early in spring, and pasture plants grow well in the dry part of summer. The gentle slopes permit intensive pasture management.

This soil is not used extensively as woodland, though a wide variety of trees common in the area can be grown. Trees in new plantings are subject to severe competition from grasses and shrubs.

This soil compacts fairly well and is good foundation material when dry; it is unstable when wet. It is generally too porous to be used as fill for dams. The material below a depth of about 30 inches is fair roadfill. The soil has some gravel, but there are few places where the gravel deposits have commercial value. There are few sites for natural ponds. Excavated ponds are not likely to hold water because the soil is porous.

This soil has moderate limitations for use as sites for buildings that do not have basements and severe limitations for those that have basements. There are periods of seasonal wetness. There is a hazard of ground-water pollution if the effluent from a septic tank is discharged into the gravelly substratum.

Capability subclass IIe; woodland suitability subclass 1o.

CaB—Canfield silt loam, 2 to 6 percent slopes. This is a gently sloping, deep, moderately well drained soil on till plains and moraines. In some places the soil is on broad hilltops that are bordered by steep-sided valleys. Such areas are convex, they have long uniform slopes, and they are 20 to 200 acres in size. This soil is also in smaller concave areas that are surrounded by the well drained Wooster soils. Such areas are 4 to 15 acres in size. Areas of this soil have a variety of shapes. This is the most extensive soil in the county.

Typically, the surface layer is dark brown, friable silt loam about 10 inches thick. The subsoil is about 34 inches thick. In the upper part it is yellowish brown, mottled, friable silt loam and loam. In the lower part it is yellowish brown, mottled, firm and very firm loam. This firm layer is called a fragipan. The substratum, to a depth of about 60 inches, is yellowish brown, mottled, firm glacial till that is loam.

Some spots in cultivated fields are eroded. In these eroded spots, which typically are on the highest and steepest parts of the landscape, the plow layer is brown or yellowish brown and has chunks of the firm subsoil material. The dense fragipan, which restricts growth of roots and movement of water, is at a depth of 15 to 30 inches.

Included in mapping are small areas of the somewhat poorly drained Ravenna soils, which are grayer and wetter than the Canfield soils. These small areas are in depressions and in minor natural drainageways. Also included are small areas of the well drained Wooster soils on higher knolls.

Permeability of the fragipan in this soil is slow. Permeability is moderate above the fragipan and moderately slow below it. The available water capacity is moderate. Runoff is medium. Because the depth of the root zone is limited by the fragipan, there is potentially a shortage of available water during long dry periods. The fragipan also is the cause of a temporary perched water table during wet periods.

The content of organic matter is moderate. The soil has naturally low fertility and a low supply of lime, but crops respond to additions of fertilizer and lime. Tilth is good where the soil is not eroded.

Most areas of this soil are used as cropland or improved pasture (fig. 1). The soil has good potential for crops, hay, pasture, and trees. It has good to fair potential for most engineering uses.

All the common field crops grow well on this soil. The hazard of erosion is moderate where the soil is cultivated. Erosion reduces the thickness of soil above the restrictive fragipan. As a result, the perched water table is nearer the surface during wet periods, and there is less soil from which plants can extract water during dry periods. The hazard of erosion is greatest in areas where the slope is long. Cultivating on the contour, minimum tillage, and growing hay crops help control erosion.

The natural drainage of this soil generally is adequate for farming. Most of the periods of excessive wetness do not occur during the growing season. Systematic subsurface drainage is not needed in most areas, but randomly

Figure 1.—Canfield silt loam, 2 to 6 percent slopes, is suited to cultivated crops, but erosion is a hazard.

spaced lines of tile are needed to drain troublesome wet spots. Controlling erosion and maintaining fertility and the content of lime and organic matter are the main management needs. This soil is moderately to highly productive if adequately managed.

This soil is suited to a variety of pasture plants. The gentle slope does not limit intensive management of pastures, and most pastured areas are used as cropland part of the time. Pastures can be grazed early in spring, and the plants grow moderately well during the dry part of summer.

Wooded areas of this soil are mostly small. A wide variety of trees common in the area will grow well. The gentle slope does not limit intensive management of woodlands. Severe competition from grasses and shrubs can be expected if plantings of trees are made in open fields.

This soil is firm and compact enough for engineering purposes and is good for foundations. It is fair to good dam fill if properly compacted and is fair roadfill. Ponds dug in this soil generally hold water.

The seasonal wetness is a moderate limitation for use of this soil as sites for buildings that do not have basements and a severe limitation for those that have basements. Water moves downslope along the top of the fragipan and commonly flows into the area of a foundation. Permeability of the fragipan is much slower than the minimum rate needed for a successful septic tank absorption field.

Capability subclass IIe; woodland suitability subclass 1o.

CaC—Canfield silt loam, 6 to 12 percent slopes. This is a moderately sloping, moderately deep, moderately well drained soil on the upper part of major hillsides and on the side slopes of small natural drainageways in the till plains. Most of the areas lie below a broad, gently sloping hilltop and above steeper hillsides or valley side slopes. Most of the areas are irregular in shape and are 5 to 20 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 8 inches thick. The subsoil is about 32 inches thick. In the upper part it is yellowish brown, mottled, friable loam or silt loam. In the lower part it is yellowish brown, firm and very firm loam; this is the fragipan. The substratum, to a depth of about 60 inches, is yellowish brown, mottled, firm glacial till of loam texture.

Included in mapping are small areas of the somewhat poorly drained Ravenna soils. These are concave areas at the head of small natural drainageways and around springs and seeps. Also included are spots of the well drained Wooster soils in higher convex areas.

This soil has slow permeability in the fragipan and moderately slow permeability below the pan. The available water capacity is moderate. Runoff is rapid. The fragipan is dense; it restricts the growth of roots and the movement of water. Because the root zone is restricted, sometimes there is not enough available water for crops during long dry periods. The fragipan is the cause of a temporary perched water table during wet periods. Flow of water downslope along the top of the fragipan produces many of the springs and seep areas that are on this soil.

This soil has a moderate content of organic matter. It has a naturally low supply of lime and plant nutrients, but crops respond well to additions of those materials. Tilth is good.

This soil is used as cropland, pasture, and woodland. It has good potential for crops, hay, pasture, and trees. It has good to fair potential for most engineering uses.

The hazard of erosion is severe when this soil is cultivated. Erosion reduces the thickness of soil above the restrictive fragipan, thus reducing the zone from which plant roots can extract water and nutrients. Common erosion-control practices include contour stripcropping, minimum tillage, and growing hay crops a large part of the time. Protected waterways are needed wherever water collects on the long slopes. Natural drainage of this soil generally is adequate for farming, but randomly spaced subsurface lines of tile are needed to drain wet spots, springs, and seep areas. Control of erosion and maintenance of the levels of lime, fertility, and organic matter are the main management needs. When properly managed, this soil is suited to all the crops common in the area.

This soil is well suited to a variety of pasture plants. Pastures can be grazed fairly early in spring, and growth is good during the dry part of summer. The slope does not limit intensive pasture management.

Most of the woodlots on this soil are small. A wide variety of trees common in the area can be grown. Competition from grasses and shrubs is severe when plantings of trees are made in open fields.

This soil is firm and compact. It is good material for foundations and is fair roadfill. It is fair to good dam fill if properly compacted. Ponds dug in this soil generally hold water.

Slope and seasonal wetness are moderate limitations for use of this soil as sites for buildings. There is a hazard of erosion if the soil is left bare during construction. Basements are likely to intercept water that seeps laterally along the top of the fragipan.

The fragipan has permeability considerably slower than the rate needed for a septic tank absorption field.

Capability subclass IIIe; woodland suitability subclass 1o.

CaC2—Canfield silt loam, 6 to 12 percent slopes, eroded. This is a moderately sloping, deep, moderately well drained soil on the upper part of major hillsides and on side slopes of small natural drainageways in the till plains. These areas are eroded to a degree that productivity of the soil has been significantly reduced. Most of

the areas lie below broad, gently sloping hilltops and above steeper hillsides or valley side slopes. The areas are irregular in shape and are mostly 4 to 15 acres in size.

Typically, the surface layer is brown, friable silt loam about 7 inches thick. In some places it has small chunks of firm, yellowish brown loam or silt loam. The subsoil is about 31 inches thick. In the upper part it is yellowish brown, mottled, friable loam or silt loam. In the lower part it is yellowish brown, firm and very firm loam that is the fragipan. The substratum, to a depth of about 60 inches, is yellowish brown, mottled, firm glacial till of loam texture.

Differences in the degree of erosion are evident within most of the mapped areas of this soil. The color of the plow layer is yellowish brown in the more eroded spots and dark grayish brown where little erosion has occurred. The most severely eroded spots are in the highest and steepest areas. These are marked by a special spot symbol on the soil map. Protected areas and concave spots are the least eroded, and there the surface layer is darkest. In some of those places, soil material that washed from higher ground has accumulated.

Included in mapping are somewhat poorly drained Ravenna soils in small concave areas and well drained Wooster soils in high convex areas. There are also many included areas that have seep spots and springs.

This soil has slow permeability in the fragipan. Permeability is moderate above the fragipan and moderately slow below it. The available water holding capacity is low. Runoff is rapid. The fragipan layer is dense, and it restricts the growth of roots and the movement of water. Because the root zone is restricted, there is likely to be a shortage of available water for crops during long dry periods. The fragipan is the cause of a temporary perched water table during wet periods. Lateral flow of water along the top of the fragipan supplies the springs and seep areas that are in this soil. The effects of the fragipan are more evident in this soil than in uneroded Canfield soils because the layers above the pan are thinner. This soil has a low organic-matter content. Tilth is fair to poor.

Most areas of this soil have been used as cropland. The soil has fair potential for crops, hay, pasture, and trees and fair potential for most engineering uses.

There is a continuing severe hazard of erosion if this soil is cultivated. Significant erosion has already occurred in most of the areas. Subsoil material makes up part of the plow layer. The depth to the restrictive fragipan layer is less than in the uneroded soil, and plants have a thinner root zone from which to extract nutrients and water. A way to control further erosion is to keep the soil in hay crops much of the time. This soil is suitable for occasional cultivation if erosion is controlled, for example, by contour stripcropping and minimum tillage. Additions of organic matter are helpful in restoring productivity.

Natural drainage of this soil generally is adequate for farming, but randomly spaced subsurface lines help to drain wet spots, springs, and seep areas. Permanent sod in natural drainageways deters the formation of gullies.

The soil is suited to a variety of pasture crops. Pastures can be grazed early in spring and grow moderately well during the dry part of summer. The slope does not limit intensive pasture management.

Few areas of this soil are wooded. Most of the trees common in the area will grow well. The slope does not limit intensive woodland management. There is severe competition from grasses and shrubs in new plantings of trees.

This soil is firm and compact, and it makes good foundation material. It is fair roadfill. It is fair to good dam fill if properly compacted. Ponds dug in this soil generally hold water. In many places, a good pond site can be developed by damming a small natural drainageway.

Slope and seasonal wetness are moderate limitations for use of this soil as sites for buildings. Erosion is likely to occur in areas that are bare during construction. Basements dug into the soil are likely to intercept water that seeps laterally along the top of the fragipan. Because of water, a wall can fail if the excavation is not adequately drained. Permeability in the fragipan is considerably less than that needed for a septic tank absorption field. There is also a risk that the effluent will seep along the top of the fragipan.

Capability subclass IIIe; woodland suitability subclass 1o.

CdB—Cardington silt loam, 2 to 6 percent slopes. This is a gently sloping, deep, moderately well drained soil on till plains. Some areas are on broad hilltops between steep-sided valleys. Such areas have long uniform slopes and are 20 to 200 acres in size. Other areas are on knolls that rise above the surrounding landscape. These areas have short, irregular slopes and are 2 to 10 acres in size.

Typically, the surface layer of this soil is dark brown, friable silt loam about 8 inches thick. The subsoil is about 22 inches thick. In the upper part it is yellowish brown, mottled, firm silty clay loam and clay loam. In the lower part it is yellowish brown, mottled, firm clay loam. The substratum, to a depth of about 60 inches, is yellowish brown, mottled, firm clay loam glacial till.

Included in mapping are eroded spots in which the surface layer is lighter colored than typical. These eroded spots are mostly on the higher and steeper knolls. Also included in mapping are small areas of the wetter Bennington soils in low spots, depressions, and around the base of knolls. These wet inclusions make up as much as 20 percent of some of the larger mapped areas.

This soil has moderately slow permeability and moderate available water capacity. Runoff is medium. The con-

tent of organic matter is moderate. Tilth is good. The water table is at a depth of 24 to 36 inches in the wettest time of the year. Most periods of excessive wetness do not occur during the growing season.

Most areas of this soil are used as cropland. This soil has good potential for crops, hay, pasture, and trees. It has fair potential for most engineering uses.

There is a moderate erosion hazard if this soil is cultivated. Erosion removes organic matter and worsens tilth. In some of the areas, the slope is too irregular to be adapted for stripcropping. Natural drainage generally is adequate for farming, but randomly spaced subsurface tile lines are beneficial in some areas, especially in places where there are inclusions of the wetter Bennington soils. Maintaining fertility and the content of lime and organic matter and controlling erosion are the main management needs. This soil is well suited to a variety of pasture crops, but it is not used much as permanent pasture because it is good cropland.

Woodlots on this soil are small. Most of the trees common in the area will grow well. Few new plantings of trees are made. Competition from grass and shrubs is severe if trees are planted in open fields.

This soil is firm and compact. It is good material for foundations and good fill for dams. It is too clayey to be good roadfill. Ponds dug in this soil are likely to hold water.

Because there are periods of excessive wetness, this soil has moderate and severe limitations for use as sites for buildings. The wetness can be corrected by adequate drainage, or the problem can be avoided by selecting convex spots as sites for buildings. The permeability of this soil is less than that needed for a septic tank absorption field.

Capability subclass IIe; woodland suitability subclass 2o.

CdB2—Cardington silt loam, 2 to 6 percent slopes, eroded. This is a gently sloping, deep, moderately well drained soil on till plains. Some of the areas are on broad hilltops between steep-sided valleys. Such areas have long uniform slopes and are 20 to 200 acres in size. Other areas of this soil are on knolls that rise above the surrounding landscape. These knolls have short, irregular slopes and are 2 to 10 acres in size. This soil is eroded to a degree that its productivity has been reduced. The degree of erosion differs within short distances.

Typically, the surface layer is brown, friable silt loam about 8 inches thick that has distinct chunks of yellowish brown silty clay loam. The subsoil is about 22 inches thick. In the upper part it is yellowish brown, mottled, firm silty clay loam and clay loam. In the lower part it is yellowish brown, mottled, firm clay loam. The substratum, to a depth of about 60 inches, is yellowish brown, mottled, firm clay loam glacial till.

Variations in the color of the surface layer are typical in plowed fields. The eroded soil, which generally is on high spots and slopes, is lighter in color than the rest of the soil.

Included in mapping are small areas of the somewhat poorly drained Bennington soil in low spots and depressions and around the base of knolls. These wet areas make up as much as 15 percent of some of the larger mapped areas.

This soil has moderately slow permeability and moderate available water capacity. Runoff is medium. The organic-matter content is low. Tilth is fair to poor. The water table is at a depth of 24 to 36 inches in the wettest time of the year. Most of the periods of excessive wetness do not occur during the growing season.

Most areas of this soil are now or have been cultivated intensively. This soil has fair potential for crops, hay, pasture, and trees and fair potential for most engineering uses.

The hazard of erosion is moderate if this soil is cultivated. Erosion removes organic matter and worsens tilth. The supply of organic matter in this soil is considerably less than that in the similar but uneroded soil. Cultivation on the contour is effective for controlling erosion on the long and smooth slopes. Natural drainage of this soil is generally adequate for farming, but randomly spaced subsurface tile lines are beneficial in some areas, especially where there are inclusions of the wetter Bennington soil. Controlling erosion and maintaining fertility and the content of lime and organic matter are the major management needs. Additions of organic matter are beneficial. This soil is suited to all the common field crops grown in the area, although erosion has decreased its productivity. It is also suited to pasture.

There are few wooded areas on this soil. Most trees common in the area will grow well. Competition from grasses and shrubs is a serious problem in new plantings of trees.

This soil is firm and compact. It is good foundation material and good fill for dams. The excessive wetness is a moderate and severe limitation for its use as sites for buildings. The wetness can be overcome by installing adequate drains or avoided by selecting high, convex spots as sites for buildings. There is some risk of erosion during construction. Permeability of this soil is considerably less than that needed for a septic tank absorption field.

Capability subclass IIe; woodland suitability subclass 2o.

CdC—Cardington silt loam, 6 to 12 percent slopes. This is a moderately sloping, deep, moderately well drained soil. It is on the side slopes of small drainageways on the till plain and also on high knolls that rise above the surrounding landscape. Most of the areas are smaller than 10 acres, but a few are larger. The slopes are short and generally smooth.

Typically, the surface layer is dark brown, friable silt loam about 8 inches thick. The subsoil is about 22 inches thick. In the upper part it is yellowish brown, mottled, firm silty clay loam and clay loam. In the lower part it is yellowish brown, mottled, firm clay loam. The substratum, to a depth of about 60 inches, is yellowish brown, mottled, firm clay loam glacial till. In the eroded spots in most of the cultivated areas, the surface layer is lighter colored and more clayey than that described as typical.

Included with this soil in mapping are somewhat poorly drained Bennington soils on the lower part of some slopes. These soils make up 5 to 10 percent of most mapped areas.

This soil has moderately slow permeability and moderate available water capacity. Runoff is rapid. The content of organic matter is moderate. Tilth is good. The water table is at a depth of 24 to 36 inches in the wettest time of year. Most of the periods of excessive wetness do not occur during the growing season.

This soil is used as pastureland, cropland, and woodland. It has good potential for hay, pasture, and trees and fair potential for most engineering uses.

The hazard of erosion is severe if this soil is cultivated. The soil is suited to row crops if erosion is controlled. Some areas of this soil are farmed in fields along with less sloping soils and are not managed adequately to control erosion. This soil is well suited to pasture. It can be grazed early in spring, and growth of the plants is good during the dry part of summer. The slope does not limit intensive practices for seeding and improving pastures.

This soil is suitable for use as woodland. The existing woodlots are small. Most trees common in the area will grow well. Competition from grasses and shrubs is a problem in new plantings of trees.

This soil is firm and compact. It is good foundation material and good fill for dams. There are good natural pond sites where the soil is on both sides of a narrow drainageway. The soil is too clayey to make good roadfill.

The periods of excessive wetness and the risk of erosion during construction are major limitations if this soil is used as sites for buildings. Suitable drains can correct the wetness. Permeability is considerably slower than that needed on a site for a septic tank absorption field.

Capability subclass IIIe; woodland suitability subclass 2o.

CdC2—Cardington silt loam, 6 to 12 percent slopes, eroded. This is a moderately sloping, deep, moderately well drained soil on till plains. This soil is on high knolls and low hills and on side slopes of minor drainageways on the till plain. The areas on knolls and hills are irregularly shaped and have short irregular slopes. The areas on side slopes of drainageways tend to be long, to lie parallel to the drainageway, and to have short smooth slopes. Most areas are 5 to 25 acres in size, but a few range from 25 to 100 acres.

This soil is eroded to a degree that its productivity has been reduced. The degree of erosion differs within short distances.

Typically, the surface layer is brown, friable silt loam about 8 inches thick. In it are distinct chunks of yellowish brown silty clay loam. The subsoil is about 20 inches thick. In the upper part it is yellowish brown, mottled, firm silty clay loam and clay loam. In the lower part it is yellowish brown, mottled, firm clay loam. The substratum, to a depth of about 60 inches, is yellowish brown, mottled, firm clay loam glacial till. In eroded spots, which generally are the highest and most sloping parts of the soil areas, the surface layer is lighter colored than the one described as typical.

Included in mapping are small areas of the somewhat poorly drained Bennington soils on the lower parts of some slopes. These inclusions make up 5 to 10 percent of most mapped areas.

This soil has moderately slow permeability and low available water capacity. Runoff is rapid. The content of organic matter is low. Tilth is fair to poor. The water table is at a depth of 24 to 36 inches in the wettest time of the year. Most of the periods of excessive wetness do not occur during the growing season.

This soil has good potential for hay, pasture, and trees. It has fair potential for some engineering uses.

Most areas of this soil are now or have been cultivated. As a result, erosion is moderate over most of the area. The hazard of erosion is severe where this soil is cultivated. Erosion removes organic matter and worsens tilth. Many areas of this soil are farmed as small parts of less sloping fields and are not managed adequately to control erosion. The most practical methods of controlling erosion are cultivation on the contour and the growing of hay a large part of the time. Grass waterways will prevent the formation of gullies.

This soil is well suited to pasture. Pastures can be grazed early in spring, and growth of the plants is fairly good during the dry part of summer. Slope does not limit intensive practices for pasture seeding and improvement. Few areas of this soil are wooded. Competition from grasses and shrubs is a major problem in new plantings of trees. Most of the trees common in the area will grow well.

This soil is firm and compact enough for engineering purposes. It is good material for foundations and good fill for dams. It is too clayey to be good roadfill. There are good natural pond sites where this soil is on both sides of a narrow drainageway.

The periods of excessive wetness and the risk of erosion during construction are major limitations in the use of this soil as sites for buildings. Suitable drains can correct the wetness. Immediate seeding of scalped areas will generally prevent erosion. The permeability of

this soil is considerably slower than that needed on a site for a septic tank absorption field.

Capability subclass IIIe; woodland suitability subclass 2o.

CeC3—Cardington silty clay loam, 6 to 12 percent slopes, severely eroded. This is a moderately sloping, deep, moderately well drained, severely eroded soil on high knolls and on side slopes of stream valleys in till plains. Most of the areas are irregular in shape and 2 to 10 acres in size. Slopes are short and irregular. This soil is eroded to a degree that productivity has been substantially reduced. Most of the original surface soil has been removed, and the present surface layer is mostly material that was part of the subsoil.

Typically, the surface layer is brown or yellowish brown, firm silty clay loam about 6 inches thick. The subsoil is about 20 inches thick. In the upper part it is yellowish brown, mottled, firm silty clay loam or clay loam. In the lower part it is yellowish brown, mottled, firm clay loam. The substratum, to a depth of about 60 inches, is yellowish brown, mottled, firm clay loam glacial till.

The depth to natural lime is 20 to 30 inches. Small parts of most mapped areas are not severely eroded and have a surface layer that is brown or dark brown silt loam.

Included in mapping are small areas of the somewhat poorly drained Bennington soils around the base of some slopes. These areas make up less than 10 percent of most mapped areas. There are accumulations of loose, washed-in soil material at the base of some of the slopes.

This soil has moderately slow permeability and moderate available water capacity. Runoff is rapid. The content of organic matter is very low. Tilth is poor. The water table is at a depth of 24 to 36 inches in the wettest time of year. Most of the periods of excessive wetness do not occur during the growing season.

Most areas of this soil are small parts of fields that consist mainly of less sloping soils.

This soil has fair potential for hay, pasture, and trees and fair to poor potential for most engineering uses. The hazard of erosion is very severe if the soil is cultivated. The most practical way to control erosion is by growing grass or trees. Control of erosion is greatly needed to prevent loss of productive soil and enlargement of the eroded spots.

This soil is poorly suited to cultivated crops because of its poor tilth and low organic-matter content. It is suited to pasture, and most pasture plants will grow well. It is difficult, however, to establish a seeding in the eroded soil. Additions of manure and other organic materials will aid in establishing a seeding. This soil is suited to trees, and most of the trees common in the area will grow. Competition from grasses and shrubs is a major problem in establishing new plantings of trees.

This soil is firm and compact. It is good foundation material and good fill for dams. It is too clayey to be good material for roadfill.

Periods of excessive wetness and the risk of erosion during construction are major limitations in the use of this soil as sites for buildings. The wetness can be corrected by adequate drains. Scalped areas should be reseeded immediately to prevent erosion. Establishing a lawn is likely to be difficult on the eroded or graded soil. This soil has permeability considerably slower than that needed on a site for a septic tank absorption field.

Capability subclass IVe; woodland suitability subclass 2o.

Cf—Carlisle muck. This is a nearly level, deep, dark-colored, very poorly drained organic soil in closed depressions on flood plains and low terraces. In these areas the partly decomposed remains of plants have accumulated. Most of the areas are low on the landscape along the sides of major stream valleys. The slope is less than 2 percent. Most of the areas are between a terrace and a flood plain, both higher than this soil. The areas are irregular in shape and are 5 to 40 acres in size.

Typically, the surface layer is black, friable muck, about 38 inches thick, that has a few brown and yellowish brown fibers. Below this layer, to a depth of about 54 inches, there is very dark grayish brown, friable muck that has many fibers and a few wood fragments. The next layer, to a depth of about 60 inches, is mineral soil that is gray, friable silt loam.

Included in mapping are small areas of Linwood soil in which the thickness of muck is less than 50 inches. These inclusions are typically in the form of a narrow rim around the edge of this soil in depressions. In a few areas in Lake Township the muck is underlain by marl at a depth of 3 to 5 feet.

This soil has moderately rapid to moderately slow permeability and very high available water capacity. Runoff is very slow. The water table is within 6 inches of the surface much of the time unless the soil is drained artificially. Areas in closed depressions are subject to ponding (fig. 2), and areas adjacent to stream valleys are subject to floods. The soil has a very high organic-matter content. Tilth is good. Thickness of the root zone is limited by the water table.

This soil is used mostly as cropland or pasture. It has good potential for crops and poor potential for most engineering uses.

The soil is well suited to crops, but the wetness is a severe limitation. In most areas an effective drainage system must include both subsurface drains and open ditches. The banks of ditches in the organic soil are unstable and subject to sloughing. Subsurface drains are likely to shift out of alignment, and their effectiveness then is reduced. In many areas there is a hazard of damage to drainage installations by floods.

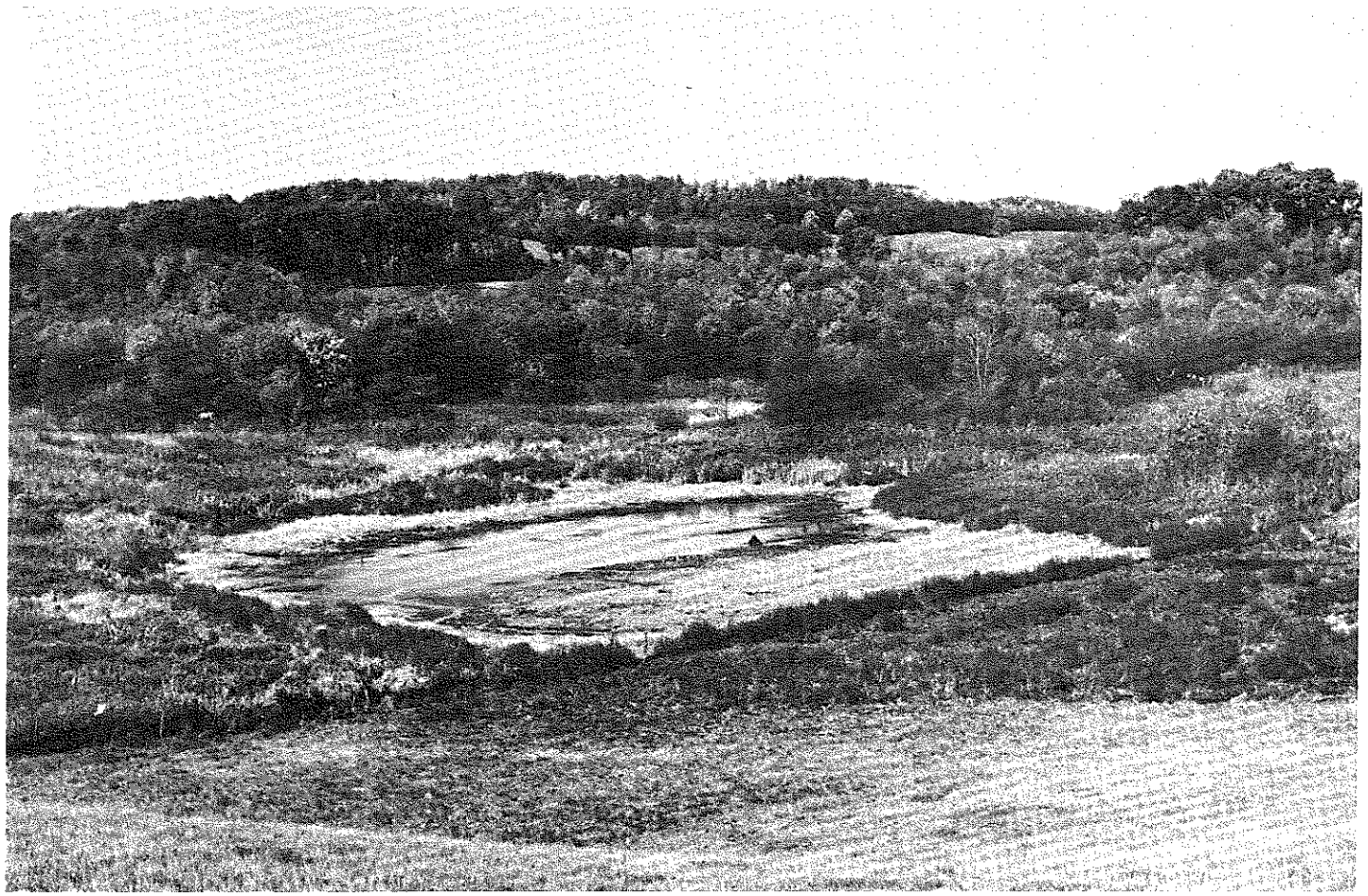

Figure 2.—Carlisle muck in closed depressions has not been adequately drained for cultivation.

This soil is highly productive if it can be adequately drained. Corn, soybeans, potatoes, onions, and celery are among the most suitable crops. Because poor air drainage is common, there is a hazard of frost. This hazard is a major limitation if vegetables are grown. This soil is subject to wind erosion, but blowing generally can be controlled by rye or other cover crops.

Most areas that are not adequately drained are used as pasture. This soil is well suited to grass but is too wet for most legumes. Canarygrass grows well in seeded pastures. Bluegrass 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 the pasture plants.

This soil is poorly suited to use as woodland because of its wetness. Most trees common in the area do not grow well. Areas of this soil that cannot be drained have potential as habitat for wetland wildlife.

The organic materials that make up most of this soil are very weak and unstable for engineering purposes. They are not suitable for use as roadfill, dam fill, or foundation material. There are very few natural pond sites. Excavated ponds are not likely to hold water. Ponds in the flood plains are subject to damage by floods. The extreme natural wetness, unstable material, and hazard of flooding make this soil unsuitable for use as sites for buildings or as a septic tank absorption field.

Capability subclass IIIw; woodland suitability subclass 4w.

CgB—Chili loam, 2 to 6 percent slopes. This is a gently sloping, deep, well drained soil on terraces and outwash plains. Typically, it is high on the terrace and is above short steeper slopes or escarpments. In the larger areas, slopes are short and irregular. Some of the smaller areas slope uniformly in one direction or outward from a central dome. The areas of this soil are irregular in shape and are 5 to 50 acres in size.

Typically, the surface layer is dark brown, friable loam about 10 inches thick. The subsoil is about 44 inches thick. In the upper part it is yellowish brown, firm and friable loam and gravelly loam and in the lower part it is yellowish brown, firm and very friable gravelly loam and

gravelly sandy loam. The substratum, to a depth of about 60 inches, is yellowish brown, loose gravelly loamy sand.

On a few of the higher knolls this soil is eroded. In these places, the surface layer is brown or yellowish brown and has more gravel than the surface layer in nearby less eroded areas. In up to a third of some areas, slopes are less than 2 percent. The water table is at a depth below 6 feet most of the time. In most areas, natural lime is at a depth of more than 5 feet; in some areas, in the Muddy Fork and Lake Fork valleys, limy gravel is at a depth of 3 to 5 feet.

Included in mapping are many small areas of the more gravelly, droughty Conotton soils. Also included are moderately well drained Bogart soils and somewhat poorly drained Jimtown soils in seep spots, flats, and depressions where slopes are commonly short and irregular.

This soil has moderately rapid permeability. Runoff is medium. The available water capacity is low to moderate. The organic-matter content is low, and tilth is good.

Most areas of this soil are used as cropland. The smaller areas are in permanent pasture or woods. This soil has good potential for cultivated crops, hay, pasture, and trees. It also has good potential for most engineering uses.

Erosion is a moderate hazard in cultivated areas. This soil is well suited to no-till or minimum tillage practices. These practices generally are adequate in controlling erosion. The soil is well suited to deep-rooted hay crops such as alfalfa. Adding manure and other organic materials is beneficial to this soil, and adding lime and fertilizer is essential to good yields. This soil tends to be droughty, particularly in periods of dry weather. Natural drainage is adequate for farming. The soil is suitable for irrigation.

The soil is suitable for use as pasture. Natural drainage is adequate to permit grazing early in spring. Grass pastures do not grow well during the dry part of summer. Slopes do not limit intensive pasture management, including seeding and fertilizing.

The soil is suited to use as woodland. Desirable trees common to the area are growing in the few existing woodlots. The soil is well suited to fruit trees and to the production of nursery stock.

This soil is porous and quite loose. It is good foundation material when dry, but it is unstable when wet. It is too porous for dam fill but makes good roadfill. This soil is one of the best potential sources of sand and gravel in the county. Natural pond sites are few, and excavated ponds are not likely to hold water.

The soil has slight limitations for use as sites for buildings either with or without basements. Natural drainage and gentle slopes are favorable for septic tank absorption fields. Nearby ground water supplies may be contaminated if this soil is used for disposal of effluent.

Capability subclass IIe; woodland suitability subclass 2o.

CgC—Chili loam, 6 to 12 percent slopes. This is a moderately sloping, deep, well drained soil on terraces and outwash plains. The larger areas are on the outwash plains where slopes are short and extremely complex. In these areas, round or elongated knolls slope in many directions into closed depressions. These areas are irregular in shape and are 10 to 100 acres in size. Other areas consist of short slopes that separate two terrace levels or a terrace and flood plain. These areas slope in one direction. They are long and narrow and 2 to 20 acres in size. This soil is also on isolated gravelly knolls that are roughly circular in shape and slope outward from the center. These areas are 5 to 20 acres in size.

Typically, the surface layer is dark brown, friable loam about 10 inches thick. The subsoil is about 44 inches thick. In the upper part it is yellowish brown, firm and friable loam and gravelly loam, and in the lower part it is yellowish brown, firm and very friable gravelly loam and gravelly sandy loam. The substratum, to a depth of about 60 inches, is yellowish brown, loose gravelly loamy sand.

In some of the higher and steeper areas, this soil is eroded, and the plow layer is brown or yellowish brown and is as much as 40 percent gravel. In many areas, especially where slopes are short and complex, slopes are outside the 6 to 12 percent range. The water table is at a depth of more than 6 feet most of the time. In most areas natural lime is at a depth of more than 5 feet.

Included in mapping are many small areas of the more gravelly, droughty Conotton soils. These areas are mainly in the Black Fork Valley, especially in the Perrysville area. Also included are small areas of the moderately well drained Bogart soils in seep spots and flats and on the lower part of some slopes and some areas of the somewhat poorly drained Jimtown or Pitchville soils or the poorly drained Sebring soils in closed depressions.

This soil has moderately rapid permeability. Runoff is rapid. The available water capacity is low to moderate. The organic-matter content is low, and tilth is good.

Most areas of this soil are used as cropland or pasture. The soil has good potential for hay, pasture, and trees. It also has good potential for most engineering uses.

If this soil is used for cultivated crops, erosion is a severe hazard. Erosion removes the finer soil particles, leaving gravel-sized particles on the surface. In most areas, slopes are either too short or too irregular to permit contour stripcropping or cross-slope cultivation. This soil is well suited to alfalfa, which is grown extensively. It is well suited to no-till or minimum tillage methods; the use of these methods permits a higher proportion of row crops to be grown. The soil commonly does not provide adequate available water in most years. Additions of organic matter, lime, and fertilizer are essential for good production. Natural drainage on this soil is adequate for farming.

The soil is suitable for use as pasture. Natural drainage is adequate to permit grazing early in spring. Grass

pastures do not grow well during the dry part of the summer. Slopes do not limit intensive pasture management, including seeding and fertilizing.

The soil is suited to use as woodland. It is well suited to most of the trees common to the area and to fruit trees. Air drainage, however, especially in the valleys is not favorable for commercial fruit production.

This soil is good foundation material when dry but is unstable when wet. It is too porous for dam fill but makes good roadfill. Areas of this soil are some of the best potential sources of sand and gravel in the county. Natural pond sites are few, and excavated ponds are not likely to hold water.

The main limitations to the use of this soil as building sites result from the slopes. Natural drainage and porous nature of the soil are favorable. Some leveling is likely to be needed on most sites, but leveling can expose gravelly layers in which it is difficult to establish a lawn. Permeability is adequate for use of this soil as a septic tank absorption field. There is, however, a hazard of downslope seepage of effluent through the porous soil material. Also, ground water can become polluted.

Capability subclass IIIe; woodland suitability subclass 2o.

ChC—Chili-Wooster complex, 6 to 12 percent slopes. This complex consists of moderately sloping, deep, well drained soils on hillsides adjacent to stream valleys and on moraines and kames. These soils are in a pattern so complex that mapping them separately was not practical. The valley-side areas are below steeper hillsides and above terraces. These areas are elongated, and most are 5 to 30 acres in size. They slope uniformly in one direction. The kame and moraine areas are extremely variable. Some consist of an entire knoll, and others consist of only the top of larger hills. These areas are irregular in shape and are 5 to 20 acres in size. Slopes are very complex.

Typically, Chili soils and some closely related well drained loamy soils make up about 50 percent of the mapped areas. These soils formed in outwash. Typically, the surface layer is dark brown, friable loam about 10 inches thick. The subsoil is about 44 inches thick. In the upper part it is friable gravelly loam, and in the lower part it is yellowish brown, friable gravelly sandy loam. The substratum, to a depth of about 60 inches, is loose gravelly sandy loam that is stratified.

Typically, Wooster soils make up about 30 percent of the mapped areas. Wooster soils formed in ice-deposited glacial till. In cultivated areas they have a surface layer that is typically dark brown, friable silt loam about 9 inches thick. The subsoil is about 35 inches thick. In the upper part it is yellowish brown, friable loam, and in the lower part it is yellowish brown, firm loam. The substratum, to a depth of about 60 inches, is yellowish brown, firm loam glacial till.

Oshtemo and Wheeling soils and some soils in wet spots around springs and seep areas make up 20 percent of this complex. Oshtemo soils are more sandy and Wheeling soils more silty than Chili and Wooster soils.

In many cultivated fields there are eroded spots. The plow layer in those places is brown or yellowish brown.

The gravel and stone content of this complex varies horizontally and vertically. In some areas there are irregularly shaped pockets and lenses of clean gravel.

Because this map unit is a mixture of soils, the soil properties are variable and differ within small areas. Permeability is dominantly moderate but ranges from moderately rapid to moderately slow. Runoff is rapid, and the available water capacity is low to moderate. The organic matter content is low, and tilth is good. The water table generally is deeper than 4 feet. The rooting zone is deep, except in the Chili soils where it is restricted by gravelly layers.

Most areas of this complex are cropland or pasture. A few are wooded. The soils have good potential for hay, pasture, and trees. They have fair potential for most engineering uses.

If the soils making up this complex are cultivated, the hazard of erosion is severe. The soils on valley sides where slopes are uniform are well suited to stripcropping, but the soils on most kames and moraines are not suited to this erosion-control practice. This complex is suited to minimum tillage or no-till methods of corn production, which, combined with growing hay crops, help to reduce erosion. In addition to erosion control, adding lime, fertilizer, and organic matter to the soil is essential in maintaining productivity. Natural drainage is adequate for farming.

The soils in this complex are suited to use as pasture. Natural drainage is adequate to permit grazing early in spring without damage to pasture plants. Grass pastures grow moderately well. Slopes do not limit intensive pasture management, and a cultivated crop can be grown occasionally to aid in establishing a seeding.

The soils are suited also to use as woodland. Slopes do not limit intensive management practices for woodland. Competition from grasses and shrubs is severe if new plantings are made in the open. This complex is well suited to fruit trees, but in most areas the soils have poor air drainage, which severely limits their potential for fruit production.

The soils making up this complex differ considerably in gravel content. Soil properties significant in engineering, therefore, can be expected to differ within short distances. The soils generally are good foundation material and are a fair source of dam fill and roadfill. There are few natural sites for ponds. Excavated ponds are not likely to hold water.

Because natural drainage is adequate, this complex is suited to use as sites for buildings. On about 70 percent of the area, permeability is adequate for use of the soils as septic tank absorption fields. On about 30 percent,

slopes are somewhat steep for this use. Effluent lines need to be laid out across the slope to minimize the problem of downslope seepage. Ground water can become poliuted if effluent enters the more gravelly layers below the subsoil.

Capability subclass IIIe; woodland suitability subclass, Chili soils 2o, Wooster soils 1o.

ChD—Chili-Wooster complex, 12 to 18 percent slopes. This is a complex of moderately steep, deep, well drained soils that are on the lower side slopes of major stream valleys and on the side slopes of large kames and morainic hills. In the areas of this complex, the Wooster soils, which formed in glacial till, and the Chili soils, which formed in water-laid glacial outwash, are in such a complex pattern that they cannot be separated at the scale of mapping. The areas on valley sides are long and narrow. The areas on kames and moraines are irregular in shape and have very complex slopes. The areas are mostly 5 to 30 acres in size.

About 50 percent of most mapped areas consists of Chili soils and closely related well drained loamy soils that formed in outwash. A typical cultivated Chili soil in this complex has a surface layer that is dark brown, friable loam 8 inches thick. The subsoil is about 44 inches thick. In the upper part it is yellowish brown, friable gravelly loam. in the lower part it is yellowish brown, friable gravelly sandy loam. The substratum, to a depth of about 60 inches, is loose, friable stratified gravelly sandy loam.

About 30 percent of most mapped areas consists of Wooster soils. A cultivated Wooster soil in this complex typically has a surface layer about 8 inches thick that is dark brown silt loam. The subsoil is about 35 inches thick. In the upper part it is yellowish brown, friable loam, and in the lower part it is yellowish brown, firm loam glacial till.

The remaining 20 percent of the complex consists of small included areas of the sandier Oshtemo soils and the siltier Wheeling soils, and wet soils around seep areas and springs.

Severely eroded spots are in many cultivated fields. In these spots the plow layer is yellowish brown, and it may have as much as 25 percent gravel. The amount of gravel and stones in the soils of this complex is extremely variable from place to place and also vertically within the soils. Spots where there is little or no gravel may be only a few feet from spots where there is a large amount. In some places there are irregularly shaped pockets and lenses of clean gravel. There are cobbles in areas along the Black Fork Valley.

Because this map unit is a mixture of soils, the properties of the soils are variable. They differ within a short distance. Permeability in most places is moderate, but the range is from moderately rapid to moderately slow. Available water capacity is low to moderate. Runoff is rapid. The organic-matter content is low. Tilth is good except in eroded spots.

The depth to the water table generally is more than 4 feet. The root zone is thick, but roots do not penetrate the gravelly layers in the Chili part of the complex.

The soils of this complex are used as cropland and pasture. They have a good potential for hay, pasture, and trees. They have fair potential for some engineering uses.

There is a very severe erosion hazard if areas of this soil complex are cultivated. Eroded spots are in most cultivated fields. Much hay is grown, and the cover has prevented more severe erosion. Maintaining perennial vegetation is the best way to control erosion. Alfalfa grows well. A row crop can be grown occasionally if care is taken to prevent erosion. A few areas have a slope pattern suited to stripcropping, but most do not.

The soils in this complex are well suited to pasture. The good natural drainage permits grazing early in spring with little damage to pasture plants. Grasses do not grow well during the dry part of summer, but seeded pastures that include the deeper rooted alfalfa are productive. Lime and fertilizer are needed to maintain the productivity of seeded pastures. Overgrazing can result in substantial erosion.

The soils are also well suited to trees. Most trees common in the area will grow well. Competition from grasses and shrubs is severe if new plantings of trees are made in open fields.

The soils in this complex have variable amounts of gravel, and for that reason the engineering properties are variable. Much of the soil material is good for foundations and fair for dam fill and roadfill. Pockets or lenses of different soil material may be encountered in all areas of the complex. There are few natural pond sites. Excavated ponds are not likely to hold water.

The good natural drainage of the soils is favorable for their use as sites for buildings, but the moderately steep slope is a limitation. Considerable excavation is needed when a house is constructed, and erosion can be severe if the scalped area is not protected. The soils are too steep to be used as a septic tank absorption field. The effluent is likely to seep downslope through the gravelly layers in and below the subsoil, and it can pollute nearby ground water.

Capability subclass IVe; woodland suitability subclass, Chili part 2r, Wooster part 1r.

ChE—Chili-Wooster complex, 18 to 25 percent slopes. This is a complex of steep, deep, well drained soils that are on the side slopes of major stream valleys and on the side slopes of large kames. In these areas the Wooster soils, which formed in glacial till, and the Chili soils, which formed in water-laid outwash, are in such an intricate pattern that they cannot be shown separately at the scale of mapping. The areas on valley sides are long and narrow. Typically, they lie below less

sloping areas of Wooster or Canfield soils and above areas of Chili or Wheeling soils on terraces. The valley sides typically slope in only one direction. The areas on kames and moraines are irregular in shape and have very complex slopes. Most areas of this complex are 5 to 15 acres in size.

Typically, about 45 percent of most mapped areas consists of Chili and closely related soils that formed in outwash. A typical pastured Chili soil in this complex has a surface layer of very dark brown, friable loam about 2 inches thick. The subsoil, about 38 inches thick, is yellowish brown, friable loam. The substratum, to a depth of about 60 inches, is friable stratified gravelly loam. About 35 percent of most mapped areas consists of Wooster soils. A typical pastured Wooster soil in this complex has a surface layer of friable, very dark brown silt loam about 2 inches thick. The subsurface layer, about 7 inches thick, is friable, yellowish brown silt loam. The subsoil is about 31 inches thick. In the upper part it is yellowish brown, friable loam, and in the lower part it is yellowish brown, firm loam. The substratum, to a depth of about 60 inches, is yellowish brown, firm loam glacial till.

The other 20 percent of this complex consists of wet soils around springs and seep areas and soils that are underlain by shattered or broken rock at a depth of 20 to 40 inches.

In the few areas that are cultivated, the plow layer is brown or yellowish brown silt loam or loam. The depth to solid rock in these soils is more than 5 feet, but shattered or broken rock is at a depth of 4 feet in many small areas. The amount of gravel and stones in the soils of this complex is extremely variable from place to place and also vertically within the soils. Spots where there is little or no gravel may be only a few feet from spots where there is a large amount. In some places there are irregularly shaped pockets and lenses of clean gravel. There are cobbles in areas along the Black Fork Valley.

Because this map unit is a mixture of soils, the properties of the soils are variable; they differ within a short distance. Permeability in most places is moderate, but the range is from moderately rapid to moderately slow. The available water capacity is low to moderate. Runoff is very rapid. The organic-matter content is low. Tilth is fair. The depth to the water table generally is more than 4 feet. The root zone is thick, but in the Chili soil roots do not grow in the gravelly layers.

Most areas of this soil complex are used as pasture. The soils have fair potential for hay, pasture, and trees and fair potential for some engineering uses.

The soils in this complex are too steep to be suitable for use as cropland. The steep slope limits the use of most farm machinery, and there is a very severe erosion hazard if the soils are cultivated. The most practical way to control erosion is to maintain cover of perennial vegetation.

The soils are suitable for use as pasture. The good natural drainage permits grazing early in spring with little damage to the pasture plants. Grasses do not grow well during the dry part of summer. The steep slope limits practices for seeding and fertilizing that are needed to obtain good production of forage. Erosion can be severe if pastures are overgrazed.

The soils are suitable also for use as woodland. Most trees common in the area will grow well. Competition from grasses and shrubs is severe when new plantings of trees are made in open fields.

The soils in this complex have a variable amount of gravel, and for that reason their engineering properties are variable. In most places the soil material is good for foundations and is fair as dam fill and roadfill. There is always a possibility that local pockets or lenses of different soil material will be encountered. There are few natural pond sites. Excavated ponds are not likely to hold water.

In some areas the soils are too steep to be used as sites for buildings and for septic tank absorption fields.

Capability subclass VIe; woodland suitability subclass, Chili part 2r, Wooster part 1r.

CkD—Chili and Conotton gravelly loams, 12 to 18 percent slopes. This map unit consists of moderately steep, deep, well drained soils on terraces. Both the Chili and the Conotton soils are well drained and gravelly. They differ only in the amount of gravel in the subsoil. Most mapped areas of this map unit have some Chili soil and some Conotton soil, but the proportions of the two differ greatly. A few of the areas mapped are all Chili soil, and a few are all Conotton soil. Most of the areas are long and narrow and are on slopes between two terrace levels or between a terrace and a flood plain. Some areas, however, are kames that are roughly circular and that rise above the surrounding landscape. Most of the areas are 5 to 10 acres in size.

Typically, the Chili soil has a surface layer, about 8 inches thick, that is dark brown friable, gravelly loam. The subsoil is about 42 inches thick. In the upper part it is yellowish brown, friable gravelly loam, and in the lower part it is yellowish brown, friable gravelly sand. The substratum, to a depth of about 60 inches, is loose stratified very gravelly sandy loam.

Typically, the Conotton soil has a surface layer, about 6 inches thick, that is dark brown, friable gravelly loam. The subsoil is about 36 inches thick. In the upper part it is brown, yellowish brown, and strong brown gravelly loam, and in the lower part it is yellowish brown very gravelly loam. The substratum, to a depth of about 60 inches, is yellowish brown very gravelly sand.

Many spots in cultivated fields are eroded. There the surface layer is brown or yellowish brown, and it may be as much as 60 percent gravel. In some included areas the surface layer is loam. The areas of these soils in

Black Fork Valley are more cobbly than those elsewhere in the county.

Included in mapping are many areas of Oshtemo soils. They have more sand and less gravel in the surface layer and in the subsoil than the Chili or Conotton soils. Also included are some seep spots and springs; the soil around them is gray and mottled.

The Chili and the Conotton soils have moderately rapid or rapid permeability. They have low or very low available water capacity. Runoff is rapid. Organic-matter content is low. Tilth is fair.

Most areas of this map unit are used as permanent pasture. The soils have good potential for hay, pasture, and trees and fair potential for some engineering uses.

There is a very severe erosion hazard if the soils of this complex are cultivated. Erosion removes the fine particles and leaves the gravel. The most practical way to control erosion is to maintain a cover of perennial vegetation. A cultivated crop can be grown occasionally if care is taken to prevent erosion. Addition of organic matter is especially beneficial in maintaining the productivity of these soils. There is a hazard of drought as well as one of erosion. In most years there are periods when plants do not have enough available water. Natural drainage of these soils is adequate for farming.

The soils are moderately suited to use as pasture. The good natural drainage permits grazing early in spring. Most pasture plants do not grow well during the dry part of summer. Overgrazing of pastures can result in erosion.

These soils are suitable for use as woodland. Most trees common in the area will grow well.

The soils in this map unit are porous. They do not pack well and are poor fill for dams. They are good roadfill, but the slope interferes with excavations. In many of the areas there is gravel that has commercial value. The potential for ponds is very poor because the soils are porous.

The good natural drainage of the soils in this map unit is favorable for building sites. The moderately steep slope, however, is a limitation. The soils have permeability adequate for a septic tank absorption field, but the effluent is likely to seep downslope and pollute nearby ground water.

Capability subclass VIe; woodland suitability subclass, Chili part 2r, Conotton part 3f.

CkE—Chili and Conotton gravelly loams, 18 to 35 percent slopes. This map unit consists of steep and very steep soils on terraces. Both the Chili and the Conotton soils are deep, gravelly, and well drained. They differ only in the amount of gravel in the subsoil. Some of the areas are mostly Conotton soil, some are mostly Chili soil, and some are a mixture of the two. The soils of this map unit are between two terrace levels or between a terrace and a flood plain. They slope mostly in one direction. The areas are long and narrow; few of them are more than 300 feet wide. They range in size from 2 to 20 acres.

Typically, the surface layer of the Chili soil is very dark brown, friable gravelly loam about 3 inches thick. The subsoil is about 47 inches thick. In the upper part it is yellowish brown, friable gravelly loam, and in the lower part it is yellowish brown, friable gravelly sandy loam. The substratum, to a depth of about 60 inches, is loose stratified very gravelly loamy sand.

Typically, the surface layer of the Conotton soil is dark brown, friable gravelly loam about 6 inches thick. The subsoil is about 36 inches thick. In the upper part it is brown, yellowish brown, and strong brown gravelly loam. In the lower part it is yellowish brown very gravelly loam. The substratum, to a depth of about 60 inches, is yellowish brown stratified very gravelly sand.

Included in mapping are a few small areas of Oshtemo soils, which have more sand and less gravel in the subsoil than the Chili or the Conotton soils. Also included are springs and seep areas around which the soil is gray and mottled.

These soils have moderately rapid or rapid permeability. They have low or very low available water capacity. Runoff is rapid. Organic-matter content is low or very low. Tilth is fair.

Most areas of this map unit are used as pasture or woodland. The soils have fair to good potential for pasture or trees and poor potential for most engineering uses.

The soils are poorly suited to use as cropland because of a very severe hazard of erosion and a hazard of drought. Most cultivated areas of these soils are narrow strips across fields that consist mainly of less sloping soils. Such areas are difficult to manage separately. The best way to control erosion is to maintain a cover of vegetation.

These soils are suitable for use as pasture. The good natural drainage permits grazing early in spring, but growth of the plants is slow during the dry part of summer. Overgrazed pastures are likely to erode, and there are many eroded areas in pastures. The very steep slope limits some practices that are desirable for management of pastures.

The soils in this map unit are suitable for use as woodland. Most trees common in the area will grow. The planting of trees on narrow strips of these soils is a good practice for control of erosion.

The soils are porous. They do not pack well, and are poor fill for dams. They are good roadfill, but the steep slope interferes with excavations. Gravel of commercial value is present in many areas. The potential as sites for ponds is very poor because the soils are porous.

The soils of this map unit are too steep to be good sites for buildings. Considerable excavation is needed to make a level spot large enough for a building. These soils are too steep to be used as a septic tank absorption field.

Capability subclass VIIe; woodland suitability subclass, Chili part 2r, Conotton part 3f.

Cr—Condit silt loam. This is a nearly level, deep, poorly drained soil on flats and in depressions on till plains. The areas have slopes of less than 2 percent and are in the lowest positions on the landscape. They range in size from 2 to 100 acres. The small areas are mainly nearly round closed depressions that do not have a surface outlet. The large areas are long and narrow.

Typically, the surface layer is dark grayish brown, friable silt loam about 9 inches thick. The subsoil, about 33 inches thick, is gray or dark gray, mottled, firm silty clay loam. The substratum, to a depth of about 60 inches, is gray and yellowish brown, mottled, firm silty clay loam; it is glacial till.

The depth to natural lime is 40 to 55 inches. In a few areas a silty or a gravelly layer is at a depth below 3 feet. In some places loose soil material that was recently eroded from nearby slopes is on the surface.

Included in mapping are small areas of the dark-colored, very poorly drained Pewamo soils in closed depressions and of the somewhat poorly drained Bennington soils on low knolls. There are some areas where the upper layers of soil to a depth of 1 foot to 2 feet are washed-in material that has less clay than a typical Condit soil. There are also included areas of a soil in which the surface layer is silty clay loam and the subsoil is silty clay.

This Condit soil has slow permeability and moderate available water capacity. Runoff is very slow. The root zone is deep if the soil is artificially drained. Tilth is fair. The water table is within 6 inches of the surface for long periods unless the soil is drained.

This soil is used for crops, pasture, and trees. It has fair to poor potential for crops, hay, pasture, or trees and poor potential for many engineering uses.

Wetness is a severe limitation where crops are grown. Artificial drainage is needed for the growth of most crops. Both surface and subsurface drains are needed in many areas. Subsurface drains are effective if properly installed. Suitable outlets are not available in many areas, especially in the closed depressions. Some of the areas can be used to advantage as grassed waterways. Very few areas of this soil now have adequate drainage. If drained, the soil is moderately productive. Tilth is generally poor unless tillage is done at the right moisture content.

Many of the larger areas of this soil are used as permanent pasture. Drainage is needed to obtain the best growth, but few of the pastured areas are adequately drained. Grazing early in spring can damage the pasture plants severely. Pastures make good growth during the dry part of summer. Some deep-rooted plants do not grow well because of the wetness.

Only a few kinds of trees will grow well on this wet soil. Few new plantings of trees are being made.

Wetness is a severe limitation to the use of this soil as sites for buildings. Few areas are drained adequately to control the wetness. Wetness and the slow or moderately slow permeability are severe limitations to the use of this soil as a septic tank absorption field.

Capability subclass IIIw; woodland suitability group 2w.

CtD—Conotton Variant, gravelly loam, 10 to 20 percent slopes. This is a deep, moderately sloping, well drained soil on kames. The kames are rounded hills that have extremely complex and irregular shape. Most of the areas include several kames, and the surface slopes in many directions. Some of the areas include closed depressions. Most areas are irregular in shape and are 5 to 40 acres in size.

Typically, the surface layer is dark brown, friable gravelly loam about 6 inches thick. The subsoil is about 36 inches thick. It is brown, strong brown, and yellowish brown, friable, very friable, and loose gravelly loam and very gravelly loam. It is made up of several thin layers that differ slightly in color, texture, and amount of gravel. The substratum, to a depth of about 60 inches, is yellowish brown, loose stratified sandy loam and loam.

The color of the surface layer ranges from dark grayish brown in uneroded spots to yellowish brown in spots that are moderately to severely eroded. Areas of this soil have a high proportion of inclusions that have slopes outside the range of 10 to 20 percent; the slopes are too complex to be mapped in detail. Gravel and cobbles make up 15 to 50 percent of the plow layer and are most abundant in the eroded spots. The size and the amount of the gravel and cobbles vary vertically within the soil and also from place to place. There are some pockets of loose sand that is almost free from gravel.

Included in mapping are small areas of the wetter Sebring, Fitchville, and Luray soils in small closed depressions. These areas are 1 to 3 acres in size.

This soil has moderately rapid permeability. The available water capacity is low. Runoff is rapid. The organic-matter content is low. Tilth is fair.

Most areas of this soil are used as cropland or improved pasture. Alfalfa hay is a major crop. This soil has good potential for hay, pasture, or trees and good potential for some engineering uses. There is a very severe erosion hazard when this soil is cultivated. Erosion removes the finer particles and leaves a more gravelly plow layer. Slopes commonly are too complex to permit contour stripcropping. Maintaining permanent vegetation is the best way to control erosion. No-till or minimum tillage methods are suitable when corn is grown. Adding organic matter helps restore the productivity of eroded spots. Shallow-rooted crops such as small grains commonly do not get enough available water during dry periods. In general, however, the hazard of drought is less severe on this soil than on the typical Conotton soils. Natural drainage is adequate for farming except in the

included closed depressions. Some of the wet inclusions in depressions are very difficult to drain.

The soil is suitable for use as pasture. The good natural drainage permits grazing early in spring. Grass does not grow well during the dry part of summer. This soil is not used extensively as woodlots. Most trees common in the area will grow, but trees do not grow so well as on other soils that have a higher available water capacity.

This soil is porous and does not compact well. It makes very poor dam fill but good roadfill. It is good for foundations when dry but is unstable when wet. In some of the areas there are deposits of sand and gravel that have commercial value. Because of the sand and gravel, there is little chance of constructing a pond that will hold water.

This soil has good natural drainage and is favorable for use as sites for buildings. The good natural drainage and moderately rapid permeability are favorable for the operation of a septic tank absorption field. There is a hazard, however, of downslope seepage of effluent and contamination of ground water.

Capability subclass IVe; woodland suitability subclass 3f.

CvB—Coshocton loam, 2 to 6 percent slopes. This is a gently sloping, moderately deep, moderately well drained soil on unglaciated hilltops. It is high in the landscape; only the Schaffenaker and the Rigley soils are higher. It lies above steeper Lordstown soils. The areas are variable in shape and are 5 to 20 acres in size.

Typically, the surface layer is dark brown, friable loam about 9 inches thick. The subsoil is about 28 inches thick. In the upper part it is yellowish brown, friable sandy loam; in the middle part it is yellowish brown, mottled, firm sandy clay loam; and in the lower part it is brownish yellow, mottled, very firm clay loam. The substratum is variegated gray and brown very shaly silty clay loam, and there is hard siltstone or shale bedrock at a depth of about 45 inches.

In some places this soil is eroded, and there the plow layer is brown or yellowish brown. In other places the soil in the upper 18 inches is variable in texture because the present rock was stratified. In places immediately below areas of the Schaffenaker or the Rigley soils, the surface layer typically is sandy loam. In most other places the surface layer is loam or silt loam. About 5 to 15 percent of most mapped areas consists of a soil that has somewhat poor natural drainage. This somewhat poorly drained soil, in low or concave parts of the landscape, is mottled just below the surface layer.

This Coshocton soil has moderately slow or slow permeability and low to moderate available water capacity. Runoff is medium. The water table is at a depth of 24 to 36 inches in the wettest time of year. The organic-matter content is low. Tilth is fair.

Most areas of this soil are used as woodland or pasture. This soil has good potential for hay, pasture, and trees. It has fair potential for some engineering uses.

This soil can be used as cropland if it is managed to control erosion, is limed heavily to correct the natural acidity, and is fertilized. The hazard of erosion is moderate when the soil is cultivated. In eroded areas tilth is very poor. The supply of available water is not adequate during dry periods. Natural drainage is adequate for farming except in the wet inclusions.

This soil is suited to pasture. Pastures can be grazed early, and the plants grow fairly well during dry periods. Lime and fertilizer are needed to obtain good yields of forage. This soil is suitable for use as woodland. Most of the trees common in the area will grow.

The soil material above the shale packs rather well. It is good material for foundations and good fill for dams. In places where the subsoil is silty clay, the material is not so well suited to these uses as in other areas. This soil is too clayey to make good roadfill. There are few good pond sites. Excavated ponds are likely to hold water, but most areas commonly are well above the spring line and do not have an adequate drainage basin.

Because of low strength, this soil has severe limitations for use as sites for buildings. Occasionally the water table is high for a while late in winter or early in spring. The substratum of shale typically is soft enough to be excavated for basements. Water seeping along the top of the shale, however, can be a hazard in building foundations. Adequate drains can be installed to intercept the water.

The permeability of this soil is slower than that needed for a septic tank absorption field. Effluent is likely to seep downhill along the top of the shale and come to the surface in nearby places.

Capability subclass IIe; woodland suitability subclass 2o.

CvC—Coshocton loam, 6 to 15 percent slopes. This is a moderately sloping, deep, moderately well drained soil on unglaciated hilltops and hillsides. Many areas are in the highest position of the landscape, but others are below sandstone ridges. Some areas slope in only one direction; others slope downward from a central dome. The areas are irregular in shape and are 2 to 20 acres in size.

Typically, the surface layer is dark brown, friable loam about 9 inches thick. The subsoil is about 28 inches thick. In the upper part it is yellowish brown, friable sandy loam; in the middle part it is yellowish brown, mottled, firm sandy clay loam; and in the lower part it is brownish yellow, mottled, very firm clay loam. The substratum is variegated gray and brown very shaly silty clay loam over hard siltstone or shale bedrock at a depth of about 45 inches. In places the surface layer is silt loam. In others the upper 18 inches of soil is variable in texture because the parent rock was stratified.

Included with this soil in mapping are areas where the natural drainage is somewhat poor. These are in low, concave seep areas, and they make up 5 to 10 percent of the map unit. Also included are small areas in which the surface layer is sandy loam and some eroded spots in which the surface layer is clay loam or silty clay loam.

This soil has moderately slow or slow permeability and low or moderate available water capacity. Runoff is rapid. The organic-matter content is low. Tilth is fair to poor. The water table is at a depth of 24 to 36 inches during the wettest time of year.

Most areas of this soil are used as woodland or pasture. Many areas were used for crops and became eroded. This soil has good potential for hay, pasture, and trees. It has fair potential for some engineering uses.

This soil has some potential for use as cropland if erosion is controlled. Natural drainage is generally adequate for farming. The hazard of erosion is severe if the soil is cultivated. Erosion removes the friable surface soil. Then part of the subsoil, which has higher clay content, is very acid, and has very low organic-matter content, is mixed into the plow layer.

This soil is suitable for use as pasture. Pastures can be grazed early in spring, but they do not produce well during dry periods. The root zone is acid, and adequate liming is needed for good growth of desirable pasture plants. This soil is suited to trees. Most of the trees common in the area will grow.

The soil material above the shale packs rather well. It is good material for foundations and good fill for dams. In places where the subsoil is silty clay, the material is not so well suited to these uses as in other areas. This soil is too clayey to be good for roadfill. There are few natural pond sites. Excavated ponds are likely to hold water, but most of the possible sites are above the spring line and do not have adequate drainage basins.

This soil has severe limitations for use as sites for buildings because of slope and low strength. Water seeps along the top of the shale during wet periods and is a hazard in building foundations. Adequate drains are needed to intercept the water. Permeability is considerably less than that needed for a septic tank absorption field. Downslope seepage of effluent is a potential hazard.

Capability subclass IIIe; woodland suitability subclass 2o.

EIB2—Ellsworth silt loam, 2 to 6 percent slopes, eroded. This is a gently sloping, deep, moderately well drained soil on moraines. It is high on the landscape. In most areas the surface slopes outward from a central dome or a ridge. In many areas the slope is not more than 4 percent. The areas are variable in shape and are 2 to 40 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 7 inches thick and has a few chunks of yellowish brown, firm silty clay loam that formerly was in the upper part of the subsoil. The subsoil is about 25 inches thick. In the upper part it is dark yellowish brown and yellowish brown, mottled, firm silty clay loam; in the lower part it is yellowish brown, mottled, firm clay loam. The substratum, to a depth of about 60 inches, is yellowish brown, mottled, firm clay loam glacial till.

In cultivated fields, the surface layer is dark grayish brown in uneroded spots and brown in the most eroded spots. The degree of erosion differs within a short distance, and the color of the surface soil is variable in most areas. In most places the degree of erosion is moderate, and the plow layer is a mixture of the surface soil and former subsoil. In some severely eroded spots, most of which are on the higher and steeper places, the surface layer consists mostly of former subsoil.

Included in mapping are small areas of the somewhat poorly drained Mahoning soils in low or concave areas and around the base of knolls and hills. These wet inclusions make up as much as 20 percent of some of the mapped areas but are not in all areas.

This soil has slow permeability and moderate available water capacity. Runoff is medium. The water table is at a depth of 24 to 36 inches in the wettest time of year. The soil has a low organic-matter content. Tilth is fair.

Most areas of this soil are used as cropland or pasture. The soil has fair potential for crops, hay, pasture, and trees. The main cultivated crops are corn and soybeans. The potential is poor for most engineering uses.

The hazard of erosion is severe where this soil is cultivated. Erosion worsens tilth. Some of the larger areas are suitable for contour stripcropping. Mulches, cultivation on the contour, and growing hay crops are other methods for control of erosion.

Some artificial drainage is needed in most areas of this soil to obtain good yields of grain. Subsurface drains do not work well because of the slow permeability of the subsoil. Surface drains are needed in some of the wetter inclusions, especially if the surface is undulating. Heavy applications of manure and of other organic material are helpful in maintaining productivity.

This soil is suited to pasture. Many legumes and grasses grow well. Pastures can be grazed early in spring, and growth is moderate during the dry part of summer. The slope does not limit practices for intensive pasture management, and a cultivated crop can be grown occasionally to aid in establishing a new seeding and to control weeds. This soil is suitable for use as woodland. Trees that tolerate wetness will grow best.

This soil is firm and compact. It makes good foundation material and good fill for dams, but it has too much clay to be good roadfill. There are few natural pond sites. Excavated ponds are very likely to hold water.

This soil is limited for use as sites for buildings because of low strength. Houses that have basements need adequate drains around the foundation. The limitations of this soil for use as sites for buildings are less severe than those of most other nearby soils.

The permeability of this soil is much slower than that needed for a septic tank absorption field. The high water table in winter and spring also interferes with the disposal of effluent.

Capability subclass IIIe; woodland suitability subclass 3o.

E1C2—Ellsworth silt loam, 6 to 12 percent slopes, eroded. This is a sloping, deep, moderately well drained soil on the side slopes of small natural drainage courses that begin on moraines. The bottoms of these drainage courses are too narrow to be shown on the soil map, and both side slopes are included in the same mapped area of this soil. Where the drainage courses are close together, the side slopes of several drainage courses are in the same mapped area. Most areas of this soil are elongated and are 2 to 20 acres in size.

Typically, the surface layer is dark brown friable silt loam about 7 inches thick and has a few chunks of yellowish brown firm silty clay loam from the upper part of the subsoil. The subsoil is about 25 inches thick. In the upper part it is dark yellowish brown and yellowish brown mottled firm silty clay loam, and in the lower part it is yellowish brown mottled firm clay loam. The substratum, to a depth of about 60 inches, is firm yellowish brown clay loam glacial till.

In cultivated areas the plow layer is dark grayish brown in uneroded spots and yellowish brown in severely eroded spots. The degree of erosion differs within a short distance, and color of the surface is variable in most plowed fields. The dominant degree of erosion is moderate, and the most common surface layer has both surface soil and part of the former subsoil. Severely eroded spots, in which the surface layer is mostly part of the former subsoil, are in the higher and more sloping parts of many fields. Slightly eroded areas are in concave parts of the landscape.

Included in mapping are small areas of the somewhat poorly drained Mahoning soils on the lower and more concave parts of some slopes. The bottoms of some small natural drainageways are included. The soils in these drainageways are variable, but in general they are wetter than the Ellsworth soil. Some of these wet soils have a surface layer of loose material that was washed from nearby sloping soils.

This soil has slow permeability and moderate available water capacity. Runoff is rapid. The water table is at a depth of 24 to 36 inches in the wettest time of year, and it is shallowest in the most severely eroded areas. The organic-matter content is low. Tilth is fair to poor.

Most areas of this soil are used as cropland or as pasture. The soil has good potential for hay, pasture, and trees. It has poor potential for many engineering uses.

The hazard of erosion is very severe if this soil is used for cultivated crops. Some erosion can be expected every time the soil is plowed. Erosion worsens tilth by removing friable surface soil. As the natural surface soil is removed, plowing turns up increasing amounts of the clayey subsoil, and poor tilth is a result. Erosion has already been significant in most cultivated fields. Practices to control further erosion are cultivating on the contour, growing a cover crop or applying mulch, and including hay in the cropping system.

Excessive wetness of this soil is a limitation that affects adversely the growing of most grain crops. Closed drains are only moderately effective, and few of the farmed areas are managed to control wetness adequately. Adding manure and other organic residues is helpful in maintaining productivity and in restoring the productivity of severely eroded areas.

This soil is suitable for use as pasture. Many legumes and grasses will grow. Pastures can be grazed early in spring, and growth is fairly good during the dry part of summer. The slope does not limit intensive management of pastures, and a cultivated crop can be grown occasionally to aid in establishing a new seeding and controlling weeds. Seeding to permanent pasture is a good way to control erosion.

This soil is suitable for use as woodland. Most trees common in the area will grow, but growth is slow.

This soil is firm and compact. It makes good foundation material and good fill for dams, but it has too much clay to be good roadfill. There are some good natural pond sites in places where this soil is on both sides of a small draw. Excavated ponds are very likely to hold water.

This soil has limitations for use as homesites because of its slope and low strength. Adequate drains are needed around foundations. Diversions are needed in some places to keep surface water away from building sites. The risk of erosion during construction is a major problem. Scalped areas need to be reseeded immediately. Establishment of a new seeding is likely to be difficult if the clayey subsoil is exposed. Control of sediment is needed if a subdivision or other major project is built.

The permeability of this soil is less than that needed for a septic tank absorption field. The high water table in winter and spring also interferes with disposal of effluent. The slope is a limitation.

Capability subclass IVe; woodland suitability subclass 3o.

E1E2—Ellsworth silt loam, 12 to 25 percent slopes, eroded. This is a moderately steep to steep, deep, moderately well drained soil on the side slopes of narrow valleys that are cut into moraines. Most of the areas are narrow and elongated and are 2 to 5 acres in size.

Typically, the surface layer is dark grayish brown or dark brown, friable silt loam about 1 inch thick. The subsurface layer, about 7 inches thick, is yellowish brown, firm silt loam or silty clay loam. The subsoil is about 20 inches thick. In the upper part it is yellowish brown, firm silty clay loam, and in the lower part it is

yellowish brown, mottled, firm clay loam. The substratum, to a depth of about 60 inches, is yellowish brown, firm clay loam glacial till.

Some areas of this soil have been plowed, and the plow layer is 6 to 8 inches of dark yellowish brown silt loam or silty clay loam. Even the pastured and wooded areas of this soil are eroded to some degree, and the color of the surface layer is variable. The depth to rock is typically more than 5 feet, but in a few areas next to Buck Creek the depth to shale is 4 to 6 feet. A few nearly vertical banks and a few areas that have slope as steep as 35 percent are included in mapping. Also included are some seep spots and areas around springs, and in these places the soil is grayer and more mottled than the typical Ellsworth soil. Loose soil material eroded from higher areas is at the base of some of the slopes.

This soil has slow permeability and low or moderate available water capacity. Runoff is very rapid. The water table is at a depth of 24 to 36 inches for brief periods late in winter and early in spring. The organic-matter content is low. Tilth is fair to poor. This soil is very erodible.

This soil is poorly suited to cultivated crops because of the steep slope and very severe hazard of erosion. It is suitable for use as pasture, and most areas are used as pasture or woodland. Pastures can be grazed early in spring. Grass does not grow well during the dry part of summer. The slope limits somewhat the seeding and fertilizing practices that are needed for good management of pastures. Severe erosion is likely to occur if pastures are overgrazed.

This soil has good potential for trees. Most trees common in the area will grow, but the growth is slow.

This soil has poor potential for most engineering uses. The material is firm and compact, and it makes good foundation material and good fill for dams. It has too much clay to be good roadfill. The slope limits excavation, and cut banks erode rapidly. There are no natural pond sites. Because the areas of this soil are too steep and narrow the soil is not suitable for use as sites for buildings. The hazard of erosion is very severe if streets or driveways are built. This soil is too steep and too slowly permeable for a septic tank absorption field.

Capability subclass VIe; woodland suitability subclass 3r.

FcA—Fitchville silt loam, 1 to 4 percent slopes. This is a deep, nearly level or gently sloping, somewhat poorly drained soil on low knolls, upland flats and depressions, and low parts of stream terraces. The areas are irregular in shape, and most of them are 2 to 15 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 6 inches thick. The subsoil is about 40 inches thick. In the upper part it is yellowish brown, mottled, firm silt loam and silty clay loam, and in the lower part it is yellowish brown, mottled, firm silt loam and silty clay loam. The substratum, to a depth of about 60 inches, is a mixture of grayish brown and yellowish brown friable silt loam.

Included in mapping are a few areas in northwestern Ruggles Township and in the vicinity of Mapleton High School where the subsoil is silty clay. Also included are small areas of the poorly drained Sebring soil. The poorly drained inclusions are typically in the lowest and flattest parts of the landscape. Other inclusions are some small knolls that have a slope of more than 4 percent.

This soil has moderately slow permeability and high available water capacity. Runoff is slow or medium. The root zone is deep. Tilth is good. The natural water table is at a depth of 6 to 18 inches in the wettest time of year. Subsurface drains work well if adequate outlets are available.

This soil is used mostly as cropland. It has good potential for crops, hay, pasture, and trees. Wetness is a moderate limitation. There is also a moderate hazard of erosion on the higher knolls. Cultivated crops can be grown year after year. Maintaining lime and fertility is the major management need after drainage is established. Some of the lowest areas are subject to floods.

The soil is well suited to use as pasture. Maximum production of forage requires adequate drainage. Early grazing when the soil is wet can damage pasture plants. Pasture plants on this soil make fairly good growth during the dry part of the summer. This soil is suitable for use as woodland. The wooded areas are undrained, and trees that tolerate wetness will grow.

This soil has fair potential for most engineering uses. The particles are mostly silt sized. The silty material does not compact well, and it is unstable when wet. Because the soil is naturally wet much of the time, it is poor material for foundations. This is one of the few soils in the county in which foundations are likely to be unstable. Because the material is unstable, it is poor as roadfill and as fill for dams. The frost action is severe and is a problem in maintaining roads and streets.

The natural wetness of this soil makes it poorly suited to use as sites for buildings. Adequate surface and subsurface drains around foundations can help reduce the wetness. The wetness is less severe on the knolls. Permeability is borderline for use of this soil as a septic tank absorption field, and wetness is a severe limitation for such use.

Capability subclass IIw; woodland suitability subclass 2o.

GfA—Glenford silt loam, 0 to 2 percent slopes. This is a nearly level, deep, moderately well drained soil on terraces. Typically, it lies below well drained gravelly soils and above flood plains. Most areas are irregularly shaped and are 2 to 10 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 8 inches thick. The subsoil is about 32

inches thick. In the upper part it is yellowish brown, friable and firm silty clay loam or silt loam, and in the lower part it is yellowish brown, mottled, firm and friable silt loam and silty clay loam. The substratum, to a depth of about 60 inches, is yellowish brown, mottled, very friable stratified silt loam and fine sandy loam.

Included in mapping are small areas of the somewhat poorly drained Fitchville soils in low spots.

This soil has moderately slow permeability and high available water capacity. Runoff is slow. The organic-matter content is moderate. Tilth is good. The water table is at a depth of 24 to 36 inches during the wettest time of year. Most of the periods of excessive wetness do not occur during the growing season.

Most areas of this soil are used as cropland. The soil has few limitations and is very well suited to crops. All the common crops grow well. Maintaining fertility and the content of lime and organic matter is the main management need. This soil also has good potential for hay, pasture, and trees. It has fair to good potential for most engineering uses.

Most pastured areas of this soil are in rotation pastures and are used for cultivated crops part of the time. The soil is well suited to all the common pasture plants. Pastures can be grazed in early spring, and they maintain good growth through the dry part of summer.

Few areas of this soil are wooded. Most of the trees common in the area will grow well. Competition from weeds and grasses is severe in a new planting of trees.

This soil has a high content of silt and as a result has poor compaction characteristics. It is a poor source of roadfill or fill for dams. It is one of the few soils in the county on which foundations are likely to be unstable. Excavated ponds are likely to have excess seepage. Sides of ditches and other cut surfaces are subject to severe erosion.

Seasonal wetness is a moderate to severe limitation for use of this soil as sites for buildings. Frost action is very great when the soil is wet, and some damage to foundation walls can be expected unless adequate subsurface drains are installed. Permeability is somewhat slower than that needed on a site for a septic tank absorption field.

Capability class I; woodland suitability subclass 1o.

GfB—Glenford silt loam, 2 to 6 percent slopes. This is a gently sloping, deep, moderately well drained soil in a variety of positions on the landscape. It occupies low knolls and elongated terraces; footslopes below steep bedrock hills; and elongated draws and closed depressions in rolling moraines. The areas differ considerably in shape. Most of them are 2 to 10 acres in size. Some areas slope in only one direction, some include the two facing side slopes of a small drainageway, and some slope outward from a central knoll. Most of the slopes are short.

Typically, the surface layer is dark brown, friable silt loam about 8 inches thick. The subsoil is about 32 inches thick. In the upper part it is yellowish brown, friable and firm silty clay loam or silt loam, and in the lower part it is yellowish brown, mottled, firm and friable silt loam and silty clay loam. The substratum, to a depth of about 60 inches, is yellowish brown, mottled, very friable stratified silt loam and fine sandy loam.

A few spots are eroded, and there the surface layer is brown or yellowish brown. In some included areas the soil is underlain by sand, gravel, glacial till, or broken rock below a depth of 4 feet. Some areas in southern Hanover Township have more pebbles and also have a denser subsoil than the typical soil. Also included in mapping are small areas of the wetter Fitchville and Sebring soils. These wet soils are in low spots, depressions, and minor natural drainageways.

This soil has moderately slow permeability and high available water capacity. Runoff is medium. The organic-matter content is moderate. Tilth is good. The water table is at a depth of 24 to 36 inches during the wettest time of year. Most of the periods of excessive wetness do not occur during the growing season.

Because this soil is in several positions and the areas are small, its use is varied. Many of the areas are used as cropland, but there is significant acreage in pasture, woodland, and nonfarming uses. This soil has good potential for crops, hay, pasture, and trees. It has fair to poor potential for some engineering uses.

If properly managed, this soil is well suited to all crops common in the area. The hazard of erosion is moderate where the soil is cultivated. This hazard is most severe in the elongated areas that receive surface water from adjacent higher soils. The soil material is loose, and a small volume of flowing water can form a gully. Many of these elongated areas are natural places of grass waterways. The most practical methods of control of erosion in most areas are cultivation on the contour, use of mulches, and minimum tillage. Natural drainage of the soil is generally adequate for farming, but randomly spaced tile lines help in draining the wetter inclusions and the seep areas. A good liming and fertilizing program helps obtain good yields of crops.

This soil is well suited to all the common pasture plants. Pastures can be grazed fairly early in spring, and the plants grow well during the dry part of summer. The gentle slope permits intensive practices for pasture management.

Most trees common in the area will grow well. Strong competition from grasses and shrubs can be expected if plantings of trees are made in open fields.

Because this soil has a high content of silt, it has poor compaction characteristics. It is a poor source of roadfill or of fill for dams. It is one of the few soils in the county on which foundations are likely to be unstable. Cuts made for ditches, roads, and basements are unstable

when wet. Excavated ponds are likely to have excessive seepage.

Seasonal wetness is a moderate to severe limitation for use of this soil as sites for buildings. Frost action is very high when the soil is wet, and some damage to foundation walls by freezing is likely unless adequate subsurface drains are installed. Considerable erosion is likely if areas are left bare during construction. Permeability is less than that needed for a septic tank absorption field. Permeability of this soil generally increases with depth.

Capability subclass IIe; woodland suitability subclass 1o.

GfC—Glenford silt loam, 6 to 12 percent slopes. This is a sloping, deep, moderately well drained soil that is mostly on colluvial footslopes. Typically, it lies below steep bedrock hills and above terraces and narrow flood plains. Most of the areas are long and narrow and are 2 to 20 acres in size. The slope is dominantly in one direction.

Typically, the surface layer is brown, friable silt loam about 7 inches thick. The subsoil is about 32 inches thick. In the upper part it is brown, friable and firm silt loam. In the lower part it is yellowish brown, mottled, firm silt loam. The substratum, to a depth of about 60 inches, is yellowish brown, very friable loam.

In a few areas along Charles Mill Lake and in the Lake Fork Valley, the soil is more clayey and less acid than the typical Glenford soil. Included in mapping are many small wet spots, springs, and minor natural drainageways around which the soil is grayer and more mottled than typical. In a few included areas, there is shattered rock at a depth of 4 feet or more.

This soil has moderately slow permeability and moderate to high available water capacity. Runoff is rapid. In parts of the larger areas in Hanover Township, there is in the lower part of the subsoil a layer dense enough to interfere with growth of roots and movement of water. The content of organic matter is low or moderate. Tilth is fair. The water table is at a depth of 24 to 36 inches in the wettest time of year.

Most of the large areas of this soil, in the southern part of Hanover Township, have been farmed, but only a few are now cultivated. The small areas farther north are used as cropland, pasture, or woodland. This soil has good potential for hay, pasture, and trees. It has fair potential for most engineering uses.

There is a severe erosion hazard if this soil is farmed. Erosion worsens tilth. This soil is suited to crops if it is managed to control erosion. Most of the cultivated areas are small parts of fields that consist mostly of less sloping soils. Such areas are not likely to be managed to control erosion adequately. The most practical erosion-control practices are contour cultivation, minimum tillage, and mulching. A few of the larger areas are suited to contour stripcropping. Natural drainage is generally adequate for farming.

The soil is well suited to all the common pasture plants. Pastures can be grazed early in spring, and pasture grasses grow well during the dry part of summer. The slope does not limit intensive management of pastures. Erosion can be a hazard if a pasture is overgrazed.

This soil is well suited to use as woodland. Most of the woodlots have young trees and are maintaining themselves. Most of the trees common to the area grow well. Strong competition from grass and weeds can be expected if a new planting of trees is made in an open field.

In areas in Hanover Township, this soil is firm and compact; it is fair to good as fill for dams and as material for foundations. In areas farther north, this soil has a high content of silt; it therefore has poor compaction characteristics and makes poor material for foundations or for dams. In all areas this soil has too much clay to be used as roadfill. The potential as a site for ponds is extremely variable.

Seasonal wetness is a moderate to severe limitation to the use of this soil as sites for buildings. The hazard of wetness can be partly avoided by building on the high places and by choosing spots that do not receive surface water from adjacent hillsides. Any excavation for a building or a utility line produces a hazard of erosion. Immediate reseeding of scalped areas is needed to control erosion. The permeability of this soil is slower than that needed for a septic tank absorption field.

Capability subclass IIIe; woodland suitability subclass 1o.

Ho—Holly silt loam. This is a nearly level, deep, poorly drained soil on flood plains. Typically, it is on the lowest part of a flood plain, away from the stream channel. On a wide flood plain it is in the areas that are flooded most often for the longest periods. In a narrow valley it is in areas where the soil is kept wet by springs much of the time, even when the stream is not flooding. The slope is less than 2 percent. Most of the areas are elongated and are 5 to 100 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 10 inches thick. The subsoil is about 22 inches thick. In the upper part it is dark gray, mottled, friable silt loam; in the middle part it is dark gray, mottled, firm silty clay loam; and in the lower part it is dark gray, mottled, firm silt loam. The substratum, to a depth of about 60 inches, is gray, mottled, friable and firm, stratified silt loam.

The material making up this soil is variable; there are variations within small areas in thickness, color, and texture of the different layers. Very thin layers of gravel are below the subsoil in some areas.

Included in mapping are areas that have a surface layer of silty clay loam and a subsoil of silty clay. Some

of these areas around England Station are large. Tilth in these areas is very poor. Other inclusions are small areas of Killbuck soils, which have a thick, dark, buried layer. Small areas of the somewhat poorly drained Shoals soils are also included; they are on low knolls and narrow natural levees.

This soil has moderate or moderately slow permeability and high available water capacity. Runoff is very slow. The natural water table is within 6 inches of the surface for long periods. Most areas are subject to flooding, and many remain ponded for a long time after the flood water recedes. This soil has a moderate organic-matter content. Tilth is fair except in the included areas of silty clay.

The use of this soil depends on the degree to which it is drained and on the size and location of the areas. This soil is used as cropland, pasture, woodland, or freshwater marsh. It has good potential for pasture and poor potential for most engineering uses.

This soil has a severe hazard of wetness that must be overcome before it can be used as cropland. A system of subsurface drains and open ditches is needed to drain most areas adequately. Few areas are drained or protected from flooding to the extent that they are well suited to alfalfa or winter grain. Some of the areas are drained well enough to produce fair to good yields of corn and soybeans.

Areas that cannot be drained adequately or are not accessible for use as cropland are well suited to grass pasture. Bluegrass and canarygrass grow rather well during the dry part of summer. Grazing early in spring when the soil is soft and muddy can damage pasture plants.

The soil is not well suited to trees. Trees in the woodlots are mainly willow, elm, and sycamore. Trees that tolerate wetness will grow best.

Areas that cannot be drained adequately for cropland or pasture are suitable for use as a habitat for wetland wildlife. Some fairly large areas in the Lake Fork and Jerome Fork valleys have vegetation of marsh grass and are a very good habitat for wetland wildlife.

In general, this soil does not pack well enough to be good foundation material or good fill for dams, and it is too clayey to be used as roadfill. There are some natural pond sites, especially in spring-fed areas in the smaller valleys. Excavated ponds differ widely in their ability to hold water. Ponds constructed on this soil are subject to damage by floods.

The hazard of flooding and the extreme natural wetness of this soil make the soil very poorly suited to use as sites for buildings or as a septic tank absorption field.

Capability subclass IIIw; woodland suitability subclass 2w.

JwA—Jimtown silt loam, 0 to 2 percent slopes. This is a deep, nearly level, somewhat poorly drained soil on terraces and outwash plains. Typically, it lies below moraines or till plains and above stream bottoms. Most areas are irregular in shape and are 5 to 15 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 37 inches thick. In the upper part it is grayish brown, mottled, friable silt loam; in the middle part it is yellowish brown, mottled, firm clay loam; and in the lower part it is yellowish brown, mottled, friable loam. The substratum, to a depth of about 60 inches, is yellowish brown and grayish brown, mottled, friable stratified sandy loam, loam, and fine sandy loam.

The surface layer in some cultivated areas is nearly black. The amount of gravel in this soil is extremely variable within a short distance. In the northern part of the county most of the gravel consists of rounded pebbles, but in the southern part much of it consists of angular pebbles. There are many thin lenses and irregularly shaped pockets of sand and gravel in the lower part of the soil, and there is much local variation. Included in mapping are small areas of poorly drained soils in which the subsoil is grayer. These areas are in shallow depressions.

This soil has moderate permeability in the subsoil. Permeability below the subsoil is extremely variable because of the variable soil material. Available water capacity is moderate. Runoff is slow. The root zone is thick after the soil is drained. The soil has moderate or high organic-matter content. Tilth is good. The water table is at a depth of 6 to 18 inches in the wettest time of year.

The larger areas of this soil are used as cropland. The smaller areas are used as cropland, pasture, or woodland. This soil has good potential for crops, hay, pasture, and trees. It has poor potential for some engineering uses.

The wetness is a moderate hazard if this soil is cultivated. If adequately drained, the soil is well suited to use as cropland. Subsurface drains are generally effective if they are properly installed. Diversions along the base of the upland may be needed as part of a water management system. Some of the larger areas, especially those along the Black River, commonly do not have good outlets for tile drains. Maintenance of lime and fertility levels is the main management need after the soil has been drained.

This soil is suitable for use as pasture. Yields of forage are best in the drained areas. Grazing early in spring when the soil is soft can damage pasture plants. Pastures grow well during the dry part of summer.

This soil is suitable for use as woodland. Trees that tolerate somewhat wet soil will grow best. Competition from grasses and shrubs is severe if trees are planted in the open.

The properties of this soil that affect engineering are variable. In most places the soil is too clayey to be used as roadfill. The clayey parts of the soil are firm and compact and make good dam fill, but the gravelly layers

are too porous. The sandy and gravelly layers are unstable when wet, and they are naturally wet for long periods. Ponds dug in the soil can be expected to leak. Natural pond sites are few because the slope is not suitable.

Wetness severely limits the use of this soil as sites for buildings. It also severely limits the use of this soil as septic tank absorption fields. In many areas the permeability is adequate, but the water table is too high part of the time.

Capability subclass IIw; woodland suitability subclass 2o.

JwB—Jimtown silt loam, 2 to 6 percent slopes. This is a deep, gently sloping, somewhat poorly drained soil on low knolls and sloping natural drainageways on terraces and outwash plains. Most areas are irregular in shape and are 5 to 15 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 37 inches thick. In the upper part it is grayish brown, mottled, friable silt loam; in the middle part it is yellowish brown, mottled, firm clay loam; and in the lower part it is yellowish brown, mottled, friable loam. The substratum, to a depth of about 60 inches, is yellowish brown and grayish brown, mottled, friable stratified sandy loam, loam, and fine sandy loam.

In about one-fourth of some of the larger areas, the surface layer is almost black. A few spots are eroded, and there the surface layer is lighter colored. In some areas there are abrupt changes in gravel content with depth, but in others scarcely any change is evident. In the northern part of the county most of the gravel consists of rounded pebbles, but in the southern part much of it consists of angular pebbles.

Included in the mapping are areas of poorly drained soils that have a gray subsoil. These areas are in depressions and low spots. Also included are small areas of the moderately well drained Bogart soils on some of the higher knolls.

This soil has moderate permeability in the subsoil. Permeability below the subsoil is extremely variable because the soil material is heterogenous. The available water capacity is high. Runoff is medium. The root zone is thick if the soil is adequately drained. The organic-matter content is moderate. Tilth is good. The water table is at a depth of 6 to 18 inches in the wettest time of year. In many areas this soil is wet mostly because water moves into it laterally through the porous zones in and below the subsoil.

This soil is used as cropland, pasture, and woodland. It is well suited to crops after it is adequately drained. It has good potential for hay, pasture, and trees and fair potential for most engineering uses.

Wetness is a moderate limitation to the use of this soil as cropland. Subsurface drains are effective in most areas, and outlets generally are available. Blinding of tile is likely to be needed in the more gravelly areas. Problems of water management are greatest in areas where spring water or surface water from adjacent uplands flows through the gravelly layers in and below the subsoil. In some of these areas, diversions are needed along the base of the upland to help establish adequate drainage. Erosion is a minor hazard in some areas.

This soil is suitable for use as pasture. Pasture plants grow best in drained areas, but few of the adequately drained areas are pastured. Deep-rooted plants such as alfalfa do not grow well in the undrained areas. Grazing early in spring in undrained areas is likely to damage pasture plants. Pasture plants grow fairly well during the dry part of summer.

This soil is suitable for use as woodland. Trees that tolerate a somewhat wet soil will grow best. Competition from grasses and shrubs is severe after trees are planted in the open.

The properties of this soil that affect engineering are variable. In most areas the soil is too clayey for good roadfill. The more clayey parts of the soil are firm and compact and make good dam fill, but the gravelly layers are too porous. The sandy and gravelly layers are unstable when wet, and the soil is naturally wet for long periods. Because of the wetness, the stability of foundations is poor. Ponds dug in the soil can be expected to leak. There are few natural sites for ponds because the slope is gentle.

Wetness severely limits the use of this soil as sites for buildings with or without basements. There is a risk that an excavation for a foundation will cut into a water-bearing layer.

The seasonal wetness of this soil is a severe limitation for a septic tank absorption field. In many areas the permeability is adequate for an absorption field when the water table is low.

Capability subclass IIw; woodland suitability subclass 2o.

Kb—Killbuck silt loam. This is a nearly level, deep, poorly drained to very poorly drained soil. It is mainly on flood plains in valleys, where a flooding main stream or a tributary stream has deposited light-colored soil material on dark-colored soil material. Areas are low on the flood plain. The slope is less than 2 percent. Most of the areas of this soil are elongated and are 2 to 40 acres in size. A few areas are in upland draws and depressions. These areas in the uplands are never flooded, but they are subject to overwash by water from adjacent slopes.

Typically, the surface layer of this soil is dark grayish brown, friable silt loam about 10 inches thick. The subsoil, about 10 inches thick, is dark gray and dark grayish brown, mottled, friable silt loam. An older buried soil extends from a depth of about 20 to 53 inches. It is black, mottled, firm silty clay in the upper part and is grayish brown, mottled, firm silty clay loam in the lower part. The substratum, to a depth of about 60 inches, is

grayish brown, mottled, firm silty clay loam. In some unplowed areas, the surface layer is very dark gray in the upper few inches.

This soil has moderately slow permeability and high available water capacity. Runoff is slow. The natural water table is within 6 inches of the surface for long periods. Most areas are subject to flooding, and many remain ponded after the flood has receded. The organic-matter content is moderate or high. Tilth is fair.

This soil is used as pasture and cropland. It has fair potential for pasture and poor potential for most engineering uses.

Wetness is a severe limitation that must be overcome before this soil can be used successfully as cropland (fig. 3). Drainage adequate for alfalfa or winter grain is very difficult to establish, but drainage adequate for corn or soybeans can be established in many areas. Both surface and subsurface drains typically are needed. Banks of ditches are unstable, and caving occurs frequently if the ditches are deep. There is always a danger of flood damage to crops and to drainage installations.

This soil is moderately well suited to pasture grasses and to any plants that tolerate wetness. The soil is very soft early in spring, and grazing at that time can damage pasture plants. Pasture plants make rather good growth during the dry part of summer.

This soil is not well suited to use as woodland because it is wet. Trees that tolerate wetness will grow best. Undrained areas are well suited to use as a habitat for wetland wildlife.

The particles that make up the fine fraction of this soil have a narrow range in size. The soil material does not pack well, and it is poor as material for foundations and as fill for dams. It is too clayey to be good roadfill. Some natural pond sites are available. Dams and levees are subject to damage by flood waters. Because of wetness and the hazard of flooding, this soil is very poorly suited

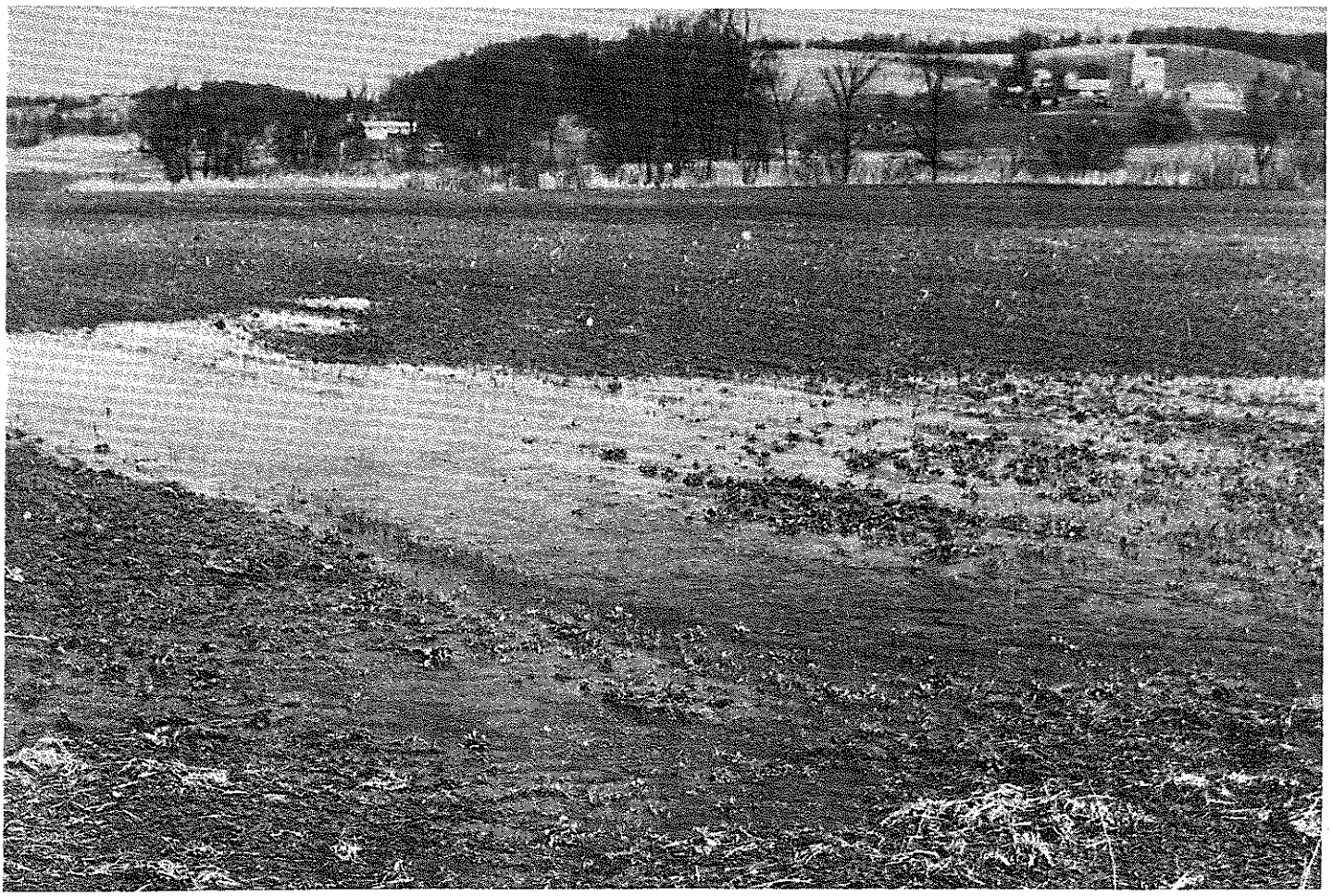

Figure 3.—Killbuck silt loam is subject to flooding. It must be adequately drained before it can be used successfully for crops.

to use as sites for buildings and as septic tank absorption fields.

Capability subclass IIIw; woodland suitability subclass 2w.

Ln—Linwood muck. This is a nearly level, deep, dark-colored, very poorly drained organic soil in depressions on flood plains, terraces, and till plains. In these depressions a rather thin deposit of muck overlies mineral soil material that was deposited by water or ice. Some areas are above an adjacent area of the deeper Carlisle muck, but most are in the lowest part of the landscape where the slope is less than 2 percent. Areas are irregular in shape and are 4 to 20 acres in size.

Typically, the surface layer is black, friable and firm muck, about 26 inches thick, that has a few fibers and chunks of wood. The upper part of the substratum is dark gray, friable silt loam; and the lower part, to a depth of about 60 inches, is dark gray, mottled, very friable, stratified loam and fine sandy loam. The depth to natural lime is 24 to 60 inches.

Included in mapping are small areas of Carlisle soils in which the muck is more than 50 inches thick. These areas typically are in the center of depressions. Also included are areas, around the edge of some of the depressions, of the Pewamo, Sloan, or Luray soils, which are dark colored but do not have a surface layer of muck. In a few included areas in Lake Township the soil is underlain by marl and is limy throughout its depth. In some other included areas, the organic part of the soil is peat rather than muck.

This soil has moderate permeability and very high available water capacity. Runoff is very slow. The natural water table is within 12 inches of the surface much of the time. Areas in closed depressions are subject to ponding, and areas adjacent to stream valleys are subject to periodic flooding. Some are flooded regularly. This soil has very high organic-matter content. Tilth is good. The depth of rooting is limited by the water table.

This soil is used as cropland and pasture. Crops are grown only in areas that have adequate artificial drainage. This soil has good potential for crops and poor potential for most engineering uses. The wetness is a moderate limitation for farming. Corn, soybeans, and a variety of vegetable crops will grow well. For adequate drainage there must be a system of ditches and subsurface drains. Stability of ditchbanks is poor, and subsurface drains placed in the organic part of the soil are likely to shift. Subsurface drains commonly are more effective if they can be placed in the mineral part of the soil.

The soil is suited to pasture. Pasture grasses grow very well, even in dry periods. Canarygrass grows well. The soil is very soft in spring, and grazing during that time can cause serious damage to the pasture plants.

This soil is not well suited to use as woodland because it is wet. Trees that tolerate wetness will grow. Undrained areas make a good habitat for wetland wildlife.

Organic material that makes up the upper part of this soil is very weak and unstable; therefore this soil is not a suitable source of roadfill, dam fill, or material for foundations. In most areas, the mineral part of the soil as well as the organic part are unstable. The best sites for ponds are in small closed upland depressions in which the muck is underlain by compact glacial till within a depth of 3 feet. The suitability of this soil for excavated ponds depends on the nature of the mineral part. In most areas, excessive seepage from a pond can be expected.

The extreme natural wetness and the unstable material make this soil very poorly suited to use as sites for buildings and as septic tank absorption fields.

Capability subclass IIw; woodland suitability subclass 4w.

Lo—Lobdell silt loam. This is a nearly level, deep, moderately well drained soil on flood plains. In wide valleys it is on low knolls and natural levees that rise above the rest of the flood plain and are flooded less often and for shorter periods. In narrow valleys it occupies the entire flood plain and is bounded on both sides by a steep slope. The areas are elongated and are 20 to 200 acres in size. They are 150 feet to one-fourth mile wide, and many are more than one mile long. The slope is less than 2 percent.

Typically, the surface layer is dark brown, friable silt loam about 9 inches thick. The subsoil is about 25 inches thick. In the upper part it is brown, friable silt loam; in the middle part it is yellowish brown, mottled, friable silt loam; and in the lower part it is dark brown, friable loam. The substratum, to a depth of about 60 inches, is yellowish brown, massive loam, silt loam, or sandy loam. The depth to natural lime typically is more than 40 inches, but in some areas the depth to lime is as little as 20 inches. Typically this soil is underlain by solid rock at a depth of more than 5 feet; but in many areas it is underlain by shattered or broken rock at a lesser depth. In a few areas in the southern part of the county the depth to solid rock is less than 3 feet.

Included in the mapping are areas where the soil has a layer or pocket of sandy loam, gravelly loam, or clean gravel. Also there are areas where rock rubble or a recent deposit of soil is on the surface. In some places there are old stream channels that have nearly vertical side slopes. Other inclusions are small areas of the somewhat poorly drained Shoals soils and of the poorly drained Holly soils in depressions and old stream channels and around springs and seeps. Also included are areas of a well drained soil that is not mottled and of a soil that has a black surface layer.

This soil has moderate permeability and high available water capacity. Runoff is slow. The water table in most areas is at a depth of 18 to 36 inches in the wettest time

of year. All the areas are subject to flooding. The duration and frequency of flooding differ greatly. In general, this soil is flooded less often and for shorter periods than other soils on flood plains in the county. The organic-matter content is moderate. Tilth is good. The rooting zone is thick.

The use of this soil is determined largely by shape and location of the areas. Many of the areas in wide valleys are used as cropland or improved pasture, and the narrow, inaccessible areas are used mostly as permanent pasture or woodland.

The soil is well suited to crops. Its natural drainage generally is adequate for farming. The main limitation for crops is the hazard of flooding. Late-season crops, such as corn and soybeans, are less likely to be damaged by floods than are winter grains or perennial forage plants. This soil is suitable for irrigation.

Many areas in which the soil is suited to crops are too narrow or are dissected by old channels, and the soil cannot be farmed conveniently. In these areas, the soil is well suited to use as pasture. Most pastures can be grazed early in spring, and they produce well during the dry part of summer. All the common pasture plants will grow on this soil.

This soil is well suited to trees. It is one of the best soils in the county for black walnut. White pine and yellow poplar also will grow well. There is competition from grasses and shrubs after plantings of trees are made in the open. Young trees are subject to damage by floods. Except for the hazard of flooding, this soil is suitable for use as orchards and for growing nursery stock.

This soil is poorly suited to use as homesites and as septic tank absorption fields because of flooding. Floods can damage the disposal system and are likely to spread the effluent and pollute the flood plain.

Capability subclass IIw; woodland suitability subclass 1o.

LtB—Lordstown silt loam, 2 to 6 percent slopes. This is a gently sloping, well drained, moderately deep soil on unglaciated ridgetops. The areas are elongated, and most of them are 10 to 100 acres in size. The ridgetops are bordered by steeper slopes. The areas slope in opposite directions from the crest. The slope is most gentle on the crest and is steeper near the edges of the ridgetops. The slope is greater than 6 percent in 10 to 20 percent of most mapped areas.

Typically, the surface layer in a forested area is very dark grayish brown, very friable silt loam about 2 inches thick. The subsurface layer, about 2 inches thick, is dark brown, very friable silt loam. The subsoil is about 19 inches thick. In the upper part it is brown and yellowish brown, very friable, channery silt loam. In the lower part it is yellowish brown, friable, channery fine sandy loam and is about 20 percent sandstone fragments. The substratum, to a depth of about 27 inches, is yellowish brown, very friable, channery fine sandy loam and is about 40 percent rock fragments. Fine-grained sandstone bedrock is at a depth below 27 inches.

In cultivated areas the surface layer is dark brown silt loam. Rock fragments in the soil commonly are angular pieces of fine-grained sandstone. Most are 1 to 4 inches long. The fragments make up less than 35 percent of the soil volume to a depth of at least 20 inches. In some areas, especially in the eastern part of the county, the subsoil is more clayey than that described as typical.

This soil has moderate permeability and low available water capacity. Runoff is medium. The organic-matter content is low.

This soil is used as cropland, pasture, and woodland. It has good potential for hay, pasture, and trees. It has fair to poor potential for most engineering uses.

The hazard of erosion is moderate where this soil is cultivated. A few spots in cultivated fields are eroded and have a surface layer that is lighter colored than the one described as typical. Forage crops are grown on much of this soil to control erosion. This soil has a naturally low supply of lime and plant nutrients, and crops respond to additions of these materials. There are occasional periods of drought. This soil is suited to crops if it is managed carefully to control erosion.

This soil is suited to a variety of pasture plants, but applications of lime and fertilizer are needed. Pastures can be grazed early in spring, but pasture plants do not grow well during the dry part of summer.

This soil is suited to fruit trees. Air drainage is good, and damage by frost is less likely than in lower places. The acreage used as orchards is small, but the crop is significant economically.

This soil is used mainly as woodland. The gentle slope and other soil properties permit intensive management of the woodlands.

The moderate depth to bedrock is a limitation to the use of this soil as fill for roads and dams and to the excavation of basements, underground utility lines, and septic tank absorption fields. Sites for houses on this soil are not limited by wetness, and many of them have scenic value.

This soil is suitable for many recreation uses. Erosion, however, is a hazard.

Capability subclass IIe; woodland suitability subclass 3f.

LtC—Lordstown silt loam, 6 to 12 percent slopes. This is a moderately sloping, moderately deep, well drained soil on unglaciated ridgetops. These ridgetops are surrounded by steeper slopes. The slopes face both ways from the crest and also toward the nose of the ridge. Slopes are gentle or moderate in the center of the ridge and steeper near the edge. In the center one-third of many mapped areas, the slope is less than 6 percent. Most of the areas are elongated, and they range from 10 to 100 acres in size.

Typically, the surface layer in a forested area is very dark grayish brown, very friable silt loam about 2 inches thick. The subsurface layer, about 2 inches thick, is dark brown, very friable silt loam. The subsoil is about 19 inches thick. In the upper part it is brown and yellowish brown, very friable channery silt loam; and in the lower part it is yellowish brown, friable, channery sandy loam and is about 20 percent sandstone fragments. The substratum, to a depth of about 27 inches, is yellowish brown, very friable, channery fine sandy loam and is about 40 percent sandstone fragments. Fine-grained sandstone bedrock is at a depth below 27 inches.

In a cultivated area the surface layer is friable, dark brown silt loam and is 5 to 15 percent sandstone fragments. In a few included areas, the depth to solid bedrock is more than 40 inches. In such areas, shattered rock makes up more than 90 percent of the soil volume above the bedrock. These rock fragments are angular pieces of fine-grained sandstone. Most of them are 1 to 4 inches long. This soil in the eastern part of the county has more clay in the subsoil than the typical Lordstown soil.

Included in mapping are small areas of the stonier Berks soils. These inclusions are not in a definite pattern in the landscape.

This soil has moderate permeability and low available water capacity. Runoff is rapid. Tilth commonly is good. The supply of organic matter, lime, and plant nutrients is naturally low, and crops respond to additions of these materials. Because these materials are lost if erosion occurs, frequent light applications are desirable.

This soil is used as cropland, pasture, and woodland. It has good potential for use as pasture and woodland, and poor potential for most engineering uses. The hazard of erosion is severe if this soil is cultivated.

Erosion has not been especially severe because much of this soil has been used for forage crops. A few eroded spots are in most cultivated fields; there the surface layer is lighter in color than the surrounding soil. Some of the larger areas of this soil are suited to contour stripcropping.

This soil is suitable for use as pasture. Pastures can be grazed early in spring, but pasture plants do not grow well during the dry part of summer. The slope permits practices for pasture improvement such as seeding and fertilization. Overgrazing of pastures is likely to expose the soil surface and permit erosion.

Much of this soil is used as woodland. Roots of trees can penetrate cracks in the underlying rock and obtain water. The slope and other soil properties permit intensive management of woodland. This soil is also suited to fruit trees. The soil properties and the air drainage are favorable for orchards.

The moderate depth to bedrock limits the use of this soil as fill for roads and dams. It is also a limitation if excavations are made for basements, underground utility lines, or septic tank absorption fields. Sites for homes on this soil are not limited by wetness, and many of them offer scenic advantages.

This soil is suitable for some recreation uses. There is a hazard of erosion.

Capability subclass IIIe; woodland suitability subclass 3f.

LtD—Lordstown silt loam, 12 to 18 percent slopes. This is a moderately steep, moderately deep, well drained soil on side slopes of rock hills in the unglaciated part of the county. Most of the areas are elongated and have smooth slope. Most of the areas are below gently sloping to sloping ridgetops, and many are above steep or very steep valley side slopes. The areas range from 5 to 150 acres in size.

Typically, the surface layer in a forested area is very dark grayish brown, very friable silt loam about 2 inches thick. The subsurface layer, about 2 inches thick, is dark brown, very friable silt loam. The subsoil is about 19 inches thick. In the upper part it is brown and yellowish brown, very friable channery silt loam; and in the lower part it is yellowish brown, friable, channery fine sandy loam and is about 20 percent sandstone fragments. The substratum, to a depth of about 27 inches, is yellowish brown, very friable, channery fine sandy loam and is about 40 percent sandstone fragments. Fine-grained sandstone bedrock is at a depth below 27 inches.

In a cultivated area, the surface layer is brown or dark brown, friable silt loam and is 5 to 20 percent sandstone fragments. In a few areas, the depth to solid bedrock is more than 40 inches. In such areas, shattered rock makes up more than 90 percent of the soil above the bedrock. These rock fragments are angular pieces of fine-grained sandstone.

This soil in the eastern part of the county has more clay in the subsoil than a typical Lordstown soil.

Included in mapping are small areas of the stonier Berks soils. These inclusions do not make a uniform pattern on the landscape. Also included are springs and seep areas around which the soil is grayer and more mottled than is typical for a Lordstown soil.

This soil has moderate permeability and low available water capacity. Runoff is rapid. The root zone is moderately deep. The supply of organic matter and of some plant nutrients is naturally low.

In most areas, this soil is used as woodland, but in some small areas, it is used as cropland or pasture. It has good potential for use as woodland.

The hazard of erosion is very severe if the soil is cultivated. In most cultivated fields there are eroded spots where the surface layer is lighter colored and more stony, and the depth to rock is less than in the typical soil. This soil is poorly suited to crops because of the hazards of erosion and drought. Growing hay is an effective way to control erosion. Some of the larger areas of this soil are suited to stripcropping.

The soil is suitable for use as pasture. Pastures can be grazed early in spring, but pasture plants do not grow well during the dry part of summer. The slope limits some practices for pasture improvement. In some places springs can be developed to supply water for stock.

Much of this soil is used as woodland. Roots of trees commonly can penetrate cracks in the underlying rock and extract water. There is a hazard of erosion wherever machines are used or trees are harvested.

The slope and the moderate depth to bedrock make this soil a poor source of fill material for roads or dams. Ponds constructed in this soil are likely to leak.

The slope and the moderate depth to rock are limitations to use of this soil as sites for homes. There is a severe hazard of erosion during construction. The rock interferes with excavations for basements, utility lines, and septic tank absorption fields. This soil permits downslope seepage of effluent from septic tanks. The limitations are severe for most recreation uses. This soil is too steep for use as campsites or picnic areas, but it provides habitat for wildlife.

Capability subclass IVe; woodland suitability subclass 3r.

LtE—Lordstown silt loam, 18 to 25 percent slopes. This is a steep, moderately deep, well drained soil on the side slopes of rock hills that do not have a covering of glacial material. Typically, the slope is uniform from a less sloping ridgetop or hillside above to a terrace or flood plain below. In the most rugged parts of the county, this soil commonly lies above a steeper slope. Most areas are elongated and crooked, parallel to stream valleys, and forked by drainageways. Most areas are 10 to 100 acres in size and are sloping in only one direction. In some places, however, the stream bottom is too narrow to be mapped, and both side slopes are included in the same soil area.

Typically, the surface layer in a forested area is very dark brown, very friable silt loam about 3 inches thick. The subsurface layer, about 6 inches thick, is brown, friable channery silt loam. The subsoil is about 17 inches thick. It consists of yellowish brown, very friable channery loam. The substratum, to a depth of about 32 inches, is yellowish brown, very friable channery loam. It is about 35 to 40 percent sandstone fragments. Thin bedded, fine grained, sandstone bedrock is below a depth of 32 inches.

In eroded areas, the plow layer is as much as 40 percent rock fragments. The fragments are mostly flat angular pieces of sandstone 1 to 6 inches in diameter and 1/2 inch to 1 1/2 inches thick. In uneroded areas, rock fragments make up less than 35 percent of the soil material to a depth of at least 20 inches. Below that depth the percentage of rock fragments increases. The depth to solid rock commonly is 20 to 40 inches. In most places, the boundary between soil material and solid rock is not clear because rock fragments make up at least 90 percent of the soil volume.

Included in mapping are many areas of a Berks soil, which has a stonier subsoil and a lower available water capacity than the Lordstown soil. The Berks soil makes up 10 to 20 percent of most of the areas. It is not in any particular position on the landscape. Also included are areas where the soil material in the upper few inches is similar to the Lordstown soil, but the depth to solid rock is less than 20 inches. A few rock outcrops are in most areas of this soil.

There are small springs in many of the areas. The soil in a very small area around and below a spring is more gray than typical. The bottom land in a very narrow stream valley is included in some areas of this soil. In some of these valleys, streams from the springs flow during all or part of each year. In some valleys there are piles of rock rubble and boulders that have rolled or fallen from the adjacent steep slopes.

This soil has moderate permeability and a low available water capacity. Runoff is very rapid. The organic-matter content is low, and tilth is good. The soil is rarely saturated with water.

Most areas of this soil are wooded; a few are pastured or used as cropland. The soil has good potential for use as woodland.

This soil is poorly suited to crops because of the steep slope, very severe erosion hazard, and low available water capacity. Slope limits the use of some types of farm machinery. The few cultivated areas commonly are contour-stripped to reduce erosion.

This soil is suited to use as pasture. Pasture plants commonly do not grow well during the dry part of summer. Slope limits the use of some machinery for pasture management. Runoff can remove much of the applied lime and fertilizer. Frequent light applications can help reduce these losses.

Trees do not grow so well on this soil as they do on less droughty soils. Slope as a rule does not limit practices for harvesting trees or for improving the woodland. Logging produces a hazard of erosion. The soil remains moist longer and trees grow better on north- and east-facing slopes than on south- and west-facing slopes.

This soil is a poor source of fill material for dams and roads because of the moderate depth, high content of rock fragments, and steep slope. Pond sites are very few, because water seeps rapidly through the shattered bedrock. The best pond sites are in the narrow valleys that have streams fed by springs, but large seepage losses can be expected.

This soil is very poorly suited to use as sites for buildings. The steep slope and the moderate depth to bedrock interfere with construction and with installation of utility lines. The soil also is too steep and too shallow for use as septic tank absorption fields. Effluent would seep through cracks in the rock and contaminate water supplies some distance away.

This soil has severe limitations for most kinds of recreation uses. Paths and trails can be laid out, however, in ways that will not encourage erosion.

Capability subclass IVe; woodland suitability subclass 3r.

LtF—Lordstown silt loam, 25 to 40 percent slopes. This is a very steep, moderately deep, well drained soil on the lower side slopes of stream valleys cut into rock hills. Most areas are in the unglaciated part of the county, but some are on very steep slopes in the glaciated part where there is little or no covering of glacial till. Most of the areas are below less sloping hillsides or hilltops and above flood plains or terraces. A few areas are above steeper hillsides. Most of the areas are elongated, and they lie parallel to stream valleys. The slope is typically in only one direction, but a few of the areas include both sides of a narrow valley.

Typically, the surface layer in a forested area is very dark brown, very friable, channery silt loam about 2 inches thick. The subsurface layer, about 4 inches thick, is brown, friable, channery silt loam. The subsoil, about 16 inches thick, is yellowish brown, very friable, channery loam. The substratum, to a depth of 26 inches, is yellowish brown, very friable, channery loam and is 35 to 40 percent sandstone fragments. Thin-bedded, fine-grained sandstone bedrock is at a depth of 26 inches.

The coarse fragments are mostly flat, angular pieces of sandstone 1 to 6 inches in diameter and 1/2 inch to 1 1/2 inches thick. They make up less than 35 percent of the volume of the soil to a depth of at least 20 inches. Below that depth the proportion of rock fragments to fine material is much greater. In most places there is no clear boundary to solid bedrock, but rock fragments make up at least 90 percent of the volume above a depth of 40 inches.

Included in mapping are numerous areas of Berks soils, which have a more stony surface layer and subsoil than the Lordstown soil and are more droughty. Berks soils make up 20 to 30 percent of most mapped areas and as much as 50 percent of some. The Berks soils are not in any particular position on the landscape. Also included are some areas in which the depth to solid rock is less than 20 inches. Rock outcrops are present in many places, and they make up 5 to 10 percent of some mapped areas. Loudonville soils are included in some small areas in the glaciated part of the county.

Small springs are in many places. Typically, in a very small area around and below a spring, the soil is grayer than a typical Lordstown soil. The bottom land in some very narrow stream valleys is included with this Lordstown soil. Some of the narrow valleys have streams that flow from springs during all or part of each year. Piles of rock, rubble, and boulders that have rolled or fallen from the adjacent very steep slopes are in some of these bottoms.

This soil has moderate permeability and low available water capacity. Runoff is very rapid. The organic-matter content is low. Tilth is good. The soil is rarely saturated with water.

This soil has good potential for use as woodland. Nearly all the areas are wooded. This soil is too steep for use as cropland or pasture. Some of the existing woodlots are of good quality. This soil has few limitations for woodland management, but some harvest operations and some practices for woodland improvement are hampered by the very steep slope. There is a severe hazard of erosion when woodland products are harvested.

Trees do not grow so rapidly on this soil as on soils that are less droughty. The best sites for planting trees are on slopes that face north or east, because the soil on these slopes is moist for longer periods than that on slopes that face south or west.

This soil is a very poor source of dam fill or roadfill because the soil is only moderately deep, has a large amount of rock fragments, and is very steep. Ponds in valleys bordered by this soil are likely to lose water by seepage into the rock on the side walls. This soil is too steep to be used for house sites or as septic tank absorption fields.

This soil has severe limitations for most kinds of recreation uses. Paths and trails can be developed, however, in ways that will not cause erosion.

Capability subclass VIe; woodland suitability subclass 3r.

LvB—Loudonville silt loam, 2 to 6 percent slopes. This is a gently sloping, moderately deep, well drained soil on the tops of hills that have a thin covering of glacial till over bedrock. Most areas are in the highest position on the landscape, and they slope outward from a central dome or ridge toward a steeper hillside below. The individual areas are elongated or irregular in shape, and they are 5 to 30 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 8 inches thick. The upper part of the subsoil is about 28 inches thick and is yellowish brown, firm to friable loam or silt loam. The lower part of the subsoil, to a depth of about 39 inches, is yellowish brown, friable loam. Below this there is fine-grained sandstone bedrock, the upper part of which is shattered and broken.

In areas that have never been plowed, the surface layer is thinner and darker than the plow layer in cultivated fields.

In areas that have not been plowed for a long time, the surface layer to a depth of 1 to 2 inches is darker than the rest of the old plow layer. A few eroded spots are in cultivated fields. The plow layer in an eroded spot is lighter colored and has more stones than that in the other parts of the same mapped area. The bedrock just beneath the soil in most areas is shattered; solid bedrock is at a greater depth. The depth to solid bedrock is

more than 40 inches in about half of most mapped areas and more than 60 inches in some spots.

Included in mapping are springs and seep areas around which the soil is grayer and more mottled than typical. Also included are small areas of Berks soils, which are more stony and more droughty than the Loudonville soil.

This soil has moderate permeability above the rock. The available water capacity is low or medium, depending on the depth to rock. Runoff is medium. The water table generally is deep. This soil has a low to moderate supply of organic matter. Tilth is good.

This soil is used as cropland, pasture, and woodland. It has good potential for crops, hay, pasture, and woodland. It has fair to poor potential for most engineering uses.

The hazard of erosion is moderate if this soil is cultivated. Because erosion reduces the depth to rock, it reduces the volume of soil from which plants can extract water and nutrients. This soil is suited to no-till and minimum tillage methods of corn production. In many areas it is suited to contour stripcropping. Most areas of this soil are used to produce hay, and this practice keeps the loss of soil low. Additions of lime, organic matter, and plant nutrients are needed to grow most crops. Natural drainage is adequate for farming.

The soil is suited to pasture. The good natural drainage permits grazing early in spring. Most pasture plants do not grow well during the dry part of summer. The slope permits intensive pasture management, and a crop can be grown to aid in establishing a new seeding and in controlling weeds.

This soil is well suited to use as woodland. Trees grow at a slower rate than on less droughty soils. The slope permits all common practices for woodland improvement and for harvesting. Competition from grasses and shrubs can be expected if a planting is made in the open.

This soil is also well suited to fruit trees. Air drainage commonly is good in most of the areas.

This soil commonly is good material for foundations and good fill for dams, but its volume is limited by the moderate depth to rock. There are very few natural pond sites. Excavated ponds are likely to lose water by seepage through cracks in the underlying rock.

The good natural drainage and gentle slope of this soil are favorable for homesites. The rock at a depth of 20 to 40 inches, however, interferes with excavations for basements and utility lines.

The moderate depth to rock also makes this soil poorly suited to use as a septic tank absorption field. The volume of soil above the rock is not enough to filter the effluent adequately. Effluent can seep rapidly through cracks in the underlying rock and pollute nearby water supplies.

Capability subclass IIe; woodland suitability subclass 2o.

LvC—Loudonville silt loam, 6 to 12 percent slopes. This is a sloping, moderately deep, well drained soil on the top and upper side slopes of hills that have a thin covering of glacial till over bedrock. Most areas lie below a gently sloping hilltop and above a steeper hillside. Such areas slope mostly in one direction. Some areas include the top of a hill, and they slope outward in two or more directions from a central dome or ridge. Most of the areas are elongated and are 5 to 50 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 7 inches thick. The upper part of the subsoil, about 28 inches thick, is yellowish brown, firm to friable loam or silt loam. The lower part of the subsoil, to a depth of about 39 inches, is yellowish brown, friable loam. Below that, there is fine-grained sandstone bedrock, the upper part of which is shattered and broken (fig. 4).

In areas that have never been plowed, the surface layer is thinner and darker than the plow layer in cultivated fields.

In areas that have not been plowed for a long time, the surface layer to a depth of 1 to 2 inches is darker than the rest of the old plow layer. Eroded spots are present in most cultivated fields. The plow layer in these spots is lighter colored, and the soil is more stony than in other parts of the same mapped area. There is typically no clear boundary between soil and rock. The bedrock which occurs beneath the soil in most areas is shattered; solid rock lies at a greater depth. The depth to solid bedrock is more than 40 inches in about half of the mapped areas and more than 60 inches in some spots.

Included in mapping are springs and seep areas around which the soil is grayer and more mottled than typical. Also included are small areas of Berks soils, which are stonier and more droughty than this soil.

This soil has moderate permeability above the rock. The available water capacity is low or medium, depending on the depth to rock. Runoff is rapid. The water table generally is deep. This soil has a low to moderate content of organic matter. Tilth is good.

This soil is used as cropland, pasture, and woodland. It has good potential for crops, hay, pasture, and woodland. It has fair to poor potential for most engineering uses.

There is a severe hazard of erosion if this soil is cultivated. Erosion reduces the depth to the underlying rock and reduces the volume of soil from which plants can extract water and nutrients. Many areas of this soil are suited to contour stripcropping, and almost all can be cultivated conveniently across the slope. Most areas are suited to no-till or minimum tillage methods of growing corn. Hay is grown extensively on this soil, and this practice has prevented serious erosion. Additions of or-

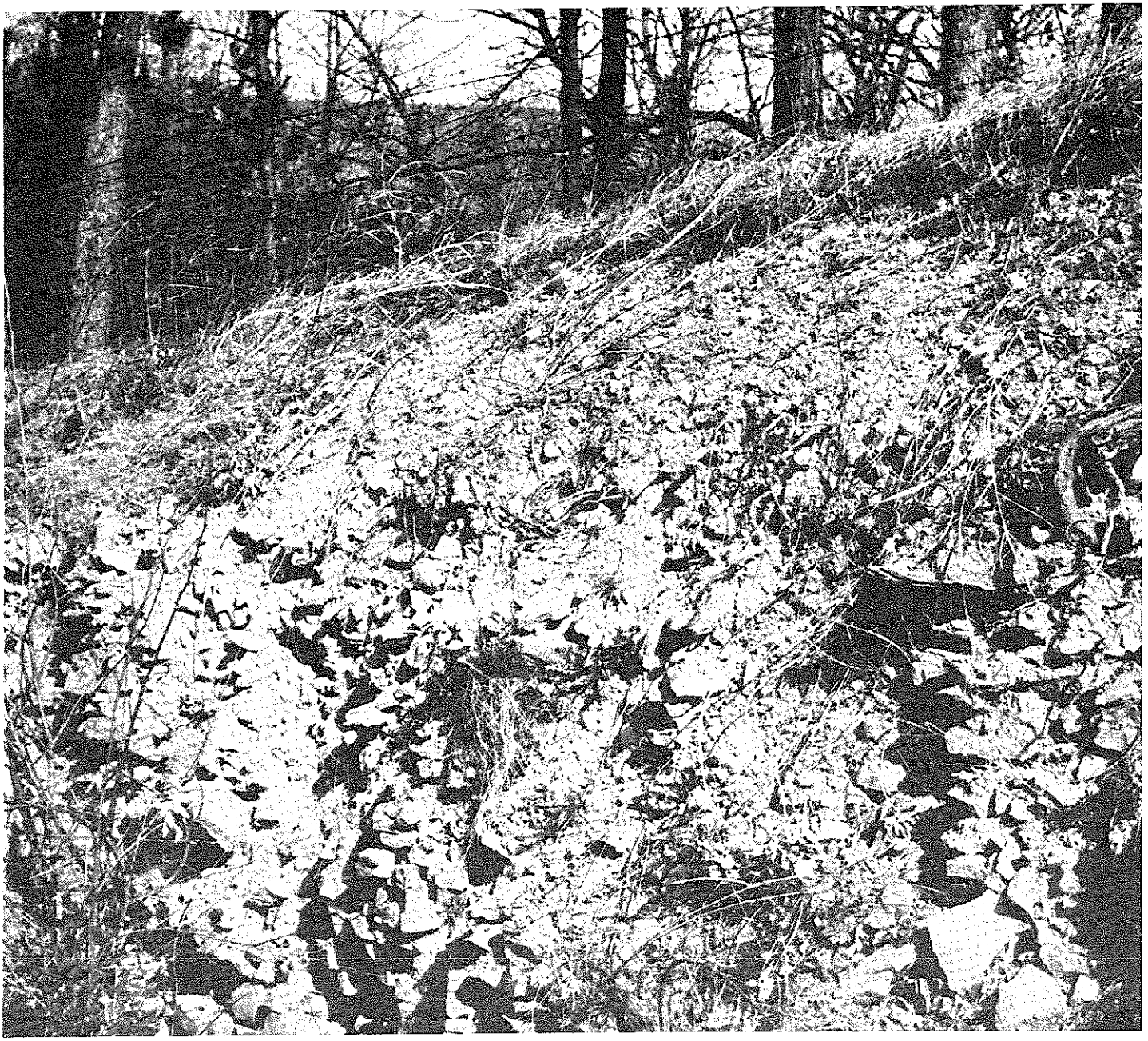

Figure 4.—Profile of Loudonville silt loam, 6 to 12 percent slopes. This soil is moderately deep to bedrock.

ganic matter, lime, and plant nutrients are needed for good yields of crops. Crops commonly do not get enough available water for good growth during long dry periods, especially in areas of the most shallow soil.

This soil is suited to pasture. The good natural drainage permits grazing early in spring. Most pasture grasses do not grow well during the dry part of summer. The slope permits intensive management of pastures.

The soil is well suited to use as woodland. Trees do not grow quite so rapidly as on less droughty soils. The slope permits all the common practices for woodland improvement and harvesting. Competition from grasses and shrubs can be expected after a planting of trees is made in the open.

The soil is also well suited to fruit trees. Air drainage commonly is good in most of the areas.

This soil commonly makes good foundation material and good fill for dams, but it is limited by its moderate

depth to rock. There are very few natural pond sites. Excavated ponds are likely to lose water by seepage through cracks in the underlying rock.

The good natural drainage of this soil is favorable for homesites. However, the underlying rock at a depth of only 20 to 40 inches interferes with excavations for basements and utility lines. There is a hazard of erosion during construction. Immediate reseeding is needed to reduce erosion in disturbed areas.

This soil is poorly suited to use as a septic tank absorption field because of the moderate depth to rock. The volume of soil above rock is not enough to filter the effluent adequately. Seepage of effluent downslope is likely to occur. The effluent can seep rapidly through cracks in the underlying rock and pollute nearby water supplies.

Capability subclass IIIe; woodland suitability subclass 2o.

LvD—Loudonville silt loam, 12 to 18 percent slopes. This is a moderately steep, moderately deep, well drained soil on hillsides that have a thin covering of glacial till over bedrock. It typically extends from a less sloping hilltop or ridgetop above to a terrace below. In some places it lies above a steeper slope. The slope is uniform and generally in one direction. In some areas, however, the opposite side slopes of a small valley are included in a mapped area. Most areas are elongated and are 5 to 50 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 7 inches thick. The subsoil, about 26 inches thick, is yellowish brown, firm to friable loam or silt loam. The subsoil rests on shattered sandstone bedrock that is more solid at a greater depth.

In areas that have never been plowed, the surface layer is very dark grayish brown and is only 2 to 4 inches thick. In some areas that have not been plowed for many years, the surface layer to a depth of 1 or 2 inches is darker than the rest of the old plow layer. Eroded spots are in many areas that are now or have been cultivated. In such spots the plow layer is lighter colored, and there are more stones on the surface. The depth to rock is typically 20 to 40 inches. The upper part of the bedrock is shattered and broken. The depth to solid bedrock is more than 40 inches in as much as one-third of some mapped areas, and is more than 60 inches in a few spots. A few areas have rock outcrops or have large boulders on the surface.

Included in mapping are many seep spots and springs around which the soil is grayer and more mottled than typical. As much as one-fourth of some mapped areas is composed of Lordstown or Berks soils, which do not have a component of glacial till and are more droughty than this soil.

This soil has moderate permeability above the rock. The available water capacity is low or medium depending on the depth to rock. Runoff is rapid. The water table is deep. The organic-matter content is low. Tilth is good. The supply of most plant nutrients is low.

The hazard of erosion is very severe if this soil is cultivated. Erosion reduces the depth to bedrock and thus reduces thickness of the root zone from which crops can extract water and nutrients. Many areas of the soil are suited to contour stripcropping and to no-till or minimum tillage methods of growing corn. Most of the farmed areas of this soil are used for hay much of the time, and this practice has minimized erosion. Crops generally do not get enough available water to make good growth during long dry periods, especially in areas where the soil is most shallow. Additions of fertilizer, lime, and organic matter are needed to produce good yields of most crops.

Most areas of this soil are used as pasture or woodland. The soil has good potential for these uses. It has fair to poor potential for most engineering uses.

This soil is well suited to pasture for grazing early in spring but does not produce much pasture during the dry part of summer. A wide variety of pasture plants will grow well. The slope permits intensive management of pastures, and a cultivated crop can be grown occasionally to aid in establishing new seeding and in controlling weeds. Severe erosion can occur in pastures that are overgrazed.

The soil is well suited to use as woodland. Trees do not grow quite so rapidly as on less droughty soils, but a good stand can be produced. The slope permits most of the practices for woodland improvement and harvesting. Erosion is a hazard along logging trails. There is competition from grasses and shrubs if plantings of trees are made in the open.

The soil above the rock is suitable for foundation material and fill for dams, but its volume is limited by the rock. There are some natural pond sites in places where this soil is on both sides of a small valley. Ponds in many of the sites would be likely to lose water by seepage.

The soil is poorly suited to use as homesites because of its slope and the moderate depth to rock. The rock interferes with excavations for basements and utility lines. There is a very severe hazard of erosion during construction.

The soil has severe limitations for use as a septic tank absorption field because of the slope and the moderate depth to rock. Downslope seepage of effluent is likely to occur. The volume of soil above the rock is too small to filter the effluent properly. The effluent is likely to seep into cracks in the underlying rock and move freely to pollute nearby water supplies.

Capability subclass IVe; woodland suitability subclass 2r.

LvE—Loudonville silt loam, 18 to 25 percent slopes. This is a steep, moderately deep, well drained soil on the sides of hills that have a thin covering of glacial till over bedrock. In some places it occupies an

entire hillside. In some it lies below and in others it lies above a steeper hillside. In most mapped areas, the slope is in only one direction, but in some there are the two opposite slopes of a small valley. Individual areas are elongated and are 4 to 40 acres in size.

Typically, the surface layer is very dark brown, friable silt loam 3 inches thick. The subsurface layer, about 5 inches thick, is pale brown, friable silt loam. The subsoil, about 20 inches thick, is yellowish brown, firm to friable loam or silt loam. The subsoil rests on shattered sandstone bedrock that is more solid at a greater depth.

A few areas of this soil were formerly cultivated, and there the surface layer is thicker and lighter colored than that in areas that have never been plowed. A few spots in old fields and pastures are eroded, and there the surface layer is brown or yellowish brown, and rock fragments are more numerous than in the typical soil.

The depth to rock is typically 20 to 40 inches; it varies considerably within most mapped areas. In many places, the upper part of the rock is shattered and broken so that the boundary between soil and bedrock is gradual. The depth to solid rock is more than 40 inches in many small areas. A few rock outcrops are in some of the areas.

Included in mapping are springs and seep areas around which the soil is gray and mottled. These are most common on the lower third of a slope. The bottoms of some narrow valleys are included. In these, the stream typically flows on rock, and piles of stones and loose soil material lie between the stream channel and the base of the slope.

This soil has moderate permeability above the rock. The available water capacity is low or moderate, depending on the depth to rock. Runoff is very rapid. The water table is deep. The organic-matter content is low. Tilth is fair.

Most areas of this soil are used as woodland or as pasture. Only a few areas are cultivated. The hazard of erosion is very severe if this soil is cultivated. Erosion reduces the depth to rock and thus reduces the thickness of the root zone from which crops can extract water and nutrients. Crops are likely not to have enough available water during dry periods. The slope limits use of most types of farm machinery. This soil is suitable for use as pasture. Pastures can be grazed early in spring, but they produce little forage during the dry part of summer. Overgrazed pastures are likely to be eroded. No-till methods establishing a pasture seeding are desirable.

This soil is suitable for use as woodland. Trees grow somewhat more slowly than on less droughty soils, but a good stand can be obtained. There is a hazard of erosion when logging is done. Careful layout of logging trails will help to minimize erosion. The slope permits most of the common practices for woodland improvement and harvesting. The best planting sites are on the slopes that face north or east because they stay moist longer than those facing south or west.

This soil is suitable for foundation material and dam fill, but the volume of soil over the rock is small, and the slope interferes with excavation. The potential for pond sites is very small, because water seeps through cracks in the underlying rock. The best sites for ponds are in narrow valleys between areas of this soil.

This soil has several limitations for use as homesites, mainly because of the slope. The bedrock interferes with construction and with installation of utility lines. This soil is too steep and too shallow to be used as a septic tank absorption field. The effluent will seep for a long distance through cracks in the underlying rock and can contaminate a nearby water supply.

Capability subclass IVe; woodland suitability subclass 2r.

Ly—Luray silty clay loam. This is a nearly level, deep, dark-colored, very poorly drained soil in areas that held shallow lakes after the glaciers melted. These areas are very low in the landscape, and they have slope less than 2 percent. Some are completely surrounded by higher ground, and others slope to a flood plain or a pocket of muck. The individual areas are irregular in shape and are 2 to 200 acres in size.

Typically, the surface layer is black, firm silty clay loam about 9 inches thick. The subsurface layer, about 5 inches thick, is very dark gray, mottled, firm silty clay loam. The subsoil is about 18 inches thick. In the upper part it is dark gray, firm silty clay loam. In the middle part it is grayish brown, mottled, firm silty clay loam, and in the lower part it is grayish brown, mottled, firm silt loam. The substratum, to a depth of about 60 inches, is grayish brown or gray, mottled, friable silt loam and loam.

The layer of surface soil extends only to plow depth in 10 to 15 percent of most of the larger areas of this soil. There are a few areas where stones have rolled or have been washed onto this soil from higher areas nearby. Included in mapping are small areas where a thin deposit of light-colored soil material covers the dark layer. Also included are areas in which the surface layer is silty clay and tilth commonly is only fair. In some areas, most of them in the small upland depressions, this soil is underlain by compact glacial till at a depth of 2 to 5 feet. The soil in these areas is extremely difficult to drain. There are also small areas of a dark colored gravelly soil along the edges of some of the large areas of this soil.

This soil has moderately slow permeability and high available water capacity. Runoff is very slow. The water table is within 6 inches of the surface for long periods. Many areas in closed depressions are subject to occasional ponding late in winter and early in spring. Areas next to major stream valleys are subject to occasional flooding. This soil has a high organic-matter content. Tilth is good if the soil is worked at the right moisture

content but can be very poor if it is not. The root zone is thick where it is not restricted by a water table.

Most areas of this soil are artificially drained and are used as cropland. Smaller acreages are in pasture or woodland, and some that were formerly farmed are now unused. This soil has good potential for crops, hay, and pasture and poor potential for most engineering uses.

This soil is very well suited to crops if it is adequately drained. Subsurface drains are effective if outlets are available. Most adequately drained areas commonly have a complex system that includes both tile and surface drains. Adequate drainage for corn and soybeans is more easily attained than for small grains or alfalfa.

The soil is moderately well suited to use as pasture. Native grasses grow well during the dry part of summer. Grazing early in spring when the soil is soft can damage the sod seriously. Pasture mixtures that include legumes are planted mainly on the better drained areas. Canarygrass grows well in seeded pastures.

This soil is moderately well suited to use as woodland. Wetness is a limitation in woodland management. Plantings can be made of trees that will grow in wet soil.

This soil has a high content of silt and clay. The material, therefore, is not well suited for use as foundation material or as fill for dams. It is too clayey to make good roadfill.

The soil is poorly suited to use as homesites because of its wetness. Although the soil can be drained adequately for crops, drainage adequate for a year-round house is difficult to achieve.

This soil is poorly suited to use as septic tank absorption fields because of wetness and moderately slow permeability.

Capability subclass IIw; woodland suitability subclass 2w.

LzB—Lykens silt loam, 2 to 6 percent slopes. This is a gently sloping, deep, moderately well drained soil in areas where a thin deposit of water-laid soil material overlies glacial till. The larger areas are high on the sides of major stream valleys, where the water-laid deposits that fill the valleys thin out toward the adjacent till-covered uplands. Such areas slope mostly in one direction. Smaller areas are in places where thin water-laid deposits form low knolls on till plains. These knolls have short irregular slopes. Areas are variable in shape and are 2 to 20 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 9 inches thick. The subsoil is about 27 inches thick. In the upper part it is yellowish brown, mottled, firm to friable silty clay loam or silt loam. In the middle part it is dark brown, mottled, firm clay loam. In the lower part it is brown, mottled, firm clay loam. The substratum, to a depth of about 60 inches, is brown, firm clay loam glacial till.

The surface layer is loam or sandy loam in some areas. Several areas have slopes dominantly less than 2 percent.

Included in mapping are small areas of soils that have somewhat poor or poor natural drainage. These areas are around the base of knolls and in low or concave parts of the longer slopes. Tiro, Bennington, Condit, or Wadsworth soils are in these wetter included areas.

This soil has moderate permeability in the upper part and slow or moderately slow permeability in the underlying glacial till. The available water capacity is high. Runoff is medium. The soil has a moderate organic-matter content. Tilth is good. The soil is acid in the rooting zone of most crops, although there is natural lime deeper in the soil. The water table is at a depth of 18 to 36 inches in the wettest time of year. Some lateral movement of water occurs along the top of the glacial till, which is less permeable than the soil above it. The rooting depth is not restricted.

In most areas this soil is used as cropland. This soil has good potential for crops, hay, pasture, and trees. It has fair potential for most engineering uses.

This soil is well suited to all the common crops. There is a moderate erosion hazard if the soil is cultivated. In the larger areas, cultivation across the slope usually is effective in controlling erosion. On the knolls, the return of crop residues is a suitable practice. Natural drainage generally is adequate for farming; most periods when the water table is high do not occur during the growing season. Randomly spaced tile lines may be needed to drain small areas of the wetter inclusions. Maintenance of lime and fertility are the main needs for management.

This soil is well suited to use as pasture. Pastures can be grazed moderately early in spring, and growth is good during the dry part of summer. The slope permits seeding, fertilizing, and other intensive practices for pasture management.

This soil is suitable for use as woodland; very few of the areas, however, are so used. Severe competition from grasses and shrubs can be expected in new plantings of trees.

The upper part of this soil has a high content of silt that limits engineering uses. The underlying glacial till is firm and compact and is suitable for use as foundation material and as fill for dams. There are few natural pond sites. Ponds dug into the underlying glacial till are likely to hold water.

The soil has moderate suitability for use as homesites. The seasonally high water table is a limitation for homes that have basements. Water can seep laterally along the top of the glacial till. The wetness is not so great a limitation for homes that do not have basements. Seasonal wetness and slow permeability of the underlying till limit the use of this soil as a septic tank absorption field.

Capability subclass IIe; woodland suitability subclass 2o.

MaA—Mahoning silt loam, 0 to 2 percent slopes. This is a nearly level, deep, somewhat poorly drained soil on the Defiance moraine of this county. The largest areas are between the sloping part of the moraine and the lowland along the west fork of the east branch of Black River. These areas are irregular in shape and are 10 to 50 acres in size. They slope toward the south. Other smaller areas are at the head of small natural drainageways on the sloping part of the moraine. These areas are variable in shape and are 2 to 20 acres in size. They are low on the landscape and are surrounded by gently sloping Mahoning or Ellsworth soils except on one end, which is the outlet for their surface drainage. These areas slope inward toward the center as well as toward the outlet end.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer, about 3 inches thick, is yellowish brown, mottled, firm silty clay loam. The subsoil is about 20 inches thick. It is yellowish brown, mottled, firm silty clay loam. The substratum, to a depth of about 60 inches, is yellowish brown, mottled, firm clay loam glacial till.

There are a few areas in which the surface layer is almost black. All layers of the soil except the surface layer are mottled.

Included in mapping are small areas of the poorly drained Condit soils in concave areas, shallow depressions, and minor natural drainageways. Also included are small areas of Tiro soils, which are silty to a depth of 2 feet or more.

This soil has slow or very slow permeability and moderate available water capacity. Runoff is slow. The water table is at a depth of 6 to 18 inches in the wettest time of year. A few included areas are ponded late in winter and early in spring.

The organic-matter content is low or moderate. Tilth is fair. This soil is acid in the root zone, although natural lime is present at a greater depth.

Most areas of this soil are used as cropland or pasture. This soil has fair to good potential for crops, hay, pasture, and trees. It has fair to poor potential for many engineering uses.

Corn and soybeans are the main cultivated crops. Wetness is a severe hazard in cultivated areas. Artificial drainage is needed. This soil is not easily drained by either a surface or a subsurface system. Only a few areas now have adequate drainage, but many are drained well enough to produce good yields. Additions of lime, fertilizer, and organic matter are needed if this soil is farmed.

This soil is suitable for use as pasture. A variety of pasture plants will grow well. Birdsfoot trefoil is a better suited legume for pastures than alfalfa, especially in areas that are not adequately drained. This soil is soft early in spring, and grazing at that time can damage the pasture plants severely. Pastures make good growth during the dry part of summer. The slope does not limit intensive pasture management, and cultivated crops can be grown to aid in establishing a seeding and in controlling weeds.

This soil is suitable for use as woodland. Trees that tolerate wetness will grow best. Wetness hampers work for harvesting or for improving woodlands in winter or spring. Grasses and shrubs compete with the trees in a new planting.

This soil makes good foundation material and good fill for dams. It has too much clay, however, to be good roadfill. There are very few natural pond sites because the slope is not suitable. Excavated ponds are very likely to hold water.

Wetness limits the use of this soil as sites for homes. Drainage adequate for housing is difficult to achieve. Both surface and subsurface drains are needed, and good design and construction are essential. Absorption fields for septic tanks in this soil do not function well because of the seasonal wetness and slow permeability.

Capability subclass IIIw; woodland suitability subclass 2w.

MaB—Mahoning silt loam, 2 to 6 percent slopes. This is a gently sloping, deep, somewhat poorly drained soil on moraines. Small areas are at the head of drainage courses on the higher parts of the moraine. They typically slope toward a center line, which in many places is the drainage course. The large areas have nearly uniform slope. The areas have a variety of shapes and are 5 to 250 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer, about 3 inches thick, is yellowish brown, mottled, firm silty clay loam. The subsoil is about 20 inches thick. It is yellowish brown, mottled, firm silty clay loam. The substratum, to a depth of about 60 inches, is yellowish brown, mottled, firm clay loam till.

A few spots on the higher and steeper knolls are eroded, and there the plow layer is brown or yellowish brown. In a few included areas the surface or plow layer is almost black. In 20 to 30 percent of most of the large mapped areas the slope is less than 2 percent.

Included in mapping are small areas of the poorly drained Condit soils, which are on flats and in shallow depressions and minor natural drainageways. Also included are small areas of the moderately well drained Ellsworth soils on some of the higher and steeper knolls.

This soil has slow or very slow permeability and moderate available water capacity. Runoff is medium. The water table is at a depth of 6 to 18 inches in the wettest time of year. Organic-matter content is low or moderate. Tilth is fair. The root zone is acid, although there is natural lime at a depth below the root zone.

Most areas of this soil are used as cropland or pasture. This soil has good potential for crops, hay, pasture, and trees and fair to poor potential for many engineering uses.

Corn and soybeans are the main cultivated crops, but small grains and forage are also grown. The hazard of erosion is severe if this soil is farmed. Erosion reduces productivity by removing organic matter and exposing soil that has poor tilth.

The growing of cover crops and good management of residues are among the most suitable erosion-control practices on this soil. Near-contour cultivation is also practical in some of the larger areas.

The hazard of wetness is severe and must be overcome before good yields of most crops can be obtained. Subsurface drains must be spaced closely together because the soil has slow permeability. Suitable outlets for a tile drainage system are available in most areas. The soil is moderately productive if it is properly managed. Additions of lime, fertilizer, and organic matter are part of the management needed.

This soil is suitable for use as pasture. A variety of pasture plants can be grown. Birdsfoot trefoil is a more suitable pasture legume than alfalfa, especially in areas that are not adequately drained. This soil is soft early in spring, and grazing at that time can damage the pasture plants. Pastures commonly make good growth during the dry part of summer. The slope does not limit intensive management of pastures, and a cultivated crop can be grown when needed to aid in establishing a seeding and in controlling weeds.

This soil is suitable for use as woodland. Trees that tolerate wetness will grow best. Wetness limits any work in winter or spring for woodland management. Grasses and shrubs compete with the trees in a new planting.

This soil makes good foundation material and good fill for dams; it has too much clay to be good roadfill. There are only a few natural pond sites because the slope is gentle. Excavated ponds are very likely to hold water.

Wetness limits the use of this soil as sites for buildings. It is difficult to adequately drain the soil. Both surface and subsurface drains are needed, and the design and construction must be good. Absorption fields for septic tanks do not function well in this soil because of the seasonal wetness and slow permeability.

Capability subclass IIIe; woodland suitability subclass 2w.

MaB2—Mahoning silt loam, 2 to 6 percent slopes, eroded. This is a gently sloping, deep, somewhat poorly drained soil on moraines. It is eroded to a degree that productivity is reduced. The large areas have rather uniform slopes, and areas on the crest of the moraine have short irregular slopes. The areas have a variety of shapes and are 5 to 50 acres in size.

Typically, the surface layer is brown, friable silt loam about 8 inches thick. It has a few chunks of yellowish brown silty clay loam from the subsoil. The subsoil, about 18 inches thick, is yellowish brown, mottled, firm silty clay loam. The substratum, to a depth of about 60 inches, is yellowish brown, mottled, firm clay loam glacial till.

The degree of erosion on this soil varies considerably within a short distance. In most places, erosion is moderate. The plow layer is brown or dark brown silt loam and has chunks of yellowish brown silty clay loam. As much as one-third of some mapped areas is severely eroded, and in those areas the plow layer is yellowish brown silty clay loam. Parts of most mapped areas are slightly eroded; in those parts the plow layer is grayish brown silt loam. The severely eroded spots typically are in the higher and steeper parts of the landscape, and the uneroded places are the lowest and most concave parts. In as much as one-fourth of some mapped areas, the slope is less than 2 percent.

Included in mapping are small areas of the poorly drained Condit soils, which are on flats and in shallow depressions and minor natural drainageways. Also included are small areas of the moderately well drained Ellsworth soils on some of the higher and steeper knolls.

This soil has slow or very slow permeability and moderate available water capacity. Runoff is medium. The water table is at a depth of 6 to 18 inches in the wettest time of year. The organic-matter content is low. Tilth is fair to poor. This soil is acid in the root zone, although natural lime is in the soil at a greater depth.

Most areas of this soil are used as cropland. The soil has good potential for hay, pasture, and trees. It has fair to poor potential for many engineering uses.

Corn, soybeans, and small grains are the main crops. The hazard of erosion is severe if this soil is farmed. Erosion reduces productivity by removing organic matter and leaving a plow layer that has poorer tilth. Among the most practical methods for the control of erosion are growing hay crops and cover crops, using mulches, and near-contour cultivation.

The hazard of wetness is severe on this soil, and it must be overcome before good yields of most crops can be obtained. To get good drainage, subsurface drains must be spaced closely because of the slow permeability. Suitable outlets for tile drains are available in most areas.

Liming, fertilizing, and adding organic matter, along with drainage and control of erosion, are needed to get good yields of crops. Additions of organic matter are especially beneficial in restoring productivity of the soil in eroded spots.

This soil is suitable for use as pasture. A variety of pasture plants will grow well. Birdsfoot trefoil grows better than alfalfa, especially in areas where drainage is not adequate. The soil is soft early in spring, and grazing at that time can damage the pasture plants. Pastures commonly make good growth during the dry part of summer. The slope permits intensive pasture management, and a cultivated crop can be grown to aid in establishing a seeding and in controlling weeds. Estab-

lishing a seeding may be difficult in the severely eroded spots.

The soil is suitable for use as woodland. Trees that tolerate wetness will grow best. Wetness limits management of woodland in winter and spring. Grasses and shrubs compete with trees in new plantings.

This soil makes good foundation material and good fill for dams; it has too much clay to be good roadfill. There are only a few natural pond sites because the slope is gentle. Excavated ponds are very likely to hold water.

Wetness limits the use of this soil as sites for buildings. Adequate drainage for buildings is difficult to achieve. Both surface and subsurface drains are needed, and the design and construction must be good. Septic tank absorption fields do not function well because of seasonal wetness and the slow permeability of the soil.

Capability subclass IIIe; woodland suitability subclass 2w.

Os—Orrville Variant silt loam. This is a nearly level, moderately deep, somewhat poorly drained soil on flood plains. It is mainly in narrow, steep-sided valleys that are bounded by steep hills underlain by bedrock. In most areas the stream in the valleys flow on solid bedrock. The slope is less than 6 percent. The areas are elongated and are 2 to 10 acres in size.

Typically, the surface layer is dark brown, very friable silt loam about 4 inches thick. The subsoil, about 15 inches thick, is brown, yellowish brown, and grayish brown, mottled, friable silt loam. The substratum, to a depth of about 25 inches, is grayish brown, mottled, firm loam. Sandstone bedrock is at a depth of 25 inches.

The depth to bedrock typically is 20 to 40 inches, but it varies from 12 to 60 inches in most mapped areas. In places where the depth to solid rock is more than 40 inches, there is shattered or broken rock above the solid bedrock.

This soil has moderately rapid permeability and low available water capacity. Runoff is slow. The water table is at a depth of 6 to 18 inches in the wettest time of year. All the areas are subject to brief but frequent periods of flooding. The organic-matter content is moderate. Tilth is good. The root zone is limited by rock and by the water table.

Practically all areas of the soil are used as pasture or woodland. The soil has good potential for pasture and trees and poor potential for most engineering uses. Most of the areas are too narrow and inaccessible to be used conveniently as cropland. Also, the soil tends to be too wet in spring and too dry in summer for good growth of crops. The underlying rock interferes with attempts at artificial drainage. There is danger of damage to crops by floods.

The soil is suited to use as pasture. Grazing early in spring when the soil is soft can damage pasture plants. Pastures commonly do not make good growth during the dry part of summer because the available water capacity of the soil is low.

This soil is somewhat suitable for use as woodland. Trees that tolerate wetness will grow best. There are few good stands of timber on this soil.

This soil is poorly suited to use as sites for buildings because of its wetness and the hazard of flooding. Even brief or infrequent floods can cause extensive damage to houses and other buildings. The underlying bedrock interferes with a system of subsurface drainage. This soil is very poorly suited to use as a septic tank absorption field because of the moderate depth to rock, seasonal wetness, and hazard of flooding.

Capability subclass IIw; woodland suitability subclass 2w.

OtB—Oshtemo sandy loam, 2 to 6 percent slopes. This is a gently sloping, deep, well drained soil on terraces. The larger areas are on high terraces that are below rock hillsides but are above the valley floor. The slope of these areas is nearly uniform. This soil is also on small low terraces that have short irregular slopes. The areas are variable in shape and are mostly 5 to 25 acres in size.

Typically, the surface layer is dark brown, very friable sandy loam about 10 inches thick. The subsoil is about 50 inches thick. In the upper part it is yellowish brown, very friable sandy loam. In the middle part it is dark yellowish brown, very friable gravelly sandy loam, and in the lower part it is dark yellowish brown, loose and very friable loamy sand and gravelly sandy loam.

A few spots on the higher knolls are eroded, and there the plow layer is brown or yellowish brown. In a few spots the surface layer is gravelly sandy loam.

Included in mapping are small areas of the wetter Bogart and Jimtown soils, which are in low spots and seep areas. Also included are spots where the plow layer is dark colored.

This soil has moderately rapid permeability and low available water capacity. Runoff is medium. The organic-matter content is low. Tilth is good, and the root zone is thick.

Most areas of this soil are used as cropland; a small acreage is in woodland and pasture. The soil has good potential for crops, hay, pasture, and trees. It has good potential for many engineering uses.

This soil is well suited to use as cropland. The surface layer of sandy loam permits rapid intake of rainwater so that runoff and erosion are not excessive.

The hazard of drought is severe on this soil. Some crops, especially small grains, commonly do not get enough water during long dry periods. Additions of lime, organic matter, and fertilizer are needed for good yields of crops. Erosion is a hazard on this soil, but practices such as mulching and contour cultivation can give good control. This soil is well suited to vegetable and fruit crops. Its good natural drainage, gentle slope, and favor-

able texture make soil management easy for many crops. The good infiltration and moderately rapid permeability make this soil well suited to irrigation.

This soil is suitable for use as pasture. Its good natural drainage permits grazing early in spring. Growth of most pasture plants is slow during the dry part of summer because the available water capacity is low. Deep-rooted pasture plants such as alfalfa make the best growth during dry periods.

This soil is suitable for use as woodland, but there are few woodlots. A wide variety of trees will grow well. Potentially, this soil is suitable for production of nursery stock, especially if the soil is irrigated. Its good natural drainage and sandy texture permit the digging of nursery stock with minimum damage to roots.

This soil is sandy and porous. Commonly, it is stable foundation material when dry, but it is unstable when wet. It is good roadfill but is too porous for dam fill. Ponds dug in this soil are subject to seepage. There are very few natural pond sites.

The gentle slope and good natural drainage of this soil are favorable for its use as sites for buildings. Wetness is not a limitation. There may be some difficulty establishing a lawn because of the low available water capacity.

This soil is also suited to use as a septic tank absorption field. Permeability is adequate, and the water table is deep. There is danger of polluting ground water, however, when effluent is discharged into this soil.

Capability subclass IIIs; woodland suitability subclass 3s.

OtC—Oshtemo sandy loam, 6 to 12 percent slopes. This is a moderately sloping, deep, well drained soil on kames and terraces. Most of the areas are isolated knolls and sloping areas that are between two terrace levels. Such areas are variable in shape and are 2 to 10 acres in size. There are also a few large areas on rolling terraces where the slope is complex and irregular. These areas are irregular in shape and are 20 to 50 acres in size.

Typically, the surface layer is brown, very friable sandy loam about 10 inches thick. The subsoil is about 50 inches thick. In the upper part it is yellowish brown, very friable sandy loam. In the middle part it is dark yellowish brown, very friable gravelly sandy loam, and in the lower part it is dark yellowish brown, loose and very friable loamy sand and gravelly sandy loam.

There are many eroded spots where the plow layer is brown or yellowish brown. There are also a few spots where the plow layer is gravelly sandy loam. In many included areas the slope is outside the range of 6 to 12 percent, especially in the areas of irregular slope. The areas having slopes of less than 6 percent are on the top of knolls and in closed depressions. Those having slopes of more than 12 percent are on the sides of knolls and on slopes between terraces and flood plains.

Included also in mapping are small areas of the moderately well drained Bogart soils and the somewhat poorly drained Jimtown soils. These soils are in closed depressions and around springs and seeps.

This soil has moderately rapid permeability and low available water capacity. Runoff is medium. The organic-matter content is low. Tilth is good, and the root zone is deep.

In most areas this soil is used as cropland or pasture. It has good potential for crops, hay, pasture, and trees, and it has good potential for many engineering uses.

The hazard of erosion is severe where this soil is cultivated. Suitable practices to control erosion are no-till or minimum tillage culture of corn, return of crop residues to the soil, use of cover crops, and including hay in the crop rotation. There is a hazard of drought because of the low available water capacity of the soil. Additions of organic matter are especially beneficial in maintaining productivity. Lime and fertilizer are also needed.

This soil is suitable for use as pasture. Its good natural drainage permits grazing early in spring. Growth of most pasture plants is slow during the dry part of summer because the available water capacity is low. Deep-rooted pasture plants, such as alfalfa, will grow during the dry periods.

This soil is suitable for use as woodland. There are very few woodlots in areas of this soil. A wide variety of trees will grow well, including fruit trees.

This soil is sandy and porous. Commonly, it is stable foundation material when dry, but it is unstable when wet. It is good roadfill but is too porous for dam fill. Ponds dug in this soil are subject to seepage. Natural pond sites are few.

The good natural drainage of this soil is favorable for building sites. Erosion is a hazard during construction. In the areas of irregular slope, the best sites for buildings are on the high knolls. The permeability of this soil is adequate for a septic tank absorption field. The good natural drainage is also favorable. There is, however, a danger of downslope seepage of effluent and the pollution of nearby ground water.

Capability subclass IIIe; woodland suitability subclass 3s.

Pc—Pewamo silty clay loam. This is a nearly level, deep, dark-colored, very poorly drained soil in closed depressions and flats on till plains. It is in the lowest part of the landscape. Most of the areas are irregular in shape and are less than 10 acres in size. This soil is distinctive because of its dark color.

Typically, the surface layer is very dark grayish brown, firm silty clay loam about 13 inches thick. The subsoil is about 36 inches thick. In the upper part it is dark gray, mottled, firm silty clay loam. In the middle part it is gray, mottled, firm silty clay loam, and in the lower part it is mottled, gray, firm clay loam. The substratum, to a depth

of about 60 inches, is mottled, firm, gray, calcareous clay loam.

The dark-colored surface layer in most places is 10 to 16 inches thick; it extends below plow depth in many mapped areas. The water table is within 6 inches of the surface for long periods. Included in mapping are small areas where the surface layer is covered by a thin overwash of light-colored soil material.

This soil has moderately slow permeability and high available water capacity. Runoff is very slow. The organic-matter content is high. Tilth is good if the soil is worked at a suitable moisture content but can be very poor if the soil is worked when too wet.

Most areas of this soil are cultivated. The soil is well suited to all crops commonly grown if it is properly drained. Subsurface drains are effective if outlets are available. Suitable outlets are not available, however, to drain some of the closed depressions. After it is drained, this soil is highly productive.

This soil is also used as pasture. Most of the pastured areas are undrained. Bluegrass is the most common pasture plant. Grazing early in spring while the soil is soft can cause damage to pasture plants. Pastures commonly yield well during the dry part of summer.

Wetness is a limitation if this soil is used as woodland. Few plantings of trees are made on this soil.

This soil has severe limitations for use as sites for buildings, sanitary facilities, and recreational developments. Areas of this soil that are used for any of these purposes must be artificially drained. Sloughing is a problem if excavations are made. A suitable base commonly must be built for a road on this soil.

Capability subclass IIw; woodland suitability subclass 2w.

Pg—Pits, gravel. This is a miscellaneous area from which gravel has been removed. Most gravel pits are in areas of Chili or Conotton soils. Typically, the pits have nearly vertical sides and gently sloping bottoms. The side walls consist of gravelly soil material. The floor is gravelly in some pits; where all the gravel has been removed, it is loamy.

In general, the bottom of gravel pits is very poorly suited to crops. Some bottoms are droughty, and others are excessively wet. The organic-matter content and natural fertility typically are very low. Tilth is poor. Only plants that can tolerate these adverse soil conditions are suitable for planting.

The side walls of gravel pits erode easily and are unstable. Caving of the walls can be a hazard to persons or facilities in the pit. Some back cutting may be needed to make the slopes suitable for seeding. Drought-resistant grasses are the most suitable for seeding after the side walls have been graded.

Abandoned gravel pits have potential for recreation uses. Pits in which some gravel has been left can be graded and seeded and then used as parks, playgrounds, or picnic areas. Pits that have been excavated to or below the level of the water table can be developed as habitats for wetland wildlife.

Capability and woodland suitability classes are not assigned.

RnA—Ravenna silt loam, 0 to 2 percent slopes. This is a nearly level, deep, somewhat poorly drained soil on flats, in depressions, and at the head of natural drainageways on till plains. Typically, the areas are low on the landscape and are surrounded by Canfield soils. Most areas are elongated and are 2 to 10 acres in size, but a few areas are irregular in shape and are as large as 50 acres.

Typically, the surface layer is dark grayish brown, friable silt loam about 10 inches thick. The subsoil is about 35 inches thick. In the upper part it is yellowish brown, friable silt loam. In the middle part it is yellowish brown, mottled, firm and very firm silt loam, and in the lower part it is yellowish brown, mottled, firm and very firm loam. The substratum, to a depth of about 60 inches, is yellowish brown, mottled, firm loam glacial till.

In some areas the surface layer is loam, sandy loam, or gravelly loam. There are thin layers of sand and gravel in and below the subsoil in some areas that are in or near intermittent waterways.

The available water capacity above the fragipan is low. Permeability is moderate above the fragipan and slow in the fragipan. Runoff is slow. This soil has a perched seasonal high water table that is near the surface in winter, spring, and other long wet periods. It has a moderate organic-matter content. Tilth is good. The rooting depth is restricted mainly by the dense fragipan.

Most areas of this soil are so small that they are used as cropland, pasture, or woodland along with the surrounding soils. The large areas are used mainly as pasture or woodland. This soil has good potential for farming, pasture, and woodland, but poor potential as sites for buildings. The potential is fair or poor for sanitary facilities or for recreation.

The hazard of wetness is moderate if crops are grown on this soil. Subsurface drains, if properly installed, are moderately effective in lowering the water table. Surface drains are also needed in the areas subject to ponding. If drained, the soil is suited to all crops commonly grown in the area. There is little risk of erosion because the slope is gentle. Maintaining fertility and the content of organic matter and lime is needed in the management of this soil.

This soil is suited to use as pasture. Most pastures are in areas that have little or no artificial drainage. Such areas are better suited to grasses than to deep-rooted legumes. Grazing early in spring when the soil is soft can damage the pasture plants. Pastures commonly make good growth during the dry part of summer.

This soil is suited to use as woodland. Wetness interferes with practices for improvement or harvesting in

winter and spring. There is severe competition from grasses and shrubs if plantings of trees are made in the open.

This soil is not well suited to use as sites for homes because of its seasonal wetness. The slowly permeable fragipan and the wetness are limitations for use of this soil for sanitary facilities. There are good sites for ponds in some of the areas.

Capability subclass IIw; woodland suitability subclass 2w.

RnB—Ravenna silt loam, 2 to 6 percent slopes. This is a gently sloping, deep, somewhat poorly drained soil on till plains. Most of the areas are in upland draws at the head of natural drainageways. Most of them are long and narrow and are from 2 to 10 acres in size. In some areas on low knolls and ridges, the slopes are short and irregular. These areas are irregular in shape and are 10 to 50 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 35 inches thick. In the upper part it is yellowish brown, friable silt loam; in the middle part it is yellowish brown, mottled, firm and very firm silt loam; and in the lower part it is yellowish brown, mottled, firm and very firm loam. The substratum, to a depth of about 60 inches, is yellowish brown, mottled, firm loam glacial till. Some areas near drainageways have a surface layer that is gravelly silt loam.

Included with this soil in mapping are small areas of the poorly drained Condit soils in closed depressions and in small intermittent waterways. There are also small areas of the moderately well drained Canfield soils on some of the higher knolls and ridges. Also included are small areas of eroded soils on the higher and steeper knolls and some narrow strips where the soil has slope of less than 2 percent.

Permeability is moderate above the fragipan and slow in the fragipan. The available water capacity above the fragipan is low. Runoff is medium. This soil has a perched seasonal high water table near the surface in winter and spring and in other long wet periods. It has a moderate organic-matter content. Tilth is good. The depth of rooting is restricted mainly by the dense fragipan.

This soil is used mainly as cropland, pasture, and woodland. It has good potential for farming and for woodland use but poor potential for use as sites for buildings. The potential is fair or poor for sanitary facilities and for recreation uses.

This soil has a moderate hazard of erosion. Erosion reduces the depth to the fragipan and thus reduces the volume of soil from which plants can effectively extract water and nutrients. Wetness of the soil is also a limitation. Subsurface drains are moderately effective in lowering the water table. Most areas have suitable outlets. After drainage, the soil is suited to all the commonly grown crops. Maintaining fertility and the content of lime and organic matter is an important management need. Additions of organic matter can help control erosion and maintain tilth.

This soil is well suited to use as pasture. Most of the pastures are in areas that have little or no artificial drainage. Undrained areas are better suited to native grasses than to legumes. Grazing early in spring when the soil is soft can damage the sod. Pastures produce moderately well during the dry part of summer.

The soil is suitable for use as woodland. White pine and yellow poplar are among the trees most suitable for planting. Competition in new plantings can be reduced by spraying, mowing, and disking. Use of logging equipment usually is not feasible during the wet periods.

Seasonal wetness limits the use of this soil as a site for buildings. Distinct depressions and intermittent drainage courses should be avoided and high knolls should be favored in the selection of a homesite.

The slowly permeable fragipan and the wetness limit the use of this soil for sanitary facilities. Some areas are good sites for ponds.

Capability subclass IIe; woodland suitability subclass 2w.

RrC—Rigley sandy loam, 6 to 12 percent slopes. This is a sloping, deep, well drained soil on unglaciated hills. Most of the areas are on narrow benches that lie below steep sandstone ridges occupied by Schaffenaker soils and above moderately steep hillsides occupied by Lordstown soils. A few areas are on the top of steep-sided sandstone ridges. Most of the areas are high on the landscape. They are elongated and are 5 to 20 acres in size.

Typically, the surface layer is very dark gray and dark brown, very friable sandy loam about 3 inches thick. The subsoil is about 31 inches thick. It is yellowish brown and strong brown, very friable and friable sandy loam and channery sandy loam. The substratum, to a depth of about 42 inches, is weakly bonded sandstone. Hard bedrock is at a depth of about 42 inches.

In areas that have been plowed, the surface layer is brown sandy loam. Included in mapping are some small areas in which the depth to hard rock is 20 to 40 inches. These areas of more shallow soil are most common on the ridgetops. There are also included areas in which clay shale is the bedrock at a depth of 4 feet or more.

This soil has moderately rapid permeability and low available water capacity. Runoff is rapid. The depth to the water table is more than 3 feet. The organic-matter content is low. Tilth is good.

Practically all the areas of this soil are wooded. This soil has fair to good potential for pasture and trees and poor potential for most engineering uses.

The hazard of drought is severe if this soil is used as cropland or pasture, because of the sandy texture and low available water capacity.

This soil is suited to use as woodland. A wide variety of trees will grow well. Trees do not grow so rapidly as on soils that are less droughty. This soil is suitable for fruit trees and for production of nursery stock.

This soil is not well suited to use as a site for buildings because of the limited depth to bedrock. It is also poorly suited to use as a septic tank absorption field. There is danger that the effluent will seep downslope. The effluent will seep into cracks in the underlying rock and can pollute nearby ground water.

Capability subclass IIIs; woodland suitability subclass 2o.

RsB—Rittman silt loam, 2 to 6 percent slopes. This is a gently sloping, moderately deep, moderately well drained soil on till plains. It has a dense layer in the subsoil, called a fragipan, which restricts growth of roots and movement of water. The soil is on broad hilltops between steep-sided valleys. These areas have long, uniform slopes and are irregular in shape; they are 20 to 200 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The subsoil is about 36 inches thick. In the upper part it is yellowish brown, mottled, firm silty clay loam. In the middle part it is a firm dense fragipan that is yellowish brown and dark yellowish brown, mottled, very firm silty clay loam and clay loam. In the lower part it is yellowish brown, mottled, firm clay loam. The substratum, to a depth of about 60 inches, is brown, mottled, firm clay loam glacial till.

The depth to natural lime is 42 to 60 inches. The depth to rock typically is more than 5 feet, but in a few included areas the soil is underlain by shale or sandstone at a shallower depth.

A few included spots are eroded, and there the surface layer is dark brown. In 10 to 15 percent of most mapped areas the slope is less than 2 percent. These nearly level areas are in the center of hilltops away from the valley sides. Also included in mapping are small areas of the somewhat poorly drained Wadsworth soils in depressions and on the concave part of slopes. These wet inclusions make up 5 to 15 percent of most of the large mapped areas. There are also small areas of Lykens soils, in which a silty water-laid deposit overlies glacial till. In these areas, tilth is better than is typical of this soil.

This soil has moderate permeability above the fragipan and slow permeability in and below the fragipan. It has moderate available water capacity. Runoff is medium. The water table is at a depth of 18 to 36 inches during the wettest part of each year. The organic-matter content is moderate. Tilth is fair. The root zone is restricted by the dense fragipan.

Most areas of this soil are used as cropland or improved pasture or for nonfarming purposes. The soil has good potential for hay, pasture, and trees and fair potential for crops and for many engineering uses.

This soil is suitable for use as cropland. The hazard of erosion is moderate in cultivated areas. Erosion reduces the thickness of the root zone. Most of the areas have long, uniform slopes and are well suited to erosion-control practices. Near-contour cultivation and growing cover crops and hay are suitable methods of controlling erosion. In most areas, natural drainage is adequate for crops, but randomly spaced subsurface drains are helpful in draining wet spots. Additions of lime, fertilizer, and organic matter are needed to obtain good yields of crops.

This soil is suited to use as pasture. All pasture plants common in the county will grow well. The slope is favorable for intensive management of pastures, and a crop can be grown occasionally to aid in establishing a seeding and controlling weeds. Pastures can be grazed early in spring, and they make good growth during the dry part of summer.

This soil is suitable for use as woodland. Many trees common in the area will grow well. Competition from grasses and shrubs is severe if plantings of trees are made in the open.

This soil makes good foundation material and good fill for dams. It commonly has too much clay to be good roadfill. There are few natural pond sites because the slope is gentle. Excavated ponds are likely to hold water.

Wetness is a moderate limitation for use of this soil as sites for buildings because the water table is high late in winter and early in spring. During this time of year, water commonly seeps along the top of the fragipan and can damage the walls of a basement. The hazard of wetness is likely to be less severe on the higher knolls. The permeability of this soil is slower than that needed for a septic tank absorption field. The high water table in winter and spring also is a limitation because it would interfere with disposal of the effluent.

Capability subclass IIe; woodland suitability subclass 1o.

RsB2—Rittman silt loam, 2 to 6 percent slopes, eroded. This is a gently sloping, moderately deep, moderately well drained soil on till plains. It has a dense subsoil, a fragipan, that restricts growth of roots and movement of water. This soil is on broad hilltops between steep-sided valleys. The areas have long, uniform slopes. Areas are irregular in shape and are 5 to 100 acres in size.

Typically, the surface layer is dark brown silt loam, about 7 inches thick, that has a few chunks of subsoil material. The subsoil is about 34 inches thick. In the upper part it is yellowish brown, mottled, firm silty clay loam. In the middle part it is a firm dense fragipan of yellowish brown, mottled, very firm silty clay loam and clay loam. In the lower part it is yellowish brown, mottled, firm clay loam. The substratum, to a depth of about 60 inches, is brown, mottled, firm clay loam glacial till.

Color and texture of the surface layer range from dark grayish brown silt loam in protected spots to yellowish brown silty clay loam in severely eroded spots. The most severely eroded spots typically are on the higher and steeper parts of the landscape.

Included in mapping are small areas of the somewhat poorly drained Wadsworth soils in depressions and on the concave part of slopes. These soils make up 10 to 15 percent of most of the large mapped areas. Also included are narrow natural drainageways in which the soil is grayer, more mottled, and not so firm as the typical Rittman soil.

This soil has moderate permeability above the fragipan and slow permeability in and below the fragipan. It has moderate available water capacity. Runoff is medium. The water table is at a depth of 18 to 36 inches during the wettest time of year. The organic-matter content is low to moderate. Tilth is fair. The root zone is restricted by the dense fragipan.

Most areas of this soil are used as cropland. The soil has good potential for hay, pasture, and trees. It has fair potential for many engineering uses.

Most areas of this soil are significantly eroded, and the hazard of further erosion is moderate if the soil is cultivated. The degree of erosion varies considerably within most of the mapped areas. Erosion reduces the thickness of the root zone over the restrictive fragipan. In the more severely eroded spots, the fragipan is at a depth of only about 12 inches compared to about 24 inches in the uneroded soil. This means that the root zone from which crops can extract water and nutrients is only one-half as thick, and productivity is reduced. In most areas the slope is uniform and is suited to erosion-control practices. Contour cultivation, cover crops, and hay in the rotation are suitable practices. Additions of manure and other organic materials will aid in restoring productivity of the eroded soil. Additions of lime and fertilizer are also needed. Natural drainage is generally adequate for farming, but randomly spaced subsurface drains are helpful in some places.

This soil is suited to use as pasture. All pasture plants common in the county grow well. The slope does not limit intensive management of pasture. A cultivated crop grown occasionally will aid in establishing a seeding of pasture plants after the crop and in controlling weeds. Pastures can be grazed early in spring, and they make good growth during the dry part of summer.

This soil is suitable for use as woodland. Many trees common to the area grow well. Competition from grasses and shrubs is severe if plantings of trees are made in the open.

This soil makes good foundation material and good fill for dams. It commonly has too much clay to be good roadfill. There are few natural pond sites because the slope is gentle. Excavated ponds are likely to hold water.

The seasonal wetness of this soil is a limitation to its use as sites for buildings. The permeability is slower than that needed for a septic tank absorption field. The seasonal high water table interferes with the disposal of the effluent, particularly in winter and spring.

Capability subclass IIe; woodland suitability subclass 1o.

RsC—Rittman silt loam, 6 to 12 percent slopes. This is a moderately sloping, moderately deep, moderately well drained soil on till plains. It is on the side slopes of small natural drainage courses that start on the till plain and on the upper slopes of larger hills. It has a dense layer, or a fragipan, in the subsoil. The fragipan restricts growth of roots and movement of water. Some areas of the soil slope only in one direction, and others include opposite slopes of a small valley. The areas are mostly elongated and are 5 to 50 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The subsoil is about 34 inches thick. In the upper part it is yellowish brown, mottled, firm silty clay loam. In the middle part it is a firm dense fragipan that is yellowish brown and dark yellowish brown, mottled, very firm silty clay loam and clay loam. In the lower part it is yellowish brown, mottled, firm clay loam. The substratum, to a depth of about 60 inches, is brown, mottled, firm clay loam glacial till.

A few included spots are eroded, and in those places the surface layer is dark brown. Also included are small areas of the somewhat poorly drained Wadsworth soils on the lower part of some slopes and around springs and seep areas and Shoals and Holly soils on the bottom lands of some narrow valleys.

This soil has moderate permeability above the fragipan and slow permeability in and below the fragipan. It has moderate available water capacity. Runoff is rapid. The water table is at a depth of 18 to 36 inches during the wettest time of year. The organic-matter content is moderate. Tilth is fair. The root zone is restricted by the dense fragipan.

Most areas of this soil are used as permanent pasture or woodland. The soil has good potential for hay, pasture, and trees. It has fair potential for many engineering uses.

The hazard of erosion is severe if this soil is cultivated. Erosion can seriously affect the productivity of the soil by reducing the thickness of the root zone over the restrictive fragipan and by leaving a soil that has poorer tilth. This soil can be used for a row crop occasionally if care is taken to control erosion. Contour cultivation is a suitable practice if crops are grown. Lime and fertilizer are needed to produce good yields. Natural drainage of this soil generally is adequate for farming, but randomly spaced subsurface drains are helpful in draining wet spots.

This soil is suitable for use as pasture. All the pasture plants common in the county will grow well. Pastures can be grazed early in spring, and they make good growth during the dry part of summer. The slope does

not limit intensive management of pastures. A cultivated crop can be grown occasionally to aid in establishing a seeding after the crop and in controlling weeds.

This soil is suitable for use as woodland. Many trees common in the area will grow well. Competition from grasses and shrubs is severe if plantings of trees are made in the open.

This soil is good foundation material and good fill for dams, but it commonly has too much clay to be good roadfill. There are good natural pond sites where this soil is on both sides of a small natural drainageway. Excavated ponds are likely to hold water.

This soil has some limitations to use as sites for buildings because of its slope and seasonal wetness. Water commonly seeps along the top of the fragipan in winter and spring and can cause damage to a basement wall. Erosion is a hazard in areas that are graded during construction. Immediate reseeding of such areas generally will prevent damage.

The permeability of this soil is considerably slower than that needed for a septic tank absorption field. The slope and seasonal wetness also interfere with disposal of effluent. Downslope seepage of effluent will take place along the top of the fragipan.

Capability subclass IIIe; woodland suitability subclass 1o.

RsC2—Rittman silt loam, 6 to 12 percent slopes, eroded. This is a moderately sloping, moderately deep, moderately well drained soil on till plains. It has a dense layer, or a fragipan, in the subsoil. The fragipan restricts the growth of roots and the movement of water. This soil is on the side slopes of small natural drainage courses that start on the till plain and on the upper slopes of hills. Some of the areas slope only in one direction, and others include opposite slopes of a small valley. The areas are mostly elongated and are 5 to 40 acres in size.

Typically, the surface layer is dark brown, friable silt loam, about 7 inches thick, that has a few chunks of subsoil material. The subsoil is about 34 inches thick. In the upper part it is yellowish brown, mottled, firm silty clay loam. In the middle part it is a firm dense fragipan that is yellowish brown, mottled, very firm silty clay loam and clay loam. In the lower part it is yellowish brown, mottled, firm clay loam. The substratum, to a depth of about 60 inches, is brown, mottled, firm clay loam glacial till.

The color and texture of the surface layer range from dark grayish brown silt loam in uneroded places to yellowish brown silty clay loam in severely eroded spots. A few areas are severely eroded throughout, but most of the severe erosion is in spots of less than an acre in the higher and steeper places. The restrictive fragipan is at a depth of 12 to 18 inches in the uneroded places and can be at a depth of 8 inches in severely eroded spots. The depth to natural lime is 30 to 54 inches; it is less in the eroded spots.

Included in mapping are small areas of the somewhat poorly drained Wadsworth soils on the lower part of some slopes and around springs and seep areas. Other inclusions are the bottom lands of some narrow valleys. Shoals and Holly soils and some deposits of gravelly material are in those valleys.

This soil has moderate permeability above the fragipan and slow permeability in and below the fragipan. It has low available water capacity. Runoff is rapid. The water table is at a depth of 18 to 36 inches in the wettest time of year. The organic-matter content is low to moderate. Tilth is fair to poor. The rooting depth is restricted by the dense fragipan.

In most areas this soil is used as cropland. The soil has good potential for hay, pasture, and trees. It has fair potential for many engineering uses.

The hazard of erosion is severe if this soil is cultivated. The soil is eroded enough that productivity has been reduced. Erosion can be controlled if the soil is kept in hay most of the time. Contour cultivation is essential if a cultivated crop is grown. Additions of manure and other organic materials are especially beneficial in restoring productivity in eroded spots. Lime and fertilizer are also necessary for good yields. Natural drainage is adequate for farming, but randomly spaced subsurface drains are useful in wet spots.

This soil is suitable for use as pasture. All the pasture plants common to the county will grow well. Pastures can be grazed early in spring, and they make good growth during the dry part of summer. The slope does not limit intensive management of pastures. An occasional cultivated crop can be grown to aid in establishing a seeding after the crop and in controlling weeds. Establishing a seeding is likely to be difficult in the most severely eroded areas.

This soil is suited to use as woodland, but few areas are wooded. Many trees common to the area will grow well. Competition from grasses and shrubs is severe if plantings of trees are made in the open.

This soil is good foundation material and good fill for dams, but it commonly has too much clay to be good roadfill. There are good natural sites for ponds, particularly where this soil is on both sides of a small natural drainageway. Excavated ponds are likely to hold water.

This soil has some limitations for use as sites for buildings because of slope and seasonal wetness. Water that commonly seeps along the top of the fragipan in winter and spring can damage basement walls. There is a hazard of erosion in areas that are graded during construction. Early seeding of such areas is needed.

The permeability of this soil is considerably slower than that needed for a septic tank absorption field. The slope and seasonal wetness also interfere with disposal of effluent. Downslope seepage of effluent will occur along the top of the fragipan.

Capability subclass IIIe; woodland suitability subclass 1o.

RsD2—Rittman silt loam, 12 to 18 percent slopes, eroded. This is a moderately steep, moderately deep, moderately well drained soil on the side slopes of stream valleys cut into till plains. It has a dense layer in the subsoil. This layer is a fragipan that restricts the growth of roots and the movement of water. Most areas are eroded to some degree, but the degree of erosion is variable. Areas are elongated and are 5 to 30 acres in size. In most areas the slope is in only one direction, but some of the areas include the two opposite slopes of a small valley.

Typically, the surface layer is dark brown, friable silt loam about 7 inches thick. The subsoil is about 33 inches thick. In the upper part it is yellowish brown, mottled, firm silty clay loam. In the middle part it is a firm dense fragipan that is yellowish brown, mottled, very firm silty clay loam or clay loam. In the lower part it is yellowish brown, mottled, firm clay loam. The substratum, to a depth of about 60 inches, is brown, mottled, firm clay loam glacial till.

In a cultivated field, the surface layer ranges from dark grayish brown silt loam in less eroded spots to yellowish brown silty clay loam where erosion is severe. A few of the areas are severely eroded throughout, but in most the severely eroded spots are less than an acre in size and are in the higher and steeper places.

Included in mapping are small areas of the somewhat poorly drained Wadsworth soils, which are on the lower part of some slopes and around springs and seep areas. Shoals and Holly soils and some deposits of gravelly material on the bottom lands of some narrow valleys are also included. Other inclusions are areas of the well drained Wooster soils on some of the steeper slopes.

This soil has moderate permeability above the fragipan and slow permeability in and below the fragipan. It has low available water capacity. Runoff is rapid. The water table is at a depth of 18 to 36 inches in the wettest time of year. The organic-matter content is low to moderate. Tilth is fair. The root zone is restricted by the dense fragipan.

This soil is used as cropland, pasture, and woodland. It has good potential for hay, pasture, and trees and fair to poor potential for many engineering uses.

The hazard of erosion is severe if this soil is farmed. Practically all the areas that have been cultivated are significantly eroded. Erosion can be controlled by keeping the soil in hay as much of the time as possible. A row crop can be grown occasionally, but special care should be taken to prevent erosion. Natural drainage of this soil generally is adequate for farming.

This soil is suitable for use as pasture, and all the pasture plants common to the county will grow well. Pastures can be grazed early in spring, and they make good growth during the dry part of summer. Overgrazing of pastures can cause further erosion. Establishing a seeding commonly is difficult in the eroded areas.

The soil is suited to use as woodland. Many of the trees common to the area will grow well. Erosion is a hazard when logging is done, particularly along the trails. Competition from grasses and shrubs is severe if plantings of trees are made in the open.

This soil is good foundation material and good fill for dams, but it commonly has too much clay to be good roadfill. There are good natural pond sites, particularly in places where this soil is on both sides of a small valley. Excavated ponds are likely to hold water.

This soil has some limitations to use as a site for buildings because of its slope and seasonal wetness. There is a severe hazard of erosion during construction. Commonly, water seeps along the top of the fragipan in wet periods, and it can damage the walls of a basement.

The soil is poorly suited to use as a septic tank absorption field because of its slope and slow permeability. Downslope seepage of effluent along the top of the fragipan is a major hazard.

Capability subclass IVe; woodland suitability subclass 1r.

ScE—Schaffenaker loamy sand, 10 to 40 percent slopes. This is a moderately sloping to very steep, moderately deep, well drained soil that is mostly on high, narrow, sandstone ridges that rise above the surrounding unglaciated landscape. These ridges are a quarter of a mile to a mile long and 300 to 600 feet wide. Most mapped areas include both side slopes of the ridge along with the narrow ridgetop. The ridgetop typically makes up about one-fourth of the width of a mapped area. Slope of the ridgetop typically is 10 to 15 percent; that of the sides ranges from 15 to 40 percent.

Typically, the surface layer is very dark grayish brown, very friable loamy sand about 2 inches thick. The subsurface layer, about 4 inches thick, is dark brown and yellowish brown, loose loamy sand. The subsoil, about 22 inches thick, is yellowish brown, loose loamy sand. Sandstone is at a depth of about 28 inches.

The depth to rock is dominantly 20 to 40 inches but ranges from 10 to 50 inches in most areas of this soil. Large stones and boulders are on the surface in many places. A few areas have large blocks of sandstone that are about 20 feet on each side and are not connected to bedrock.

Included in mapping are small areas of Rigley soils along the base of the ridges. These areas are less droughty than the Schaffenaker soil.

This soil has rapid permeability and very low available water capacity. Runoff in the wooded areas is moderate. Generally there is no water table. This soil has very low organic-matter content, and it commonly is very acid and infertile. Tilth is fair to good.

Practically all areas of this soil are in woodland. The soil is very poorly suited to use as cropland or pasture

because it is droughty, stony, sloping to steep, and has low fertility. Trees grow very slowly because they do not get enough water. Trees on this soil must tolerate the acid reaction, sandy texture, and droughty soil. Slope and stones in some areas interfere with practices for managing the woodland and harvesting the products.

This soil commonly is not good material for foundations. It is porous and commonly is poorly suited to use as roadfill. There are very few natural pond sites. This soil is poorly suited to onsite disposal of waste.

Capability subclass IVs; woodland suitability subclass 4s.

Sg—Sebring silt loam. This is a nearly level, deep, poorly drained soil in areas that held shallow lakes in postglacial times. The soil material that was laid down in these shallow lakes had a high content of silt and few pebbles. Areas of this soil are typically on the lowest part of the landscape and are surrounded by areas of more sloping soils of the terraces or uplands. Some areas are circular closed depressions, and others are elongated low places that open into a stream valley at one end. A few large areas along the headwaters of Black River are 50 to 100 acres in size. Most of the others are 2 to 10 acres.

Typically, the surface layer is dark gray, friable silt loam about 8 inches thick. The subsoil is about 29 inches thick. In the upper part it is gray and grayish brown, mottled, firm silty clay loam; and in the lower part it is grayish brown, mottled, firm silt loam and silty clay loam. The substratum, to a depth of about 60 inches, is mostly grayish brown, mottled, firm silt loam, but there are a few thin sandy layers.

The only pebbles in this soil are in thin layers at a depth of more than 4 feet, except in places where a few pebbles from nearby slopes have been washed onto the surface.

Included in mapping are small areas of a soil that is like the Sebring soil to a depth of 3 to 4 feet but is gravelly loam or compact glacial till below that depth. Also included are small areas of the very poorly drained, dark-colored Luray soils.

This soil has moderately slow permeability and high available water capacity. Runoff is very slow. The water table is within 6 inches of the surface for long periods. Some of the included areas of Luray soils are ponded late in winter and early in spring, and some are flooded occasionally. The organic-matter content is moderate. Tilth is fair. The rooting depth is restricted by the high water table.

The use of this soil depends largely on the degree to which the natural wetness has been overcome. Some areas are adequately drained and are used successfully as cropland. Most of the undrained areas are used as pasture or woodland. This soil has poor potential for farming and poor potential for most engineering uses.

Wetness is a severe limitation if this soil is used for farming. Both surface and subsurface drains are needed in most areas. Subsurface drains are effective, but good natural outlets are not available in many areas. This soil is moderately productive if adequately drained.

This soil is only moderately suited to use as pasture. Pasture plants grow best in the drained areas. The soil is soft early in spring, and pasture plants can be damaged by grazing at that time. Pasture plants grow well during the dry part of summer.

This soil is poorly suited to use as woodland. Trees that tolerate wetness will grow best.

The soil has a high content of silt and is not well suited to engineering uses. It does not pack well and is a poor source of foundation material, dam fill, or roadfill. There are natural pond sites in some areas. The natural wetness of this soil is a severe limitation to its use as sites for houses or as septic tank absorption fields.

Capability subclass IIIw; woodland suitability subclass 2w.

Sh—Shoals silt loam. This is a nearly level, deep, somewhat poorly drained soil on flood plains.

In the wide valleys, the soil typically is near the center of the valley. It is highest next to the stream channel, and it slopes uniformly toward a wetter soil along the edge of the valley. In some places it extends to the stream, and in others a narrow strip of the moderately well drained Lobdell soil is next to the channel. In the wide valleys the slope is generally less than 2 percent and more typically less than 1 percent. The areas of this soil are elongated and are 20 to 100 acres in size.

In the narrow valleys, this soil extends across the entire bottom. In these areas it is extremely variable and has many inclusions of other soils. These areas are elongated; some are as much as 2 miles long, and they are 5 to 50 acres in size. The slope is mostly 1 to 2 percent and is in the downstream direction.

Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The subsoil is about 24 inches thick. In the upper part it is dark grayish brown, mottled, friable silt loam. In the middle part it is brown, mottled, friable silt loam; and in the lower part it is grayish brown, mottled, friable silt loam. The substratum, to a depth of about 60 inches, is grayish brown and brown, mottled, friable and very friable silt loam, and there are thin strata of sandy and gravelly material.

In some places, a thin fresh deposit of soil material is on the surface of this soil. The slopes are generally nearly level, but on the banks of some old stream channels they are short and nearly vertical. There are more stones and pebbles in the narrow valleys than elsewhere, and pockets or layers of gravel or broken rock are common below a depth of 3 feet in these areas.

Included in mapping are small areas of the poorly drained Holly soils in old stream channels and around springs and areas of the moderately well drained Lobdell

soils on knolls and narrow natural levees. In a few areas in Hanover Township this Shoals soil is more acid than is typical.

This soil has moderate permeability and high available water capacity. Runoff is slow. The water table is at a depth of 12 to 36 inches in the wettest time of year. All the areas are subject to flooding, although some are now partly protected. The frequency and duration of flooding are variable. Ponding is uncommon but does occur in some very low areas. The soil has moderate organic-matter content. Tilth is good.

This soil is used as cropland, pasture, and woodland. The use is determined as much by shape and location of the areas as by nature of the soil. This soil has good potential for hay and pasture. It has poor potential for most engineering uses.

Wetness is a moderate limitation if this soil is farmed. Subsurface drains are effective, but most areas lie only a few feet above the stream and do not have suitable natural outlets. This soil is well suited to use as cropland if it is adequately drained. Late crops such as corn and soybeans are less likely than others to be damaged by wetness or floods.

Many areas of this soil are suited to crops but are not farmed because they are narrow strips, are not accessible, or are cut by old stream channels. Such areas, and also those that do not have adequate drainage, are suitable for pasture. Grasses are the best suited pasture plants. Fertilized bluegrass commonly grows well during the dry part of summer. Grazing early in spring when the soil is soft is likely to damage the pasture plants. Areas that are not drained commonly are too wet to be suited to legumes in a pasture mixture.

This soil is moderately well suited to use as woodland. Trees that can tolerate some wetness and flooding will grow best. Flooding and wetness restrict the harvesting of wood products late in winter or in spring. Competition from grasses and shrubs is severe if plantings of trees are made in the open.

This soil does not pack very well. It is poor material for foundations and poor fill for dams. The soil commonly is too clayey to be good roadfill. Few natural pond sites are available. Excavated ponds are not likely to hold water. All ponds constructed on this soil are subject to damage by floods.

The wetness and flooding make this soil poorly suited to use as sites for buildings. The soil also is poorly suited to use as a septic tank absorption field.

Capability subclass IIw; woodland suitability subclass 2o.

Sn—Sloan silty clay loam. This is a nearly level, deep, dark-colored, very poorly drained soil on flood plains. Typically, it is on the lowest part of the flood plain, away from the stream channel and next to the outside edge. These areas are flooded more often and for longer periods than other parts of the flood plain. The slope is less than 2 percent. Most of the areas are elongated and are 5 to 50 acres in size.

Typically, the surface layer is very dark gray, friable silty clay loam. A subsurface layer, about 9 inches thick, is black, friable silty clay loam. The subsoil is about 32 inches thick. In the upper part it is dark gray, mottled, firm silty clay loam. In the middle part it is grayish brown, firm loam, and in the lower part it is grayish brown, mottled, friable stratified loam and silt loam. The substratum, to a depth of 60 inches, is dark gray, mottled, firm stratified loam, silt loam, and silty clay loam.

In most of the areas, the surface layer is less than 12 inches thick. In places, a thin covering of light-colored soil overlies the dark surface layer. Included in mapping are small areas of the Algiers and the Killbuck soils, both of which have more than 12 inches of light-colored soil material over the surface layer. Also included are areas of a soil that has a black silty clay surface layer and a dark gray silty clay subsoil. Most of these included soils are in the wider parts of the Jerome Fork Valley. The included soils have very poor tilth and are not so productive as the Sloan soil.

This soil has moderately slow or moderate permeability and high available water capacity. Runoff is very slow. The water table is within 6 inches of the surface for long periods. Most areas are subject to flooding, and many remain ponded for a long time after the flood recedes. The organic-matter content is high. Tilth is good.

This soil is used as cropland and pasture. It has good potential for crops, hay, and pasture. It has poor potential for most engineering uses.

Wetness is a severe limitation if this soil is farmed. Subsurface and surface drainage systems are needed in most areas. Any drainage system is subject to damage by floods. The soil is highly productive if drained. The included areas tha' have a surface layer of silty clay commonly have poor tilth.

Areas of this soil that cannot be drained adequately for use as cropland are suitable for pasture. Bluegrass and canarygrass are suitable for pastures, and they produce well during the dry part of summer. Grazing early in spring, when the soil is soft and muddy, can damage the pasture plants.

The soil is poorly suited to trees. Trees that can tolerate wetness will grow best.

Areas of this soil that cannot be drained adequately for use as cropland or pasture are suitable for use as a habitat for wetland wildlife. A few areas have vegetation of cattails and marsh grasses.

This soil does not pack well so it is not suitable as material for foundations or as fill for dams, and it is too clayey for good roadfill. A few natural pond sites are available. Ponds on this soil are subject to damage by floods. Wetness and the hazard of flooding make this soil unsuited to use as sites for buildings or septic tank absorption fields.

Capability subclass IIIw; woodland suitability subclass 2w.

ToA—Tiro silt loam, 1 to 4 percent slopes. This is a nearly level to gently sloping, deep, somewhat poorly drained soil in places where a thin deposit of water-laid soil material overlies compact glacial till. Such areas are along the edges of terraces and old lake beds. Most areas are irregular in shape and are 2 to 10 acres in size. Most of them are islands in larger areas of Bennington or Wadsworth soil.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer, about 3 inches thick, is yellowish brown and grayish brown, friable silty clay loam and silt loam. The subsoil is 31 inches thick. In the upper part it is yellowish brown, mottled, firm to friable silty clay loam and silt loam. In the middle part it is yellowish brown, mottled, friable loam, and in the lower part it is yellowish brown, mottled, firm silty clay loam. The substratum, to a depth of about 60 inches, is yellowish brown, mottled, firm clay loam till.

Included in mapping are a few small areas where this soil has a dark-colored surface layer and a few small areas where it has a surface layer of sandy loam. Also included in mapping are small areas of the poorly drained Sebring, Condit, or Trumbull soils, which are in shallow depressions and minor natural drainageways. These wetter soils make up 5 to 15 percent of most of the mapped areas.

This soil has moderate permeability in its upper layers, and slow or moderately slow permeability in the underlying glacial till. The available water capacity is high. Runoff is medium. The water table is at a depth of 6 to 18 inches in the wettest time of year. The organic-matter content is moderate. Tilth is good. The depth of rooting is restricted only by the water table.

Most areas of this soil are used as cropland or pasture. The soil has good potential for crops, hay, pasture, and trees. It has fair to good potential for most engineering uses.

Wetness is a moderate limitation if this soil is farmed. Artificial drainage is needed for most crops. Subsurface drains are effective if outlets are available. Water commonly moves laterally along the surface of the underlying compact glacial till. This soil is productive and is suited to all the common crops if it is adequately drained. Maintaining fertility and the content of lime is needed. There is a slight hazard of erosion on the low knolls.

This soil is suitable for use as pasture. Pasture plants that tolerate wetness will grow well. The soil is soft early in spring, and grazing at that time can damage the pasture plants. Pasture plants grow fairly well during the dry part of summer.

A very small acreage is wooded. Trees that can tolerate some wetness will grow best. Competition from grasses and shrubs is severe in new plantings of trees.

This soil has a high content of silt and clay. It does not pack well. It is poor material for foundations and poor fill for dams. The underlying glacial till, however, is firm and compact, and it is good material for those uses. There are very few natural pond sites on this soil. Ponds dug into the underlying glacial till are likely to hold water.

Seasonal wetness limits the use of this soil as a site for buildings. Water commonly seeps along the top of the underlying glacial till; thus, wetness is a problem in buildings that have a basement. The lower part of this soil has permeability slower than that needed for a septic tank absorption field. The seasonally high water table also interferes with disposal of effluent.

Capability subclass IIw; woodland suitability subclass 2o.

Ud—Udorthents. This map unit consists of loamy soils that have been altered by cutting, filling, or leveling. About two-thirds of the acreage consists of the right-of-ways of Interstate Highway 71 and of U. S. Highway 30. The map unit includes the banks formed by cutting and filling for the highways, the traffic lanes, the median strips, and the interchanges. It also includes athletic fields, airport runways, deep railroad cuts, and small pits from which material other than gravel has been excavated.

Some information about the nature of the soil material generally can be obtained by onsite investigation. In most places the soil material is loamy glacial till; in many places the material is similar to that in the substratum of the Canfield and Rittman soils.

Erosion on cuts and on filled banks is the major problem of soil management in most areas of this map unit. Planting crown vetch or grass is the most common practice for control of erosion. Some areas, athletic fields, for example, need surface and subsurface drainage.

Capability and woodland suitability subclasses are not assigned.

Ur—Urban land. This map unit consists of areas that are mostly covered by pavement or by buildings. In such areas, information about the soil is not easily obtained. Runoff from these areas is very rapid, and properly designed water-disposal routes are essential to prevent erosion.

Capability and woodland suitability subclasses are not assigned.

WaA—Wadsworth silt loam, 0 to 2 percent slopes. This is a nearly level, deep, somewhat poorly drained soil on flats and in shallow depressions and natural drainageways on till plains. This soil has a dense layer, or fragipan, that restricts growth of roots and movement of water. Most areas of this soil are low on the landscape and are surrounded by the moderately well drained Rittman soils. The areas are irregular in shape and are 2 to 100 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 43 inches thick. In the upper part it is yellowish brown, mottled, firm and friable silt loam, silty clay loam, and clay loam. In the middle part it is dark yellowish brown and yellowish brown, mottled, very firm clay loam. This is the fragipan. In the lower part, the subsoil is dark yellowish brown, mottled, firm clay loam. The substratum, to a depth of about 72 inches, is dark yellowish brown, mottled, firm loam glacial till.

Included in mapping are small areas of the poorly drained Condit soils in very low spots and in the bottoms of narrow natural drainage courses.

This soil has moderately slow or moderate permeability above the fragipan and slow permeability in and below the fragipan. The available water capacity is moderate. Runoff is slow. The water table is held at a depth of 6 to 18 inches by the fragipan. Some of the low areas are ponded for brief periods. The organic-matter content is moderate. Tilth is fair. The rooting depth is limited by the water table.

This soil is used as cropland and pasture. A few areas are wooded. This soil has fair potential for crops, hay, pasture, and trees. It has fair to poor potential for most engineering uses.

Wetness is a severe limitation if this soil is farmed. Artificial drainage is needed for most crops. Spacing of subsurface drains must be close because the fragipan is slowly permeable. This soil is moderately suitable for crops if adequately drained. Applying lime and fertilizer and maintaining the organic-matter content are necessary for good management.

This soil is suitable for use as pasture. Most of the pastured areas are not drained or are not adequately drained. Grazing early in spring when the soil is soft can damage pasture plants. Grasses are the most suitable pasture plants. Few areas are drained well enough for a pasture mixture that includes alfalfa. Birdsfoot trefoil is a better suited legume.

This soil is well suited to use as woodland. Trees that tolerate wetness will grow. Many woodland-improvement practices and harvesting are hampered by wetness. Competition from grasses and shrubs is severe in new plantings of trees.

This soil is good foundation material and good fill for dams. It commonly has too much clay to be good roadfill. There are natural pond sites in some areas of this soil, especially in the closed depressions. Excavated ponds are likely to hold water.

This soil is poorly suited to use as sites for buildings because of its seasonal wetness. Adequately draining this soil for construction uses commonly is difficult and costly. The permeability of this soil is much slower than that needed for a septic tank absorption field. Moreover, an absorption field cannot function when the water table is high or the soil is ponded.

Capability subclass IIIw; woodland suitability subclass 2w.

WaB—Wadsworth silt loam, 2 to 6 percent slopes. This is a gently sloping, deep, somewhat poorly drained soil on low knolls and ridges and in natural drainageways on till plains. It has a dense layer, a fragipan, in the subsoil that restricts growth of roots and movement of water. In most areas the slope is short and irregular and is between 2 and 4 percent. This soil is in intermediate positions on the landscape. The areas are irregular in shape and are 4 to 50 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 43 inches thick. In the upper part it is yellowish brown, mottled, firm and friable silt loam, silty clay loam, and clay loam. In the middle part it is dark yellowish brown and yellowish brown, mottled, very firm clay loam. This part is the fragipan. In the lower part the subsoil is dark yellowish brown, mottled, firm clay loam. The substratum, to a depth of about 72 inches, is dark yellowish brown, mottled, firm loam glacial till.

About 10 percent of the areas of this soil are eroded. Erosion is most prominent on the higher and steeper knolls. In the eroded areas the plow layer is brown and is partly chunks of subsoil material.

Included in mapping are small areas of the poorly drained Condit soils in low spots, depressions, and minor natural drainageways. Also included are areas of the moderately well drained Rittman soils on some of the higher knolls.

This soil has moderately slow or moderate permeability above the fragipan and slow permeability in and below the fragipan. The available water capacity is moderate. Runoff is medium. The water table is held at a depth of 6 to 18 inches by the dense fragipan. The organic-matter content is moderate. Tilth is fair. The rooting depth is limited by the water table.

This soil is used as cropland and pasture. It has fair potential for crops, hay, pasture, and trees and fair to poor potential for most engineering uses.

The hazard of erosion is severe if this soil is farmed. Erosion reduces the thickness of soil above the restrictive fragipan and thereby reduces the amount of soil from which crops can extract water and nutrients. It also results in poorer tilth. In most areas the slope is too short and complex for contour farming. Growing hay crops and cover crops helps to control erosion. This soil is moderately well suited to crops if it is adequately drained and is managed to control erosion.

Wetness is also a limitation to the use of this soil. Artificial drainage is needed for most crops. Subsurface drains must be closely spaced because the fragipan is slowly permeable.

This soil is suitable for use as pasture. Grazing early in spring when the soil is soft can damage pasture plants.

Grasses are the best suited pasture plants. Many areas are not drained well enough for alfalfa.

The soil is suitable for use as woodland. Wetness in winter and spring hampers woodland-improvement practices and harvesting. Competition from grasses and shrubs is severe in new plantings of trees.

This soil is good material for foundations and good fill for dams. It commonly has too much clay for good roadfill. There are some natural pond sites. The best sites are valleys between steep side slopes. Excavated ponds are likely to hold water. This soil has severe limitations for use as sites for buildings because of its seasonal wetness. The permeability is slower than that needed for a septic tank absorption field. The seasonally high water table in winter and spring also interferes with absorption of effluent.

Capability subclass IIIe; woodland suitability subclass 2w.

Wb—Wallkill silt loam. This is a nearly level, deep, very poorly drained soil that is mainly on flood plains. It formed where light-colored mineral soil material was washed onto an area of dark-colored organic soil. It differs from most other soils in the county in that its darkest layer is not at the surface. Areas of this soil are low on the landscape; they lie above pockets of muck on flood plains. The slope generally is less than 2 percent. The areas are dominantly fan shaped and are 2 to 20 acres in size.

Typically, the surface layer is dark gray, friable silt loam about 8 inches thick. The substratum is about 14 inches thick. In the upper part it is grayish brown, mottled, firm silt loam; and in the lower part it is dark gray, mottled, firm silt loam. Below this, to a depth of about 60 inches, there is black, friable muck.

Included in mapping are a few areas in which the surface layer is sandy or gravelly.

This soil has moderate permeability and high available water capacity. Runoff is slow. The water table is within 6 inches of the surface for long periods. Most areas are subject to flooding or to overwash. The organic-matter content is high. Tilth is good. The depth of rooting is restricted by the water table.

This soil is used as cropland and pasture, and in some areas it is idle land. The soil has fair potential for crops, hay, and pasture. It has poor potential for most engineering uses.

Wetness is a severe limitation if this soil is farmed. A system of surface ditches and subsurface drains is needed to drain most areas adequately. Ditchbanks are not stable in areas where the organic layers of the soil are thick. Subsurface drains placed in the organic soil layers are likely to shift and become less effective. The soil is productive after it is drained. It is commonly used for corn and soybeans.

This soil is suitable for use as pasture. It is very soft in spring, especially in undrained areas, and grazing at that time can damage pasture plants. Grasses grow rather well during the dry part of summer. Drainage adequate for alfalfa is difficult to attain.

The soil has some suitability for use as woodland. Trees that tolerate wetness will grow best. In undrained areas, this soil has good potential for development as habitat for wetland wildlife.

This soil does not compact well and is not good material for foundations, fill for dams, or roadfill. The organic material is very unstable. There are few natural pond sites.

The extreme wetness and the hazard of flooding make this soil unsuited to use as sites for buildings or septic tank absorption fields.

Capability subclass IIIw; woodland suitability subclass 4w.

WhA—Wheeling silt loam, 0 to 2 percent slopes. This is a nearly level, deep, well drained soil on terraces. It is typically below a higher, more sloping terrace and is separated from the adjacent flood plain by a short slope or escarpment. The areas are irregular in shape and are 5 to 50 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. In the upper part it is yellowish brown, friable to firm silt loam. In the middle part it is yellowish brown, firm to friable silt loam, and in the lower part it is dark yellowish brown, very friable stratified gravelly sandy loam, gravelly loamy sand, and gravelly loam. The substratum, to a depth of about 60 inches, is dark yellowish brown, loose gravelly loamy sand.

Included in mapping are small areas of the moderately well drained Bogart soils, which are in concave places. Also included are small areas of a soil that does not have a gravelly layer within a depth of 40 inches.

This soil has moderate permeability in the upper part and rapid permeability in the lower part. It has moderate available water capacity. Runoff is slow. The organic-matter content is moderate. Tilth is good. The root zone extends to the gravelly material. The water table is below a depth of 4 feet except for very brief periods.

Most areas of this soil are used for crops. This soil is very well suited to all crops commonly grown in the survey area. It has good potential for crops, hay, and trees. It has good potential for most engineering uses.

Natural drainage is adequate, and there is little hazard of erosion. Maintenance of organic matter, lime, and fertility is the main management concern. Crops sometimes do not have enough water during extremely dry weather, but such dry spells are not frequent. This soil probably is the best in the county for farming. Above-average yields can be expected if a good program of liming and fertilizing is followed. The soil is irrigable and is suited to a wide variety of vegetable and fruit crops as well as to the field crops common in the area.

The soil is well suited to use as pasture, but there are few areas in pasture. Pastures can be grazed early, and the growth of pasture plants is good during the dry part of summer.

Very little acreage is used as woodland, and few trees are planted. Most of the trees common to the survey area will grow well on this soil.

The upper part of this soil is poorly suited to most engineering uses. It does not pack well, and it is poor material for foundations or for dam fill. It has too much silt and clay to be good roadfill. The lower part of the soil is fair roadfill but is much too porous for dam fill. There are no natural pond sites, and ponds dug into the soil are not likely to hold water. There are few gravel deposits of commercial value.

This soil has few limitations to use as a site for buildings. The nearly level slope and good natural drainage are favorable for such use.

This soil has few limitations for onsite disposal of septic tank effluent. Permeability is adequate, and the water table is deep most of the time. There is a risk that ground water will be polluted if effluent is discharged into the soil.

Capability class I; woodland suitability subclass 2o.

WhB—Wheeling silt loam, 2 to 6 percent slopes. This is a gently sloping, deep, well drained soil on terraces. It occupies the entire area of some terraces and the gently sloping part of others. On small terraces it slopes from the upland to a flood plain. On larger terraces it is high on the landscape and is separated from the lower terrace or the flood plain by a short slope or escarpment. Slopes are mainly long and uniform. The areas are variable in shape and are 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 43 inches thick. In the upper part it is yellowish brown, firm to friable silt loam, and in the lower part it is dark yellowish brown, very friable, stratified gravelly sandy loam, gravelly loam, and gravelly loamy sand. The substratum, to a depth of about 60 inches, is dark yellowish brown, loose gravelly loamy sand.

Included in mapping are a few small areas of the more gravelly Chili soils. There are also included areas of the moderately well drained Bogart soils in concave places, shallow depressions, and small drainageways.

This soil has moderate permeability in the upper part and rapid permeability in the lower part. It has moderate available water capacity. Runoff is slow. The organic-matter content is moderate. Tilth is good. The root zone extends to the gravelly material in the subsoil. The water table is below a depth of 4 feet except for very brief periods.

In most areas, this soil is used as cropland. This is one of the good soils in the county, and it is well suited to all the common crops. It has good potential for crops, hay, and trees. It has good potential for most engineering uses.

The hazard of erosion is moderate if this soil is farmed. This soil is suited to no-till or minimum tillage production of corn. Natural drainage is adequate for crops. Shallow-rooted crops sometimes do not have enough available water in very dry weather, but such dry spells are not frequent. The main requirement in management for this soil is maintaining the fertility and the content of lime and organic matter. This soil is irrigable, and it is suited to fruit and vegetable crops as well as to the field crops common in the area.

Most of the pastures on this soil are in a system of rotation with cultivated crops. The good natural drainage permits grazing early in spring. Pastures make moderately good growth during the dry part of summer. Alfalfa is a good pasture plant if enough lime is applied to the soil, and it grows better during summer than most other forage plants.

This soil is used as woodland only in a few places. The few woodlots contain most of the trees common to the survey area.

The upper part of this soil is poorly suited to most engineering uses. It does not pack well, and it is poor material for foundations and for dam fill. It commonly has too much silt and clay for good roadfill. The lower part of the soil makes fair roadfill but is much too porous for dam fill. There are very few natural pond sites, and ponds dug into the soil are not likely to hold water. There are very few gravel deposits of commercial value.

This soil has few limitations to use as sites for buildings or as septic tank absorption fields. The gentle slope, deep water table, and good permeability are all favorable for those uses. There is a risk that ground water will be polluted if effluent is discharged into the soil.

Capability subclass IIe; woodland suitability subclass 2o.

WhC—Wheeling silt loam, 6 to 12 percent slopes. This is a moderately sloping, deep, well drained soil on terraces. It is along the base of hills of till or of rock and above less sloping terraces. It also is on short slopes that separate terraces of two levels. The areas are 2 to 20 acres in size. Most of them are elongated.

Typically, the surface layer is dark brown, friable silt loam about 8 inches thick. The subsoil is about 43 inches thick. In the upper part it is yellowish brown, friable silt loam, and in the lower part it is dark yellowish brown, very friable gravelly sandy loam, gravelly loamy sand, or gravelly loam. The substratum, to a depth of about 60 inches, is dark yellowish brown, very friable gravelly sandy loam that has about 40 percent gravel.

This soil is eroded in some spots. In eroded spots, the plow layer is brown or yellowish brown and is as much as 30 percent gravel. The most severely eroded spots are identified by a special symbol on the soil map. In a

few other included areas, the slope is steeper than 12 percent. Shattered or broken rock is at a depth of 4 to 5 feet in some areas. Also included in mapping are small areas of the more gravelly Chili soils. There are also a few seep spots and springs, around which the soil is grayer and more mottled than is typical.

This soil has moderate permeability in the upper part and rapid permeability in the lower part. It has moderate available water capacity. Runoff is medium. The organic-matter content is low. Tilth is fair. The root zone is moderately thick over the gravelly subsoil. The water table is below a depth of 4 feet except for very brief periods.

This soil is used mainly as cropland and pasture; a small acreage is used as woodland. The soil has good potential for crops, pasture, and trees. The hazard of erosion is moderate if this soil is cultivated. Erosion reduces the depth to the gravelly layers in the lower part of the subsoil and thus reduces the capacity to hold water available for crops. Erosion-control practices such as stripcropping and cultivating across the slope are suitable for use on the larger areas. Some of the small areas of this soil form a minor part of fields that consist mainly of less sloping soils. In these small areas, control of erosion is difficult. No-till farming and growing forage crops are the most practical methods. Shallow-rooted crops commonly do not get enough water during long dry periods. Additions of organic matter are helpful in controlling erosion and maintaining good tilth.

This soil is suitable for use as pasture. The good natural drainage permits grazing early in spring. Grass pastures produce only a small amount of forage during the dry part of summer, but alfalfa in the seeding mixture makes the pasture more productive. A crop of small grain commonly is grown to aid in establishing a new pasture.

This soil has good potential for use as sites for buildings, but erosion is a hazard during construction. The potential is fair or poor for sanitary facilities and fair for campsites. This soil is suitable for onsite disposal of effluent if the system is properly designed. Downslope seepage is likely to occur, but this hazard can be minimized by laying out lines of the absorption field on the contour. There is danger that ground water will be polluted if effluent is discharged into this soil. The material in the lower part of this soil is suitable for roadfill but not for dam fill. Ponds in this soil are subject to seepage. There are a few commercial gravel deposits.

Capability subclass IIIe; woodland suitability subclass 2o.

WsB—Wooster silt loam, 2 to 6 percent slopes. This is a gently sloping, deep, well drained soil on hilltops that have a thick covering of glacial till. Typically, these areas are high on the landscape and are surrounded by steeper slopes. Most of the areas slope outward from a central dome or ridge toward the steeper slopes. The slope of most areas of this soil is smooth. The areas are variable in shape, and they range from 4 to 200 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 7 inches thick. The subsoil is about 53 inches thick. In the upper part it is yellowish brown, friable loam and silt loam. In the middle part it is a yellowish brown and dark yellowish brown, mottled, very firm loam fragipan. In the lower part it is yellowish brown, firm loam.

In some areas of this soil, on the higher and steeper parts of the landscape, there are eroded spots less than an acre in size where the plow layer is brown or yellowish brown.

The depth to natural lime in this soil is at least 5 feet. The depth to solid rock typically is more than 5 feet, but in a few areas the depth to shattered or broken rock is less than 5 feet.

Included in mapping are small areas of the moderately well drained Canfield soils in low or concave parts of the landscape. There are also small areas of Loudonville soils, which have bedrock within a depth of 40 inches. Also included are soils in wet spots, areas around springs, and small natural drainageways; in these soils, the upper part of the subsoil is grayer and more mottled than that of the typical Wooster soil.

The permeability is moderate above the fragipan and moderately slow in the fragipan. Permeability in the lower part of the subsoil is moderately slow in some areas. The available water capacity is moderate. Runoff is medium. The water table generally is deep, but it is within 4 feet of the surface for brief periods late in winter and early in spring. The organic-matter content is low. Tilth is good. The supply of lime and plant nutrients is naturally low, and crops respond well to additions of these materials.

In most areas, this soil is used as cropland or improved pasture. The soil has good potential for crops, hay, pasture, and trees. It also has good potential for most engineering uses.

The hazard of erosion is moderate if this soil is cultivated. Most of the larger areas are suitable for contour farming or field stripping. Corn can be grown if minimum tillage or a no-tillage system is used to control erosion. Maintaining fertility and the content of lime and organic matter and controlling erosion are the main management concerns. Natural drainage of this soil generally is adequate for farming. A few subsurface drains commonly are needed to drain the included soils that are in wet areas.

This soil is suitable for use as pasture. Most of the pastures are managed in rotations that include cultivated crops. All the commonly grown pasture plants will grow well. Because of the good natural drainage, grazing can begin early in spring. Pasture plants grow well during the dry part of summer. The slope does not limit intensive management of pastures. A cultivated crop can be

grown to aid in establishing a new seeding and in controlling weeds.

This soil is suited to use as woodland. Most of the trees common in the area will grow well. The slope and the good natural drainage are favorable for intensive management of woodlands and for harvesting the products. Good growth of trees can be expected, but grasses and shrubs compete with the trees if plantings are made in the open. This soil is also well suited to fruit trees.

The glacial till under this soil is firm and compact. This soil is good foundation material and good dam fill, but commonly it has too much silt to be good roadfill. There are few natural pond sites because the slope is gentle. The gentle slope and good natural drainage are favorable for use of this soil as sites for buildings. During brief periods late in winter, this soil is excessively wet, but in general the drainage is adequate for a wide variety of uses. The permeability of this soil commonly is less than that needed for a septic tank absorption field.

Capability subclass IIe; woodland suitability subclass 1o.

WsC—Wooster silt loam, 6 to 12 percent slopes. This is a moderately sloping, deep, well drained soil on till plains. It is mostly on the side slopes of small valleys that cross the till plains. These areas are long and narrow and are 2 to 20 acres in size. In places where relief is strong, this soil is on the top and upper side slopes of hills that have a thick covering of glacial till. Many of these areas are below gently sloping hilltops and above steeper slopes. The slope of most of these areas is smooth and is in only one direction. These areas are variable in shape and are 5 to 100 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 8 inches thick. The subsoil is about 43 inches thick. In the upper part it is yellowish brown, friable loam and silt loam. In the middle part is a yellowish brown and dark yellowish brown, mottled, very firm loam fragipan. In the lower part it is yellowish brown, firm loam. The substratum, to a depth of about 60 inches, is yellowish brown, firm loam glacial till.

The surface layer in a cultivated field ranges from dark grayish brown in uneroded places to yellowish brown in severely eroded spots. Erosion is severe in only a few areas, which are marked by a special spot symbol on the soil map. In most fields, the severe erosion is confined to a few areas, less than 2 acres in size, in the higher and steeper places. Erosion in the remainder of the field generally is slight or moderate, and the surface layer is dark grayish brown or dark brown. In some places, the lower part of the subsoil is dense enough to partly restrict the growth of roots and the movement of water, and in others it offers very little resistance. Solid rock is typically at a depth of more than 5 feet. In many places, especially in the extreme southern part of the county, there is shattered or broken rock at a shallower depth.

Included in mapping are small areas of the moderately well drained Canfield soils along the base of slopes and in distinctly concave areas. Also included are springs, small seep areas, and the bottoms of narrow valleys, and in these places the soil is wetter, grayer, and more mottled than the typical Wooster soil. There are also a few included areas of Loudonville soils, which have rock within a depth of 40 inches.

Permeability above the fragipan is moderate, and permeability of the fragipan is moderately slow. The available water capacity is moderate. Runoff is rapid. The water table is about 4 feet below the surface for brief periods late in winter and early in spring, but generally it is deeper. The organic-matter content is low. Tilth is good, except in the eroded places. The content of lime and of plant nutrients is low, and crops respond to additions of these materials.

This soil is used as cropland and pasture; a small acreage is used as woodland. It has good potential for crops, hay, pasture, and trees. It also has good potential for most engineering uses.

The hazard of erosion is severe if this soil is cultivated. Most of the larger areas are suitable for contour stripcropping. Corn is the principal row crop. No-till or minimum tillage methods of producing this crop can control erosion. In addition to control of erosion, additions of lime, fertilizer, and organic matter are needed in managing this soil. Natural drainage is adequate for farming.

This soil is very well suited to use as pasture. Some of the pastures are managed in rotation with cultivated crops. All the commonly grown pasture plants will produce well. The good natural drainage permits grazing early in spring, and the pastures produce well during the dry part of summer. The slope does not limit intensive management of pastures, and a cultivated crop can be grown to aid in establishing a seeding after the crop and in controlling weeds.

This soil is well suited to use as woodland. Most of the trees common in the area will grow well. The slope does not limit intensive management of woodlands or harvesting. Good growth of trees can be expected, but grasses and shrubs compete with the trees if a planting is made in the open. The soil is also well suited to fruit trees.

The glacial till under this soil is firm and compact. This soil is good foundation material and good dam fill, but commonly it has too much silt to be good roadfill. There are some good natural pond sites where this soil occupies both sides of a small valley.

Because of the good natural drainage, this soil is suitable for building sites. Because it is sloping, there is a hazard of erosion during construction. The soil is more sloping and its permeability is somewhat slower than the desirable limits for a septic tank absorption field.

Capability subclass IIIe; woodland suitability subclass 1o.

WsD2—Wooster silt loam, 12 to 18 percent slopes, eroded. This is a moderately steep, deep, well drained soil on hillsides that have a thick covering of glacial till. It is mainly on the side slopes of valleys that are cut into till. Most of the areas lie below less sloping hilltops. Some are above a flood plain or terrace, and others are above an even steeper hillside. Some of the areas consist of only one side slope of a valley, and others include both sides. The slope generally is uniform. The areas are 4 to 100 acres in size, and most of them are elongated. Some are more than a mile long.

Typically, the surface layer, about 7 inches thick, is brown, friable silt loam and has some chunks of firm, yellowish brown loam. The subsoil is about 38 inches thick. In the upper part it is yellowish brown, friable loam and silt loam. In the lower part there is a dark yellowish brown and yellowish brown, mottled, very firm loam fragipan. The substratum, to a depth of about 60 inches, is yellowish brown, loam glacial till.

The color of the surface layer in a cultivated field ranges from dark grayish brown in protected or uneroded areas to yellowish brown in severely eroded areas. Only a few areas are severely eroded; they are marked by a special spot symbol on the soil map. Most of the severely eroded areas are less than 2 acres in size and are on the higher and steeper part of the slope. Most of the cultivated fields are moderately eroded, and the surface layer is a mixture of original surface soil and some of the upper part of the subsoil. The protected parts are only slightly eroded.

Included in mapping are small areas of the moderately well drained Canfield soils on the lower part of some slopes. Also included are some seep spots and springs around which the soil is grayer and more mottled than the typical Wooster soil. In many areas, especially in the southern part of the county, shattered or broken rock is at a depth of 40 to 60 inches.

Permeability is moderate above the fragipan and moderately slow in the fragipan. The available water capacity is moderate. Runoff is rapid. The organic-matter content is low. Tilth is fair except in the severely eroded areas.

This soil is used as cropland, pasture, and woodland. It is poorly suited to row crops because of the continuing very severe hazard of erosion. It has good potential for hay, pasture, and trees. It has fair potential for most engineering uses.

This soil is suitable for a row crop occasionally if care is taken to control erosion. Corn is the only row crop grown to any great extent. If corn is grown on this soil, no-till or minimum tillage and contour stripcropping are suitable erosion control practices. Additions of organic matter, lime, and fertilizer are needed to manage this soil adequately for production of crops.

The soil is suitable for use as pasture. The good natural drainage permits grazing early in spring. A variety of pasture plants common in the area will grow well. A row crop can be grown occasionally to aid in establishing a new seeding and in controlling weeds.

This soil is well suited to use as woodland. A wide variety of trees common in the area will grow well. Slope does not limit practices for improving the woodland or harvesting products. There is a hazard of erosion when logging is done. Grasses and shrubs compete with the trees if a planting is made in the open.

The glacial till under this soil is firm and compact. This soil is good foundation material and good fill for dams, but commonly it has too much silt for good roadfill. There are natural pond sites in places where this soil is on both sides of a small valley. The good natural drainage of the soil is favorable for sites of buildings, but the slope is steep enough to be a limitation. The hazard of erosion is severe during construction. The slope is too steep for septic tank absorption fields. Downslope seepage of effluent is a hazard.

Capability subclass IVe; woodland suitability subclass 1r.

WsE—Wooster silt loam, 18 to 35 percent slopes. This is a steep or very steep, deep, well drained soil on the side slopes of valleys cut into till plains. These slopes extend from a less sloping hilltop above to a flood plain or terrace below. Areas bordering large valleys slope in only one direction, but some areas include both sides of a narrow, steep-sided valley. Most of the areas are elongated and are 5 to 50 acres in size. Many are more than a mile long.

Typically, the surface layer is very dark brown, friable silt loam about 3 inches thick. The subsurface layer, about 4 inches thick, is brown, friable silt loam. The subsoil is about 33 inches thick. In the upper part it is yellowish brown, friable loam and silt loam. In the lower part it is a dark yellowish brown and yellowish brown, mottled, very firm loam fragipan. The substratum, to a depth of about 60 inches, is yellowish brown loam glacial till.

In eroded areas the surface layer is lighter colored. The slope of this soil is more than 35 percent in 5 to 10 percent of most mapped areas. A few banks are vertical in places where a stream has cut against the side of a valley.

Included in mapping are small areas of Loudonville soils, which have rock within a depth of 40 inches. Also included are seep spots and springs around which the soil is gray and mottled.

Permeability is moderate above the fragipan. The available water capacity is moderate. Runoff is very rapid. The organic-matter content is low. Tilth is fair.

In most areas, this soil is used as permanent pasture or as woodland. This soil has good potential for pasture and trees and poor potential for most engineering uses.

The steep slope limits the use of many types of farm equipment. The hazard of erosion is very severe if this soil is cultivated, and some erosion can be expected.

This soil has moderate suitability for use as pasture. The good natural drainage permits grazing early in spring. Most pasture plants do not grow well during the dry part of summer. No-till methods of seeding pasture are appropriate on this soil. Erosion is likely to occur if a pasture is overgrazed.

The soil is well suited to use as woodland. A wide variety of trees common to the area will grow well. Slope does not limit the use of most types of equipment in managing woodland or harvesting the product, but there is a severe hazard of erosion when logging is done. Good growth of trees can be expected on the north-facing slopes. There is considerable competition from grasses and shrubs if trees are planted in the open.

The glacial till under this soil is firm and compact. This soil is good material for foundations and good fill for dams, but commonly it has too much silt for good roadfill. The steep slope interferes with excavation, however, and the walls of a borrow pit erode rapidly. There are some natural pond sites where this soil is on both sides of a small valley. This soil is too steep to be well suited to use as sites for buildings. Control of erosion during construction is a major problem, and a scalped area will erode if it is not reseeded immediately. Gullies can form rapidly in a driveway that is not paved and curbed. This soil is too steep to be used as an absorption field for septic tank effluent. The hazard of downslope seepage of the effluent is severe.

Capability subclass VIe; woodland suitability subclass 1r.

Use and management of the soils

The soil survey is a detailed inventory and evaluation of the most basic resource of the survey area—the soil. It is useful in adjusting land use, including urbanization, to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in uses of the land.

While a soil survey is in progress, soil scientists, conservationists, engineers, and others keep extensive notes about the nature of the soils and about unique aspects of behavior of the soils. These notes include data on erosion, drought damage to specific crops, yield estimates, flooding, the functioning of septic tank disposal systems, and other factors affecting the productivity, potential, and limitations of the soils under various uses and management. In this way, field experience and measured data on soil properties and performance are used as a basis for predicting soil behavior.

Information in this section is useful in planning use and management of soils for crops and pasture, and woodland, as sites for buildings, highways and other transportation systems, sanitary facilities, and parks and other recreation facilities, and for wildlife habitat. From the data presented, the potential of each soil for specified land uses can be determined, soil limitations to these land uses can be identified, and costly failures in houses and other structures, caused by unfavorable soil properties, can be avoided. A site where soil properties are favorable can be selected, or practices that will overcome the soil limitations can be planned.

Planners and others using the soil survey can evaluate the impact of specific land uses on the overall productivity of the survey area or other broad planning area and on the environment. Productivity and the environment are closely related to the nature of the soil. Plans should maintain or create a land-use pattern in harmony with the natural soil.

Contractors can find information that is useful in locating sources of sand and gravel, roadfill, and topsoil. Other information indicates the presence of bedrock or wetness.

Health officials, highway officials, engineers, and many other specialists also can find useful information in this soil survey. The safe disposal of wastes, for example, is closely related to properties of the soil. Pavements, sidewalks, campsites, playgrounds, lawns, and trees and shrubs are influenced by the nature of the soil.

Crops and pasture

The major management concerns in the use of the soils for crops and pasture are described in this section. In addition, the crops or pasture plants best suited to the soil are discussed; 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 presented for each soil.

This section provides information about the overall agricultural potential of the survey area and about the management practices that are needed. The information is useful to equipment dealers, land improvement contractors, fertilizer companies, processing companies, planners, conservationists, and others. For each kind of soil, information about management is presented in the section "Soil maps for detailed planning." Planners of management systems for individual fields or farms should also consider the detailed information given in the description of each soil.

To keep current on the latest varieties, fertilizers, herbicides, and tillage methods, the reader should refer to the "Agronomy Guide," which is published biannually by the Agronomy Department of the Ohio State University, Ohio Agricultural Research and Development Center, and the Cooperative Extension Service.

Land use and potential agricultural production

In 1967, more than 182,000 acres in Ashland County were used for crops and pasture, according to Conservation Needs Inventory (Ohio Conservation Needs Inven-

tory, 1971). Of this total 31,000 acres were used for permanent pasture; 44,000 acres for row crops, mainly corn; 27,500 acres for close-grown crops, mainly wheat and oats; and 36,000 acres for rotation hay and pasture. The rest was rural lands used for other purposes.

The potential of the soils of Ashland County for increased production of food is good. About 35,000 acres of potentially good cropland is used as woodland and about 17,000 acres as pasture. Food production could also be increased considerably by using the latest technology for crop production on all cropland in the county.

Acreage in crops and pasture has gradually decreased as more land is used for urban development. In 1967, about 16,000 acres were in urban and built-up land in the county; this acreage has increased at the rate of about 300 acres per year. The use of this soil survey to help make land use decisions in the county is discussed in the section "General soil map for broad land use planning."

Different cropping patterns are evident in different parts of the county. For example, in the northern part, cash grain or general livestock farms predominate. A large part of the land is cultivated; corn for grain, soybeans, and wheat are the major crops. The acreage of forage and pasture crops is small, except on the few dairy farms in the area. In the southern part of the county, dairy farms predominate. Here the acreage of row crops is small; corn for grain or silage is grown on most of the acreage. Wheat and oats are also grown, but the production of forage and pasture is important to the farming program. Stripcropping and minimum tillage are used extensively in this part of the county.

Soil management problems

This section discusses soil management problems, including soil erosion, of soil drainage, droughtiness, and maintenance of fertility, lime, and organic matter levels.

Soil erosion

Soil erosion is a major soil management problem on about two-thirds of the cropland and pasture in Ashland County. Erosion is a hazard on all soils that have slopes of more than 2 percent; for example, it is the most serious problem on Wooster silt loam. Both erosion and wetness are limitations on other soils, such as Bennington silt loam, 2 to 6 percent slopes.

Erosion results in the removal of the surface layer of the soil. Because the surface layer has organic matter, the loss of the surface layer reduces considerably the nutrient-supplying power of the soil.

The subsoil of Ellsworth, Cardington, and many other Ashland County soils is higher in clay content than the surface layer. Where erosion has removed soil material from the surface, the plow layer reaches into the clayey subsoil. A plow layer that has clayey material is hard to work, has poor tilth, and makes a poor seedbed.

In many soils, such as Rittman and Canfield soils, the rooting depth is restricted by a fragipan. In other soils such as Loudonville or Lordstown soils, the rooting depth is restricted by bedrock. Because erosion at the surface reduces the depth to these restrictive layers, the volume of available soil is reduced for a root system to develop.

The control of erosion is important to sustain high crop yields. There are several practices that can be used to control erosion.

One of the simplest practices of erosion control is cross-slope cultivation. This method is effective on soils that have slopes of only 2 to 6 percent. On soils such as Canfield silt loam, which typically has long, uniform slopes, tilling across the slope is easy. In soils such as Bennington silt loam, which has short irregular slopes, tillage in any direction will not completely eliminate cultivation up and down the slope.

An erosion control practice that has been used extensively in the southern part of the county for many years is contour stripcropping. It is used mostly on soils that have uniform slopes of 6 to 18 percent. Much of the contour stripcropping has been on sloping and moderately steep phases of the Wooster and Loudonville soils that typically have long, uniform slopes. This practice is not well adapted on areas that have short irregular slopes, such as the many areas of sloping Chili or Oshtemo soils.

Erosion control practices equally applicable to smooth and irregular slopes are the return of crop residue and the use of forage crops in the rotation. Residue reduces the impact of raindrops on the soil, thus preventing soil particles from being dislodged. The close-growing hay crops reduce the speed of runoff, thus reducing the amount of soil carried away. But the use of hay as an erosion control practice depends mostly on the type of farming operation.

Another erosion control practice is the use of no-till or reduced tillage methods of crop production. These methods help prevent soil erosion by the impact of raindrops and by runoff. No-till methods are best adapted on well drained, medium- to coarse-textured soils, for example, Wooster or Chili soils. In such soils the surface layer is sufficiently friable, and seeds can be planted easily. Wetter or more clayey soils are not so easily seeded or well suited to no-till methods.

Some pastures are subject to erosion. Many permanent pastures are on moderately steep or steep slopes where runoff is rapid. To help control erosion on pastures, a thick sod cover should be maintained. Many of the pastures in Ashland County are on slopes that permit the growing of cultivated crops occasionally. Special care to avoid losses by erosion is needed during periods when pastures are being cultivated.

Soil drainage

Soil drainage is important in soil management in Ashland County. Plant roots cannot grow without oxygen, which is not available in soils that are saturated with water. Wet soils are a problem in the movement of farm machinery, and animal traffic on wet soft soil can damage pasture seedings.

Soil scientists recognize classes of natural soil drainage as they make a soil survey. Each soil series in the county has been assigned a drainage class. For example, Wooster soils 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 water table under natural conditions in the wettest time of year, usually late in winter or early in spring.

About one-third of the soils in the county are well drained—the water table is at a depth of more than 2 feet most of the time. These soils have adequate natural drainage for crop production. Almost one-fourth of these well drained soils are on slopes steeper than 18 percent. More than half of the well drained soils used as cropland are in the Wooster series.

About one-third of the county consists of moderately well drained soils—the water table is mainly at a depth of 18 to 36 inches in the wettest time of year. These soils generally have adequate natural drainage for most crops, but they have low spots, springs, and seep areas where artificial drainage is helpful. Canfield, Cardington, and Rittman soils are the most extensive moderately well drained soils in the county.

About one-fourth of the county consists of somewhat poorly drained soils. These soils make up more than one-half of the acreage of the Bennington series. These soils have a water table at a depth of 6 to 18 inches in the wettest time of year. They need complete drainage to produce good yields of most crops.

The remainder of the county consists of poorly drained and very poorly drained soils in which the water table is at or near the surface or within 18 inches of the surface for extended periods under natural conditions. Artificial drainage is needed if these soils are used as cropland. Condit silt loam is the most extensive poorly drained soil in the county, and Luray silty clay loam is the most extensive very poorly drained soil.

Most of the soils in Ashland County are sufficiently permeable that they can be adequately drained by subsurface drains. Where there are no suitable outlets, for example, in the northern part of the county, ditches are needed to provide outlets. Some areas of nearly level Bennington and Condit soils in the northern part of the county are a mile or more from a suitable natural outlet. Ditches that serve such areas must be large and extend through several ownerships. Many owners cannot adequately drain their farmland because suitable outlets are not available.

Further south in the county, drainage outlets are available on most farms, except in large areas of very poorly drained soils, such as Carlisle and Linwood mucks and Luray silty clay loam. Such areas typically need ditches as well as subsurface drains for adequate removal of water.

Drainage adequate for late season crops, such as corn and soybeans, is more easily established than drainage for alfalfa or winter grains. Late soybeans are grown successfully in some areas that cannot be drained adequately for most other crops.

Droughtiness

Droughtiness is the main limitation on a small acreage of cropland in Ashland County. The droughtiest soils, Schaffenaker and Rigley soils, are used mainly as woodland. Soils where available moisture is most likely to be limiting to cultivated crops are sandy or gravelly outwash soils, such as Chili and Oshtemo soils, and soils that have limited depth to rock, such as Loudonville soils. Some of the more droughty soils are potentially irrigable.

The effects of drought are more evident in pastures than in cultivated fields. Pasture grasses on most moderately steep or steep soils grow very little through the dry part of the summer. This problem can be overcome by including drought resistant legumes, such as alfalfa, in the pasture seeding when renovating pastures. Generally, plants grown in soils having high fertility are more efficient in using available water.

Maintaining fertility, lime, and organic matter levels

Sustained high yields of crops and pasture require adequate levels of plant nutrients, lime, and organic matter. Maintaining such levels is a management concern on all the soils in the county.

The fertility of a soil depends on its past use, management, and long term fertility history. These factors differ widely from farm to farm. A regular program of soil testing is needed to determine the amount and kind of fertilizer needed. The ability of the soil to store and release plant nutrients is a property of the soil and can be related to soil phases. Soils that have a high content of clay and organic matter have a high capacity to store and release plant nutrients. Luray silty clay loam is such a soil. Soils that have a low content of clay and organic matter, such as Schaffenaker loamy sand, have a very low capacity to store and release nutrients. Because the plow layer of an eroded soil is lower in organic-matter content than that of an uneroded soil, eroded soils have a lower capacity to store and release plant nutrients.

Fertilizer or lime applied in heavy amounts on steep or very porous soils is likely to be lost through runoff or leaching before it can be held by the soil in a form that can be used by plants. For this reason, fertilizer and lime should be applied freqently and lightly on such soils.

Most of the soils in Ashland County are acid in the rooting zone. Soils such as Bennington soils that have natural lime deep in the soil profile have a surface pH of 5.0 to 6.0 where not limed. Soils such as Wooster soils that formed in acid material have a surface pH of 4.5 to 5.5 where not limed.

Most of the common crops in the area require a pH of at least 5.5 in the rooting zone for optimum growth. An exception is alfalfa, which does not grow well if the pH is less than 6.5.

Lime and fertility are closely related because lime affects the pH level of a soil. The amount of available phosphorous is closely related to the pH level. Phosphate fertilizer applied to very acid soils combines with iron and aluminum in such a way that it is not available to plants. Earthworms, which incorporate plant residue into the soil, are more active at pH values near neutral. Their activity results in better soil structure and a higher content of organic matter in the soil.

Adding organic matter benefits most soils in Ashland County. Organic matter is a very good source of nitrogen, but it is the most expensive plant nutrient to purchase. Organic matter improves soil structure and makes the soil easier to work. Organic material has a capacity to store and release plant nutrients, and, therefore, if added it can increase the potential of the soil to provide nutrients to crops. Adding organic matter is especially beneficial in making severely eroded areas more productive.

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. Absence of an estimated yield indicates that the crop is not suited to or not commonly grown on the soil.

The estimated yields were based mainly on the experience and records of farmers, conservationists, and extension agents. Results of field trials and demonstrations and available yield data from nearby counties were also considered.

The yields were estimated assuming that the latest soil and crop management practices were used. Hay and pasture yields were estimated for the most productive varieties of grasses and legumes suited to the climate and the soil. A few farmers may be obtaining average yields higher than those shown in table 5.

The management needed to achieve the indicated yields of the various crops depends on the kind of soil and the crop. Such management provides drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate tillage practices, including time of tillage and seedbed preparation and tilling when soil moisture is favorable; 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 residues, barnyard manure, and green-manure crops; harvesting crops with the smallest possible loss; and timeliness of all fieldwork.

The estimated yields reflect the productive capacity of the soils 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 included because the acreage of these crops is small. The local offices of the Soil Conservation Service and the Cooperative Extension Service can provide information about the management concerns and productivity of the soils for these crops.

Capability classes and subclasses

Capability classes and subclasses show, in a general way, the suitability of soils for most kinds of field crops. The soils are classed according to their limitations when they are used for field crops, the risk of damage when they are used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops that require special management. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for forest trees, or for engineering purposes.

In the capability system, all kinds of soil are grouped at three levels: capability class, subclass, and unit (*8*). The capability classes and subclasses are defined in the following paragraphs. A survey area may not have soils of all classes.

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 landforms 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 too cold or too 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, though they have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The acreage of soils in each capability class and subclass is indicated in table 6. All soils in the survey area except those named at a level higher than the series are included. Some of the soils that are well suited to crops and pasture may be in low-intensity use, for example, soils in capability classes I and II. Data in this table can be used to determine the farming potential of such soils.

The capability subclass is identified in the description of each soil map unit in the section "Soil maps for detailed planning."

Woodland management and productivity

Table 7 contains information useful to woodland owners or forest managers planning use of the soils for wood crops. Map unit symbols for soils suitable for wood crops are listed, and the ordination (woodland suitability) symbol for each soil is given. All soils bearing the same ordination symbol require the same general kinds of woodland 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; and 4, moderate. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *w* indicates excessive water in or on the soil; *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 insignificant limitations or restrictions. If a soil has more than one limitation, priority in placing the soil into a limitation class is in the following order: w, c, s, f, and r.

In table 7 the soils are also rated for a number of factors to be considered in management. *Slight, moderate,* and *severe* are used to indicate the degree of major soil limitations.

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 some 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 equipment; *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 that the soil affects expected mortality of planted tree seedlings. Plant competition is not considered in the ratings. Seedlings from good planting stock that are properly planted during a period of sufficient rainfall are rated. A rating of *slight* indicates that the expected mortality of the planted seedlings is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Considered in the ratings of *windthrow hazard* are characteristics of the soil that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that trees in wooded areas are not expected to be blown down by strong winds; *moderate*, that some trees are 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. Common 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 suitable for commercial wood production and that are suited to the soils.

Engineering

This section provides information about the use of soils for building sites, sanitary facilities, construction material, and water management. Among those who can

benefit from this information are engineers, landowners, community planners, town and city managers, land developers, builders, contractors, and farmers.

The ratings in the engineering tables are based on test data and estimated data in the "Soil properties" section. The ratings were determined jointly by soil scientists and engineers of the Soil Conservation Service using known relationships between the soil properties and the behavior of soils in various engineering uses.

Among the soil properties and site conditions identified by a soil survey and used in determining the ratings in this section were grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock that is within 5 or 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure or aggregation, in-place soil density, and geologic origin of the soil material. If pertinent, data about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of absorbed cations were also considered.

On the basis of information assembled about soil properties, ranges of values can be estimated for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, shear strength, compressibility, slope stability, and other factors of expected soil behavior in engineering uses. As appropriate, these values can be applied to each major horizon of each soil or to the entire profile.

These factors of soil behavior affect construction and maintenance of roads, airport runways, pipelines, foundations for small buildings, ponds and small dams, irrigation projects, drainage systems, sewage and refuse disposal systems, and other engineering works. The ranges of values can be used to (1) select potential residential, commercial, industrial, and recreational areas; (2) make preliminary estimates pertinent to construction in a particular area; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for location of sanitary landfills, onsite sewage disposal systems, and other waste disposal facilities; (5) plan detailed onsite investigations of soils and geology; (6) find sources of gravel, sand, clay, and topsoil; (7) plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; (8) relate performance of structures already built to the properties of the kinds of soil on which they are built so that performance of similar structures on the same or a similar soil in other locations can be predicted; and (9) predict the trafficability of soils for cross-country movement of vehicles and construction equipment.

Data presented in this section are useful for land-use planning and for choosing alternative practices or general designs that will overcome unfavorable soil properties and minimize soil-related failures. Limitations to the use of these data, however, should be well understood. First, the data are generally not presented for soil material below a depth of 5 or 6 feet. Also, because of the scale of the detailed map in this soil survey, small areas of soils that differ from the dominant soil may be included in mapping. Thus, these data do not eliminate the need for onsite investigations, testing, and analysis by personnel having expertise in the specific use contemplated.

The information is presented mainly in tables. Table 8 shows, for each kind of soil, the degree and kind of limitations for building site development; table 9, for sanitary facilities. Table 11 shows the kinds of limitations for water management. Table 10 shows the suitability of each kind of soil as a source of construction materials.

The information in the tables, along with the soil map, the soil descriptions, and other data provided in this survey can be used to make additional interpretations and to construct interpretive maps for specific uses of land.

Some of the terms used in this soil survey have a special meaning in soil science. Many of these terms are defined in the Glossary.

Building site development

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 are indicated in table 8. A *slight* limitation indicates that soil properties generally are favorable for the specified use; any limitations are minor and easily overcome. A *moderate* limitation indicates that soil properties and site features are unfavorable for the specified use, but the limitations can be overcome or minimized by special planning and design. A *severe* limitation indicates that one or more soil properties or site features are so unfavorable or difficult to overcome that a major increase in construction effort, special design, or intensive maintenance is required. For some soils that are rated severe, costly measures may not be feasible.

Shallow excavations are made for pipelines, sewerlines, communications and power transmission lines, basements, open ditches, and cemeteries. Such digging or trenching is influenced by soil wetness caused by a seasonal high water table; the texture and consistence of soils; the tendency of soils to cave in or slough; and the presence of bedrock or large stones. In addition, excavations are affected by slope of the soil and the probability of flooding. Ratings do not apply to soil horizons below a depth of 6 feet unless otherwise noted.

In the soil series descriptions, the consistence of each soil horizon is given, and the presence of very firm or extremely firm horizons, usually difficult to excavate, is indicated.

Dwellings and *small commercial buildings* referred to in table 8 are built on undisturbed soil and have foundation loads of a dwelling no more than three stories high. Separate ratings are made for small commercial buildings without basements and for dwellings with and with-

out basements. For such structures, soils should be sufficiently stable that cracking or subsidence of the structure from settling or shear failure of the foundation does not occur. These ratings were determined from estimates of the shear strength, compressibility, and shrink-swell potential of the soil. Soil texture, plasticity and in-place density, soil wetness, and depth to a seasonal high water table were also considered. Soil wetness and depth to a seasonal high water table indicate potential difficulty in providing adequate drainage for basements, lawns, and gardens. Depth to bedrock, slope, and large stones in or on the soil are also important considerations in the choice of sites for these structures and were considered in determining the ratings. Susceptibility to flooding is a serious hazard.

Local roads and streets referred to in table 8 have an all-weather surface that can carry light to medium traffic all year. They consist of a subgrade of the underlying soil material; a base of gravel, crushed rock fragments, or soil material stabilized with lime or cement; and a flexible or rigid surface, commonly asphalt or concrete. The roads are graded with soil material at hand, and most cuts and fills are less than 6 feet deep.

The load supporting capacity and the stability of the soil as well as the quantity and workability of fill material available are important in design and construction of roads and streets. The classifications of the soil and the soil texture, density, shrink-swell potential, and potential frost action are indicators of the traffic supporting capacity used in making the ratings. Soil wetness, flooding, slope, depth to hard rock or very compact layers, and content of large stones affect stability and ease of excavation.

Lawns and landscaping require soils that are suitable for the establishment and maintenance of turf for lawns and ornamental trees and shrubs for landscaping. The best soils are firm after rains, are not dusty when dry, and absorb water readily and hold sufficient moisture for plant growth. The surface layer should be free of stones. If shaping is required, the soils should be thick enough over bedrock to allow for necessary grading. In rating the soils, the availability of water for sprinkling is assumed.

Sanitary facilities

Favorable soil properties and site features are needed for proper functioning of septic tank absorption fields, sewage lagoons, and sanitary landfills. The nature of the soil is important in selecting sites for these facilities and in identifying limiting soil properties and site features to be considered in design and installation. Also, those soil properties that affect ease of excavation or installation of these facilities will be of interest to contractors and local officials. Table 9 shows the degree and kind of limitations of each soil for such uses and for use of the soil as daily cover for landfills. It is important to observe local ordinances and regulations.

If the degree of soil limitation is expressed as *slight*, soils are generally favorable for the specified use and limitations are minor and easily overcome; if *moderate*, soil properties or site features are unfavorable for the specified use, but limitations can be overcome by special planning and design; and if *severe*, soil properties or site features are so unfavorable or difficult to overcome that major soil reclamation, special designs, or intensive maintenance is required. Soil suitability is rated by the terms *good*, *fair*, and *poor*, which mean about the same as *slight*, *moderate*, and *severe*.

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into the natural soil. Only the soil horizons between depths of 18 and 72 inches are evaluated for this use. The soil properties and site features considered are those that affect the absorption of the effluent and those that affect the construction of the system.

Properties and features that affect absorption of the effluent are permeability, depth to seasonal high water table, depth to bedrock, and susceptibility to flooding. Stones, boulders, and shallowness to bedrock interfere with installation. Excessive slope can cause lateral seepage and surfacing of the effluent. Also, soil erosion and soil slippage are hazards if absorption fields are installed on sloping soils.

In some soils, loose sand and gravel or fractured bedrock is less than 4 feet below the tile lines. In these soils the absorption field does not adequately filter the effluent, and ground water in the area may be contaminated.

On many of the soils that have moderate or severe limitations for use as septic tank absorption fields, a system to lower the seasonal water table can be installed or the size of the absorption field can be increased so that performance is satisfactory.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons have a nearly level floor and cut slopes or embankments of compacted soil material. Aerobic lagoons generally are designed to hold 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. Soils that are very high in content of organic matter and those that have cobbles, stones, or boulders are not suitable. Unless the soil has very slow permeability, contamination of ground water is a hazard where the seasonal high water table is above the level of the lagoon floor. In soils where the water table is seasonally high, seepage of ground water into the lagoon can seriously reduce the lagoon's capacity for liquid waste. Slope, depth to bedrock, and susceptibility to flooding also affect the suitability of sites for sewage lagoons or the cost of construction. Shear strength and permeability of compacted soil material affect the performance of embankments.

Sanitary landfill is a method of disposing of solid waste by placing refuse in successive layers either in excavated trenches or on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil material. Landfill areas are subject to heavy vehicular traffic. Risk of polluting ground water and trafficability affect the suitability of a soil for this use. The best soils have a loamy or silty texture, have moderate to slow permeability, are deep to a seasonal water table, and are not subject to flooding. Clayey soils are likely to be sticky and difficult to spread. Sandy or gravelly soils generally have rapid permeability, which might allow noxious liquids to contaminate ground water. Soil wetness can be a limitation, because operating heavy equipment on a wet soil is difficult. Seepage into the refuse increases the risk of pollution of ground water.

Ease of excavation affects the suitability of a soil for the trench type of landfill. A suitable soil is deep to bedrock and free of large stones and boulders. If the seasonal water table is high, water will seep into trenches.

Unless otherwise stated, the limitations in table 9 apply only to the soil material within a depth of about 6 feet. If the trench is deeper, a limitation of slight or moderate may not be valid. Site investigation is needed before a site is selected.

Daily cover for landfill should be soil that is easy to excavate and spread over the compacted fill in wet and dry periods. Soils that are loamy or silty and free of stones or boulders are better than other soils. Clayey soils may be sticky and difficult to spread; sandy soils may be subject to soil blowing.

The soils selected for final cover of landfills should be suitable for growing plants. Of all the horizons, the A horizon in most soils has the best workability, more organic matter, and the best potential for growing plants. Thus, for either the area- or trench-type landfill, stockpiling material from the A horizon for use as the surface layer of the final cover is desirable.

Where it is necessary to bring in soil material for daily or final cover, thickness of suitable soil material available and depth to a seasonal high water table in soils surrounding the sites should be evaluated. Other factors to be evaluated are those that affect reclamation of the borrow areas. These factors include slope, erodibility, and potential for plant growth.

Construction materials

The suitability of each soil as a source of roadfill, sand, gravel, and topsoil is indicated in table 10 by ratings of good, fair, or poor. The texture, thickness, and organic-matter content of each soil horizon are important factors in rating soils for use as construction material. Each soil is evaluated to the depth observed, generally about 6 feet.

Roadfill is soil material used in embankments for roads. Soils are evaluated as a source of roadfill for low embankments, which generally are less than 6 feet high and less exacting in design than high embankments. The ratings reflect the ease of excavating and working the material and the expected performance of the material where it has been compacted and adequately drained. The performance of soil after it is stabilized with lime or cement is not considered in the ratings, but information about some of the soil properties that influence such performance is given in the descriptions of the soil series.

The ratings apply to the soil material between the A horizon and a depth of 5 to 6 feet. It is assumed that soil horizons will be mixed during excavation and spreading. Many soils have horizons of contrasting suitability within their profile. The estimated engineering properties in table 14 provide specific information about the nature of each horizon. This information can help determine the suitability of each horizon for roadfill.

Soils rated *good* are coarse grained. They have low shrink-swell potential and few cobbles and stones. They are at least moderately well drained and have slopes of 15 percent or less. Soils rated *fair* have a plasticity index of less than 15 and have other limiting features, such as moderate shrink-swell potential, moderately steep slopes, wetness, or many stones. If the thickness of suitable material is less than 3 feet, the entire soil is rated *poor*.

Sand and *gravel* are used in great quantities in many kinds of construction. The ratings in table 10 provide guidance as to where to look for probable sources and are based on the probability that soils in a given area contain sizable quantities of sand or gravel. A soil rated *good* or *fair* has a layer of suitable material at least 3 feet thick, the top of which is within a depth of 6 feet. Coarse fragments of soft bedrock material, such as shale and siltstone, are not considered to be sand and gravel. Fine-grained soils are not suitable sources of sand and gravel.

The ratings do not take into account depth to the water table or other factors that affect excavation of the material. Descriptions of grain size, kinds of minerals, reaction, and stratification are given in the soil series descriptions and in table 14.

Topsoil is used in areas where vegetation is to be established and maintained. Suitability is affected mainly by the ease of working and spreading the soil material in preparing a seedbed and by the ability of the soil material to support plantlife. Also considered is the damage that can result in the area from which the topsoil is taken.

The ease of excavation is influenced by the thickness of suitable material, wetness, slope, and amount of stones. The ability of the soil to support plantlife is determined by texture, structure, and the amount of soluble salts or toxic substances. Organic matter in the A1 or Ap

horizon greatly increases the absorption and retention of moisture and nutrients. Therefore, the soil material from these horizons should be carefully preserved for later use.

Soils rated *good* have at least 16 inches of friable loamy material at their surface. They are free of stones and cobbles, are low in content of gravel, and have gentle slopes. They are naturally fertile or respond well to fertilizer. They are not so wet that excavation is difficult during most of the year.

Soils rated *fair* are loose sandy soils or firm loamy or clayey soils in which the suitable material is only 8 to 16 inches thick or soils that have appreciable amounts of gravel, stones, or soluble salt.

Soils rated *poor* are very sandy soils and very firm clayey soils; soils with suitable layers less than 8 inches thick; soils having large amounts of gravel or stones; steep soils; and poorly drained soils.

Although a rating of *good* is not based entirely on high content of organic matter, a surface horizon is generally preferred for topsoil because of its organic-matter content. This horizon is designated as A1 or Ap in the soil series descriptions. The absorption and retention of moisture and nutrients for plant growth are greatly increased by organic matter.

Water management

Many soil properties and site features that affect water management practices have been identified in this soil survey. In table 11 the soil and site features that affect use are indicated for each kind of soil. This information is significant in planning, installing, and maintaining water-control structures.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have a low seepage potential, which is determined by permeability and the depth to fractured or permeable bedrock or other permeable material.

Embankments, dikes, and levees require soil material that is resistant to seepage, erosion, and piping and has favorable stability, shrink-swell potential, shear strength, and compaction characteristics. Large stones and organic matter in a soil downgrade the suitability of the soil for use in embankments, dikes, and levees.

Aquifer-fed excavated ponds are bodies of water made by excavating a pit or dugout into a ground-water aquifer. Excluded are ponds that are fed by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Ratings in table 11 are for ponds that are properly designed, located, and constructed. Soil properties and site features that affect aquifer-fed ponds are depth to a permanent water table, permeability of the aquifer, quality of the water, and ease of excavation.

Drainage of soil is affected by such soil properties as permeability; texture; depth to bedrock, hardpan, or other layers that affect the rate of water movement; depth to the water table; slope; stability of ditchbanks; susceptibility to flooding; salinity and alkalinity; and availability of outlets for drainage.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to intercept runoff. They allow water to soak into the soil or flow slowly to an outlet. Features that affect suitability of a soil for terraces are uniformity and steepness of slope; depth to bedrock, hardpan, or other unfavorable material; large stones; permeability; ease of establishing vegetation; and resistance to water erosion, soil blowing, soil slipping, and piping.

Grassed waterways are constructed to channel runoff to outlets at a nonerosive velocity. Features that affect the use of soils for waterways are slope, permeability, erodibility, wetness, and suitability for permanent vegetation.

Recreation

The soils of the survey area are rated in table 12 according to limitations that affect their suitability for recreation uses. The ratings are based on such restrictive soil features as flooding, wetness, slope, and texture of the surface layer. Not considered in these ratings, but important in evaluating a site, are location and accessibility of the area, size and shape of the area and its scenic quality, the ability of the soil to support vegetation, access to water, potential water impoundment sites available, and either access to public sewerlines or capacity of the soil to absorb septic tank effluent. Soils subject to flooding are limited, in varying degree, for recreation use by the duration and intensity of flooding and the season when flooding occurs. Onsite assessment of height, duration, intensity, and frequency of flooding is essential in planning recreation facilities.

The degree of the limitation of the soils is expressed as slight, moderate, or severe. *Slight* means that the soil properties are generally favorable and that the limitations are minor and easily overcome. *Moderate* means that the 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 12 can be supplemented by information in other parts of this survey. Especially helpful are interpretations for septic tank absorption fields, given in table 9, and interpretations for dwellings without basements and for local roads and streets, given in table 8.

Camp areas require such site preparation as shaping and leveling for 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 for this use 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 camping sites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for use as 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 will 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 or boulders, is firm after rains, and is not dusty when dry. If shaping is required to obtain a uniform grade, the depth of the soil over bedrock or hardpan should be enough to allow necessary grading.

Paths and trails for walking, horseback riding, bicycling, and other uses should require little or no cutting and filling. The best soils for this use are those that are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once during the annual period of use. They have moderate slopes and have 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 should have a surface that is free of stones and boulders and have moderate slopes. Suitability of the soil for traps, tees, or greens was not considered in rating the soils. Irrigation is an assumed management practice.

Wildlife habitat

Soils directly affect the kind and amount of vegetation that is available to wildlife as food and cover, and they affect the construction of water impoundments. The kind and abundance of wildlife that populate an area depend largely on the amount and distribution of food, cover, and water. If any one of these elements is missing, is inadequate, or is inaccessible, wildlife either are scarce or do not inhabit the area.

If the soils have the potential, wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by helping the natural establishment of desirable plants.

In table 13, the soils in the survey area are rated according to their potential to support the main kinds of wildlife habitat in the area. This information can be used in planning for parks, wildlife refuges, nature study areas, and other developments for wildlife; selecting areas that are suitable for wildlife; selecting soils that are suitable for creating, improving, or maintaining specific elements of wildlife habitat; and 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* means that the element of wildlife habitat or the kind of habitat is easily created, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected if the soil is used for the designated purpose. A rating of *fair* means that the element of wildlife habitat or kind of habitat can be created, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* means that limitations are severe for the designated element or kind of wildlife habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* means that restrictions for the element of wildlife habitat or kind of habitat are very severe and that unsatisfactory results can be expected. Wildlife habitat is impractical or even impossible to create, improve, or maintain on soils having such a rating.

The elements of wildlife habitat are briefly described in the following paragraphs.

Grain and seed crops are seed-producing annuals used by wildlife. The major soil properties 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 soybeans.

Grasses and legumes are domestic perennial grasses and herbaceous legumes that are planted for wildlife food and cover. Major soil properties 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, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds, that provide food and cover for wildlife. Major soil properties 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 fall panicum.

Hardwood trees and the associated woody understory provide cover for wildlife and produce nuts or other fruit, buds, catkins, twigs, bark, or foliage that wildlife eat. Major soil properties that affect growth of hardwood

trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of hardwood plants are oak, poplar, cherry, grape, hawthorn, dogwood, hickory, blackberry, and black walnut. Examples of fruit-producing shrubs that are commercially available and suitable for planting on soils rated *good* are Russian-olive, autumn-olive, and crabapple.

Coniferous plants are cone-bearing trees, shrubs, or ground cover plants that furnish habitat or supply food in the form of browse, seeds, or fruitlike cones. Soil properties that have a major effect on the growth of coniferous plants are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, cedar, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites, exclusive of submerged or floating aquatics. They produce food or cover for wildlife that use wetland as habitat. Major soil properties affecting wetland plants are texture of the surface layer, wetness, reaction, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, and willow and rushes, sedges, and reeds.

Shallow water areas are bodies of water that have an average depth of less than 5 feet and that are useful to wildlife. They can be naturally wet areas, or they can be created by dams or levees or by water-control structures in marshes or streams. Major soil properties affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. The availability of a dependable water supply is important if water areas are to be developed. Examples of shallow water areas are marshes, waterfowl feeding areas, and shallow ponds.

The kinds of wildlife habitat are briefly described in the following paragraphs.

Openland habitat 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 kinds of wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail rabbit, and red fox.

Woodland habitat consists of areas of hardwoods or conifers, or a mixture of both, and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and white-tailed deer.

Wetland habitat consists of open, marshy or swampy, shallow water areas where water-tolerant plants grow. Some of the wildlife attracted to such areas are ducks, geese, herons, muskrat, mink, and beaver.

Soil properties

Extensive data about soil properties are summarized on the following pages. The two main sources of these data are the many thousands of soil borings made during the course of the survey and the laboratory analyses of selected soil samples from typical profiles.

In making soil borings during field mapping, soil scientists can identify several important soil properties. They note the seasonal soil moisture condition or the presence of free water and its depth. For each horizon in the profile, they note the thickness and color of the soil material; the texture, or amount of clay, silt, sand, and gravel or other coarse fragments; the structure, or the natural pattern of cracks and pores in the undisturbed soil; and the consistence of the soil material in place under the existing soil moisture conditions. They record the depth of plant roots, determine the pH or reaction of the soil, and identify any free carbonates.

Samples of soil material are analyzed in the laboratory to verify the field estimates of soil properties and to determine all major properties of key soils, especially properties that cannot be estimated accurately by field observation. Laboratory analyses are not conducted for all soil series in the survey area, but laboratory data for many soil series not tested are available from nearby survey areas.

The available field and laboratory data are summarized in tables. The tables give the estimated range of engineering properties, the engineering classifications, and the physical and chemical properties of each major horizon of each soil in the survey area. They also present data about pertinent soil and water features.

Engineering properties

Table 14 gives estimates of engineering properties and classifications for the major horizons of each soil in the survey area.

Most soils have, within the upper 5 or 6 feet, horizons of contrasting properties. Table 14 gives information for each of these contrasting horizons in a typical profile. *Depth* to the upper and lower boundaries of each horizon is indicated. More information about the range in depth and about other properties in each horizon is given for each soil series in the section "Soil series and morphology."

Texture is described in table 14 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 soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains gravel or other particles coarser than sand, an appropriate modifier is added, for example, "gravelly loam." Other texture terms are defined in the Glossary.

The two systems commonly used in classifying soils for engineering use are the Unified Soil Classification System (*3*) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO) (*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, plasticity index, liquid limit, and organic-matter content. Soils are grouped into 15 classes—eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes have a dual classification symbol, for example, CL-ML.

The *AASHTO* system classifies soils according to those properties that affect their use in highway construction and maintenance. In this system a mineral soil is classified in one of seven basic groups ranging 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. At the other extreme, in group A-7, are fine-grained soils. 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 follows: A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, and A-7-6. As an additional refinement, the desirability of soils as subgrade material can be indicated by a group index number. These numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The AASHTO classification, without group index numbers, is given in table 14. Also in table 14 the percentage, by weight, of rock fragments more than 3 inches in diameter is estimated for each major horizon. These estimates are determined mainly by observing volume percentage in the field and then converting that, by formula, to weight percentage.

Percentage of the soil material less than 3 inches in diameter that passes each of four sieves (U.S. standard) is estimated for each major horizon. The estimates are based on tests of soils that were sampled in the survey area and in nearby areas and on field estimates from many borings made during the survey.

Liquid limit and *plasticity index* indicate the effect of water on the strength and consistence of soil. These indexes are used in the Unified and AASHTO soil classification systems. They are also used as indicators in making general predictions of soil behavior. Range in liquid limit and in plasticity index is estimated on the basis of test data from the survey area or from nearby areas and on observations of the many soil borings made during the survey.

In some surveys, the estimates are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount across classification boundaries (1 or 2 percent), the classification in the marginal zone is omitted.

Physical and chemical properties

Table 15 shows estimated values for several soil characteristics and features that affect behavior of soils in engineering uses. These estimates are given for each major horizon, at the depths indicated, in the typical pedon of each soil. The estimates are based on field observations and on test data for these and similar soils.

Permeability is estimated on the basis of known relationships among the soil characteristics observed in the field—particularly soil structure, porosity, and gradation or texture—that influence the downward movement of water in the soil. The estimates are for vertical water movement when the soil is saturated. Not considered in the estimates is lateral seepage or such transient soil features as plowpans and surface crusts. Permeability of the soil is an important factor to be considered in planning and designing drainage systems, in evaluating the potential of soils for septic tank systems and other waste disposal systems, and in many other aspects of land use and management.

Available water capacity is rated on the basis of soil characteristics that influence the ability of the soil to hold water and make it available to plants. Important characteristics are content of organic matter, soil texture, and soil structure. Shallow-rooted plants are not likely to use the available water from the deeper soil horizons. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design of irrigation systems.

Soil reaction is expressed as a range in pH values. The range in pH of each major horizon is based on many field checks. For many soils, the values have been verified by laboratory analyses. Soil reaction is important in selecting the crops, ornamental plants, or other plants to be grown; in evaluating soil amendments for fertility and stabilization; and in evaluating the corrosivity of soils.

Shrink-swell potential depends mainly on the amount and kind of clay in the soil. Laboratory measurements of the swelling of undisturbed clods were made for many soils. For others the swelling was estimated on the basis of the kind and amount of clay in the soil and on measurements of similar soils. The size of the load and the magnitude of the change in soil moisture content also influence the swelling of soils. Shrinking and swelling of some soils can cause damage to building foundations, basement walls, roads, and other structures unless special designs are used. A high shrink-swell potential indicates that special design and added expense may be required if the planned use of the soil will not tolerate large volume changes.

Erosion factors are used to predict the erodibility of a soil and its tolerance to erosion in relation to specific kinds of land use and treatment. The soil erodibility factor (K) is a measure of the susceptibility of the soil to erosion by water. Soils having the highest K values are the most erodible. K values range from 0.10 to 0.64. To estimate annual soil loss per acre, the K value of a soil is modified by factors representing plant cover, grade and length of slope, management practices, and climate. The soil-loss tolerance factor (T) is the maximum rate of soil erosion, whether from rainfall or soil blowing, that can occur without reducing crop production or environmental quality. The rate is expressed in tons of soil loss per acre per year.

Wind erodibility groups are made up of soils that have similar properties that affect their resistance to soil blowing if cultivated. The groups are used to predict the susceptibility of soil to blowing and the amount of soil lost as a result of blowing. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are extremely erodible, so vegetation is difficult to establish. They are generally not suitable for crops.
2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible, but crops can be grown if intensive measures to control soil blowing are used.
3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible, but crops can be grown if intensive measures to control soil blowing 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, but crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible, but crops can be grown if measures to control soil blowing 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, but crops can be grown if measures to control soil blowing 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, and 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, and crops can easily be grown.
8. Stony or gravelly soils and other soils not subject to soil blowing.

Soil and water features

Table 16 contains information helpful in planning land uses and engineering projects that are likely to be affected by soil and water features.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are placed in one of four groups on the basis of the intake of water after the soils have been wetted and have received 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 chiefly of deep, well drained to excessively drained sands or gravels. 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 that have a layer that impedes the downward movement of water or soils that have 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 clay soils 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 is the temporary covering of soil with water from overflowing streams, with runoff from adjacent slopes, and by tides. Water standing for short periods after rains or after snow melts is not considered flooding, nor is water in swamps and marshes. Flooding is rated in general terms that describe the frequency and duration of flooding and the time of year when flooding is most likely. The ratings are based on evidence in the soil profile of the effects of flooding, namely thin strata of gravel, sand, silt, or, in places, clay deposited by floodwater; irregular decrease in organic-matter content with increasing depth; and absence of distinctive soil horizons that form in soils of the area that are not subject to flooding. The ratings are also based on local information about floodwater levels in the area and the extent of flooding and on information that relates the position of each soil on the landscape to historic floods.

The generalized description of flood hazards is of value in land-use planning and provides a valid basis for land-use restrictions. The soil data are less specific, however, than those provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table is the highest level of a saturated zone more than 6 inches thick for a continuous period of more than 2 weeks during most years. The depth to a seasonal high water table applies to undrained soils. Estimates are based mainly on the relationship between grayish colors or mottles in the soil and the depth to free water observed in many borings made during the course of the soil survey. Indicated in table 16 are the depth to the seasonal high water table; the kind of water table, that is, perched, artesian, or apparent; and the months of the year that the water table commonly is high. Only saturated zones above a depth of 5 or 6 feet are indicated.

Information about the seasonal high water table helps in assessing the need for specially designed foundations, the need for specific kinds of drainage systems, and the need for footing drains to insure dry basements. Such information is also needed to decide whether or not construction of basements is feasible and to determine how septic tank absorption fields and other underground installations will function. Also, a seasonal high water table affects ease of excavation.

Depth to bedrock is shown for all soils that are underlain by bedrock at a depth of 5 to 6 feet or less. For many soils, the limited depth to bedrock is a part of the definition of the soil series. The depths shown are based on measurements made in many soil borings and on other observations during the mapping of the soils. The kind of bedrock and its hardness as related to ease of excavation is also shown. Rippable bedrock can be excavated with a single-tooth ripping attachment on a 200-horsepower tractor, but hard bedrock generally requires blasting.

Potential frost action refers to the likelihood of damage to pavements and other structures by frost heaving and low soil strength after thawing. Frost action results from the movement of soil moisture into the freezing temperature zone in the soil, which causes ice lenses to form. Soil texture, temperature, moisture content, porosity, permeability, and content of organic matter are the most important soil properties that affect frost action. It is assumed that the soil is not covered by insulating vegetation or snow and is not artificially drained. Silty and clayey soils that have a high water table in winter are most susceptible to frost action. Well drained very gravelly or sandy soils are the least susceptible.

Risk of corrosion pertains to potential soil-induced chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to soil moisture, particle-size distribution, total acidity, and electrical conductivity of the soil material. The rate of corrosion of concrete is based mainly on the sulfate content, texture, and acidity of the soil. Protective measures for steel or more resistant concrete help to avoid or minimize damage resulting from the corrosion. Uncoated steel intersecting soil boundaries or soil horizons is more susceptible to corrosion than an installation that is entirely within one kind of soil or within one soil horizon.

Physical and chemical analyses of selected soils

Many of the soils in Ashland County were sampled and laboratory data were determined by the Department of Agronomy, Ohio Agricultural Research and Development Center (OARDC), Columbus, Ohio. The physical and chemical data obtained from samples include particle-size distribution, reaction, organic-matter content, calcium carbonate equivalent, and extractable cations.

These data were used in the classification and correlation of these soils and in evaluating their behavior under various land uses. Five profiles were selected as representative for the respective series and are described in the section "Soil series and morphology." These series and their laboratory identification number are Bennington (AS-12), Cardington (AS-24), Wadsworth (AS-23), Loudonville (AS-28), and Wooster (AS-27).

In addition to the Ashland County data, laboratory data are also available from nearby counties that have many of the same soils. These data and the Ashland County data are on file at the Department of Agronomy, OARDC, Columbus, Ohio; the Ohio Department of Natural Resources, Division of Lands and Soil; and the Soil Conservation Service, State Office, Columbus, Ohio.

Engineering test data

Several of the soils in Ashland County were analyzed for engineering properties by the Soil Physical Studies Laboratory, Department of Agronomy, Ohio State University. Part of the moisture density was determined by the Ohio Department of Transportation Soil Testing Laboratory. Data from five of the series are considered as representative for the series in the county and are described in the section "Soil series and morphology." These series and the laboratory identification number are Bennington (AS-12), Cardington (AS-24), Loudonville (AS-28), Wadsworth (AS-23), and Wooster (AS-27).

In addition to the Ashland County data, engineering test data are also available from nearby counties that have many of the same soils. These data and the Ashland County data are on file at the Department of Agronomy, Ohio State University, Columbus, Ohio; the Ohio Department of Natural Resources, Division of Lands and Soil, Columbus, Ohio; and the Soil Conservation Service, State Office, Columbus, Ohio.

Classification of the soils

The system of soil classification currently used was adopted by the National Cooperative Soil Survey in

1965. Readers interested in further details about the system should refer to "Soil Taxonomy" (*9*).

The system of classification has six categories. Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. In this system the classification is based on the different soil properties that can be observed in the field or those that can be inferred either from other properties that are observable in the field or from the combined data of soil science and other disciplines. The properties selected for the higher categories are the result of soil genesis or of factors that affect soil genesis. In table 17, the soils of the survey area are classified according to the system. Categories of the system are discussed in the following paragraphs.

ORDER. Ten soil orders are recognized as classes in the system. The properties used to differentiate among orders are those that reflect the kind and degree of dominant soil-forming processes that have taken place. Each order is identified by a word ending in *sol*. An example is Alfisol.

SUBORDER. Each order is divided into suborders based primarily on properties that influence soil genesis and are important to plant growth or that are selected to reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Aqualfs (*Aqu*, meaning water, plus *alf*, from Alfisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of expression of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and a prefix that suggests something about the properties of the soil. An example is Ochraqualfs (*Ochr*, meaning light-colored surface layer, plus *aqualfs*, the suborder of Alfisols that have an aquic moisture regime).

SUBGROUP. Each great group may be divided into three subgroups: the central (typic) concept of the great groups, which is not necessarily the most extensive subgroup; the intergrades, or transitional forms to other orders, suborders, or great groups; and the extragrades, which have some properties that are representative of the great groups 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 *Aeric* identifies the subgroup that is thought to be drier than the great group. An example is Aeric Ochraqualfs.

FAMILY. Families are established within a subgroup on the basis of similar physical and chemical properties that affect management. Among the properties considered in horizons of major biological activity below plow depth are particle-size distribution, mineral content, temperature regime, thickness of the soil penetrable by roots, consistence, moisture equivalent, soil slope, and permanent cracks. A family name consists of the name of a subgroup and a series of adjectives. The adjectives are the class names for the soil properties used as family differentiae. An example is fine-loamy, mixed, mesic, Aeric Ochraqualfs.

SERIES. The series consists of soils that formed in a particular kind of material and have horizons that, except for texture of the surface soil or of the underlying substratum, are similar in differentiating characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineral and chemical composition.

Soil series and morphology

In this section, each soil series recognized in the survey area is described in detail. The descriptions are arranged in alphabetic order by series name.

Characteristics of the soil and the material in which it formed are discussed for each series. The soil is then compared to similar soils and to nearby soils of other series. Then a pedon, a small three-dimensional area of soil that is typical of the soil series in the survey area, is described. The detailed descriptions of each soil horizon follow standards in the Soil Survey Manual (*7*). Unless otherwise noted, colors described are for moist soil.

Following the pedon description is the range of important characteristics of the soil series in this survey area. Phases, or map units, of each soil series are described in the section "Soil maps for detailed planning."

Alexandria series

The Alexandria series consists of deep, well drained soils that formed in moderately fine textured glacial till that has a medium amount of calcium carbonate. These soils have moderately slow or moderate permeability. They are on the side slopes of valleys, and the slope ranges from 12 to 50 percent.

Alexandria soils commonly are adjacent to Cardington soils. Cardington soils have low-chroma mottles in the upper 10 inches of the argillic horizons.

Typical pedon of Alexandria silt loam, 25 to 50 percent slopes, in Ruggles Township, 1,450 feet west of U.S. Highway 250 and 30 feet north of County Highway 500, in lot 28, T.1 N., R.18 W.

A1—0 to 2 inches; very dark grayish brown (10YR 3/2) silt loam; moderate fine granular structure; friable; medium acid; clear wavy boundary.

A2—2 to 4 inches; pale brown (10YR 6/3) silt loam; weak thin platy structure; friable; very strongly acid; clear irregular boundary.

B1—4 to 9 inches; yellowish brown (10YR 5/ 4) light silty clay loam; moderate fine subangular blocky structure; firm; very strongly acid; clear wavy boundary.

B21t—9 to 19 inches; yellowish brown (10YR 5/6) silty clay loam; weak coarse subangular blocky structure parting to moderate fine angular blocky; firm; thin patchy brown (10YR 5/3) clay films and common pale brown (10YR 6/3) silty coatings on peds; 3 percent pebbles; strongly acid; clear wavy boundary.

B22t—19 to 30 inches; dark yellowish brown (10YR 4/4) heavy silty clay loam; moderate medium angular blocky structure; very firm; thin patchy yellowish brown (10YR 5/4) clay films of moderate thickness, and a few pale brown (10YR 6/3) silt coatings on peds; 4 percent coarse fragments; medium acid; clear irregular boundary.

B23t—30 to 35 inches; dark yellowish brown (10YR 4/4) silty clay loam; few medium distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; thin patchy yellowish brown (10YR 5/4) clay films; few very thin (0.1 inch) sandy lenses; medium acid; clear wavy boundary.

B3—35 to 42 inches; yellowish brown (10YR 5/4) silty clay loam; common medium faint grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; firm; few brown (10YR 5/3) clay films; 6 percent pebbles; slightly acid.

C—42 to 60 inches; brown (10YR 5/3) silty clay loam; massive; firm; 6 percent pebbles; strong effervescence; mildly alkaline.

Thickness of the solum and depth to carbonates range from 30 to 45 inches and typically are the same. Reaction in the upper part of the solum ranges from medium acid to very strongly acid; at the base of the solum it ranges from slightly acid to mildly alkaline. Coarse fragments, most of them small angular pebbles, make up as much as 5 percent of the A and B1 horizons and 2 to 10 percent of the B2, B3, and C horizons.

In a plowed area, the color of the Ap horizon ranges from dark grayish brown (10YR 4/2) in slightly eroded places to brown (10YR 5/3) where erosion is severe. In an unplowed area, the A1 horizon is very dark grayish brown (10YR 3/2) or dark grayish brown (10YR 4/2). It is 2 to 4 inches thick in slightly eroded places and 1/2 inch to 2 inches thick in places that are moderately eroded.

There is no A2 horizon in most cultivated areas. In unplowed places the A2 horizon is 2 to 5 inches thick and is brown (10YR 5/3) or pale brown (10YR 6/3) and is free of mottling. The B2t horizons have hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. Texture is clay loam or silty clay loam. In the upper 20 inches of the B2t horizon, the average clay content is slightly more than 35 percent. The clay in the subhorizons ranges from 32 to 42 percent. Some pedons do not have a B3 horizon. The C horizon is clay loam, silty clay loam, or heavy loam. Clay content of the C horizon is 25 to 35 percent.

Algiers series

The Algiers series consists of deep, somewhat poorly drained soils that have moderate permeability. These soils formed in thin deposits of light-colored, loamy, recent alluvium overlying older, dark-colored soils of alluvial or lacustrine origin. They are in the major stream valleys and are most common where a tributary stream enters the valley. Slope ranges from 0 to 2 percent.

Algiers soils commonly are adjacent to Holly and Shoals soils. Holly and Shoals soils do not have the thick, buried, dark-colored layers that are in Algiers soils.

Algiers soils have a light-over-dark color sequence. The other soils in the county that have such a color sequence are the Killbuck and Wallkill soils. The Killbuck soils are wetter than the Algiers soils and have a grayer B horizon. In Wallkill soils the buried dark layer is muck, and in Algiers soils it is mineral material.

Typical pedon of Algiers silt loam, in Mohican Township, 2,500 feet south and 1,800 feet west of the NE corner of sec. 15, T. 21 N., R. 18 W.

Ap—0 to 11 inches; dark brown (10YR 4/3) silt loam; weak fine granular structure; friable; neutral; abrupt smooth boundary.

C—11 to 24 inches; brown (10YR 5/3) silt loam; many coarse faint grayish brown (10YR 5/2) mottles; massive; friable; neutral; abrupt wavy boundary.

IIAb—24 to 32 inches; very dark grayish brown (10YR 3/2 crushed) silty clay loam; weak medium subangular blocky structure parting to strong fine granular; firm; neutral; clear smooth boundary.

IIB2b—32 to 35 inches; very dark brown (10YR 2/2) heavy silty clay loam; common fine prominent yellowish brown (10YR 5/6) mottles; moderate medium angular blocky structure; firm; neutral; clear smooth boundary.

IIB3bg—35 to 45 inches; grayish brown (10YR 5/2) heavy silty clay loam; common medium distinct yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure; firm; thick very dark brown (10YR 2/2) coatings on peds; few olive (5Y 5/3) crack fillings; neutral; abrupt smooth boundary.

IICg—45 to 60 inches; grayish brown (10YR 5/2) silt loam; many coarse prominent strong brown (7.5YR 5/8) and common medium distinct yellowish brown (10YR 5/4) mottles; few strata of silty clay loam; massive; friable; neutral.

The thickness of recent alluvium above the Ab horizon ranges from 20 to 36 inches. Reaction ranges from slightly acid to neutral in the upper part of the solum and from slightly acid to mildly alkaline in the lower part. Coarse fragments make up 0 to 15 percent of the recent alluvium, 0 to 10 percent of the buried A horizon, and 2 to 25 percent of the remainder of the buried soil.

The Ap horizon is dark brown (10YR 4/3) or dark grayish brown (10YR 4/2). The C horizon above the buried soil has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. Mottles of lower chroma are in all or part of this horizon. Texture is silt loam, loam, or light silty clay loam. The buried A horizon is at a depth of 14 to 30 inches and has a thickness of 8 to 18 inches. This horizon is very dark grayish brown (10YR 3/2), very dark brown (10YR 2/2), or black (10YR 2/1). Texture is silt loam or silty clay loam. The B and C horizons below the Ab horizon are dominantly brown, yellowish brown, or grayish brown. The dominant texture of these horizons is loam, silt loam, or silty clay loam, gravelly in some places.

Bennington series

The Bennington series consists of deep, somewhat poorly drained soils that have slow permeability. These soils formed in moderately fine textured glacial till that has a medium calcium carbonate content. They are on till plains, where they occupy flats, low knolls, and ridges. Slope ranges from 0 to 6 percent.

Bennington soils are commonly adjacent to Cardington and Condit soils and are similar to Mahoning and Tiro soils. Cardington soils do not have mottling immediately below the Ap horizon or low-chroma coatings on the surfaces of peds in the argillic horizons. Condit soils have a gray B horizon. Mahoning soils have a slightly higher clay content and more pronounced prismatic structure in the argillic horizons than Bennington soils and have their maximum clay content closer to the top of the argillic horizons. Tiro soils formed in a silt mantle over glacial till.

Typical pedon of Bennington silt loam, 0 to 2 percent slopes, in Sullivan Township, 250 feet south and 1,600 feet east of the junction of Township Road 150 and County Road 681, lot 87, T.1 N., R.18 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam; moderate medium granular structure; friable; few pebbles; medium acid; abrupt smooth boundary.

B&A—7 to 11 inches; yellowish brown (10YR 5/6) silty clay loam (B2t); common medium distinct light brownish gray (2.5Y 6/2) mottles; moderate medium subangular blocky structure; firm; thick light brownish gray (2.5Y 6/2) degradational coatings on peds; few pebbles; very strongly acid; clear smooth boundary.

B21t—11 to 15 inches; dark yellowish brown (10YR 4/4) silty clay loam; common medium distinct grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to strong medium subangular blocky; firm; grayish brown (10YR 5/2) coatings on peds include both degradational silt coatings and clay films; few pebbles; very strongly acid; clear smooth boundary.

B22t—15 to 23 inches; dark yellowish brown (10YR 4/4) silty clay loam; common medium distinct grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; grayish brown (2.5Y 5/2) faces of peds have thin patchy clay films and few degradational coatings; few pebbles; strongly acid; clear smooth boundary.

B23t—23 to 36 inches; brown (10YR 4/3) silty clay loam; few fine faint grayish brown (10YR 5/2) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; dark grayish brown (2.5Y 4/2) coatings on peds include thin patchy clay films; few Fe-Mn stains; 4 percent pebbles; slightly acid; clear smooth boundary.

B3t—36 to 46 inches; brown (10YR 4/3) silty clay loam; common fine faint grayish brown (10YR 5/2) mottles; weak coarse prismatic structure parting to weak coarse subangular blocky; firm; gray (N 5/0) coatings on vertical ped surfaces include thin patchy clay films; 5 percent pebbles; slight effervescence in interiors of peds; mildly alkaline; diffuse wavy boundary.

C—46 to 60 inches; dark brown (10YR 4/3) silty clay loam; few fine faint grayish brown (10YR 5/2) mottles; massive; firm; few vertical fractures have gray (N 5/0) coatings spaced 6 to 8 inches apart; common light gray (10YR 7/2) carbonate accumulations; strong effervescence; moderately alkaline.

Thickness of the solum ranges from 36 to 50 inches, and the depth to carbonates ranges from 30 to 46 inches. Reaction in the upper part of the solum ranges from medium acid to very strongly acid in an unlimed pedon. The B horizon becomes more alkaline with depth and in the lower part is slightly acid to mildly alkaline.

The Ap horizon ranges from dark grayish brown (10YR 4/2) in uneroded areas to brown (10YR 5/3) in eroded spots. The B2t horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 to 5. Faces of peds have hue of 10YR, 2.5Y, or N, value of 4 to 6, and chroma of 2 or less. The B2t horizon is silty clay loam or clay loam. The C horizon is calcareous loam, clay loam, or silty clay loam and is 24 to 32 percent clay.

Berks series

The Berks series consists of moderately deep, well drained soils that formed in material weathered from sandstone. Permeability is moderate to moderately rapid. These soils are on the sides of major stream valleys. Slope ranges from 12 to 60 percent.

Berks soils are commonly adjacent to Coshocton, Lordstown, and Schaffenaker soils. Coshocton soils are deeper to solid bedrock and have fewer rock fragments than Berks soils. They have an argillic horizon, and the Berks soils do not. Lordstown soils have a profile similar

to that of Berks soils but have less than 35 percent coarse fragments above a depth of 20 inches. Schaffenaker soils contain fewer coarse fragments. They formed in material that weathered from coarser grained sandstone. In this county, Schaffenaker soils are typically at a slightly higher elevation than Berks soils.

Typical pedon of Berks channery silt loam, 12 to 18 percent slopes, in Hanover Township, 2,350 feet east and 2,050 feet south of the NW corner of sec. 17, T. 19 N., R.16 W.

A1—0 to 3 inches; very dark grayish brown (10YR 3/2) channery silt loam; weak fine granular structure; very friable; 15 percent flat rock fragments; strongly acid; clear irregular boundary.

B1—3 to 10 inches; brown (10YR 5/3) channery silt loam; weak fine and medium subangular blocky structure; very friable; 20 percent sandstone fragments; very strongly acid; gradual smooth boundary.

B21—10 to 26 inches; yellowish brown (10YR 5/6) channery silt loam; weak very fine subangular blocky structure; very friable; 40 percent sandstone fragments; very strongly acid; gradual smooth boundary.

B22—26 to 36 inches; yellowish brown (10YR 5/4) very channery silt loam; weak medium subangular blocky structure; very friable; 60 percent sandstone fragments; strongly acid; abrupt irregular boundary.

R—36 inches; light olive brown (2.5Y 5/4) sandstone; many reddish brown (5YR 4/4) and dark brown (7.5YR 3/2) stains; beds 1 inch to 2 inches thick, vertical cracks 4 to 10 inches apart.

Thickness of the solum ranges from 18 to 36 inches and the depth to rock from 20 to 40 inches. Material of the solum is mostly strongly acid or very strongly acid, but subhorizons in some pedons are medium acid. Sandstone fragments make up 15 to 35 percent of the A and B1 horizons, 35 to 60 percent of the B2 horizon, and 50 to 80 percent of the C horizon if one is present.

The Al horizon is very dark grayish brown (10YR 3/2) or very dark brown (10YR 4/3). The B1 and B2 horizons have hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. Texture of the B horizons (excluding coarse fragments) is loam or silt loam; typically the clay content is less than 24 percent.

Bogart series

The Bogart series consists of moderately well drained, deep soils that have moderate or moderately rapid permeability. These soils formed in glacial outwash on terraces and outwash plains. Slope ranges from 0 to 6 percent.

Bogart soils commonly are adjacent to Chili, Jimtown, and Wheeling soils. Neither the Chili nor the Wheeling soils have low-chroma mottles in the top 10 inches of the argillic horizons. Unlike Bogart soils, Jimtown soils have low-chroma colors immediately below the Ap horizon.

Typical pedon of Bogart gravelly loam, 0 to 2 percent slopes, in Perry Township, 1,550 feet north and 1,700 feet east of the SW corner of sec. 14, T. 22 N., R. 15 W.

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) gravelly loam; weak fine granular structure; friable; 15 percent gravel; slightly acid; abrupt smooth boundary.

B21t—10 to 16 inches; brown (10YR 4/3) gravelly loam; weak coarse subangular blocky structure parting to moderate fine subangular blocky; friable; thin patchy brown (10YR 5/3) clay films and common pale brown (10YR 6/3) silt coatings; 15 percent fine gravel; medium acid; clear irregular boundary.

B22t—16 to 26 inches; yellowish brown (10YR 5/4) loam; many fine and medium faint grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; friable; thin patchy dark yellowish brown (10YR 4/4) clay films and few medium clay films; common pale brown (10YR 6/3) silt coatings; 12 percent gravel; strongly acid; gradual wavy boundary.

B23t—26 to 42 inches; yellowish brown (10YR 5/4) stratified gravelly loam and gravelly sandy loam; few fine faint grayish brown (10YR 5/2) mottles; single grain; very friable; gravel and sand partially coated and bridged with clay; 25 percent gravel less than 1 inch in diameter; medium acid; clear irregular boundary.

B24t—42 to 50 inches; dark yellowish brown (10YR 4/4) stratified gravelly sandy loam, gravelly loam, and gravelly sandy clay loam; few medium distinct grayish brown (10YR 5/2) mottles; single grain; very friable; sticky when wet; sand and gravel coated and bridged with clay; 20 percent fine gravel; slightly acid; clear irregular boundary.

C—50 to 60 inches; dark yellowish brown (10YR 4/4) gravelly loamy sand; single grain; loose; 30 percent fine gravel; slightly acid.

Thickness of the solum ranges from 30 to 50 inches; the depth to carbonates is more than 60 inches. Reaction in the solum ranges from slightly acid to very strongly acid. The C horizon is strongly acid to mildly alkaline. Coarse fragments make up less than 30 percent of the horizons above a depth of 20 inches and 15 to 35 percent of the horizons between a depth of 20 and 40 inches.

In an uncultivated area the A1 horizon is very dark grayish brown (10YR 3/2) or very dark brown (10YR 2/2) and is 1 to 5 inches thick. The A horizon is silt loam or gravelly loam. The gravel content in the A horizon ranges from 5 to 15 percent in the loam and is less than 5 percent in the silt loam. The thickness of the entire B2t horizon ranges from 16 to 40 inches; the hue is 10YR or

7.5YR, the value is 4 or 5, and the chroma ranges from 3 to 6. The clay content in the upper 20 inches of the B2t horizon is 20 to 30 percent. The texture is loam, gravelly loam, sandy loam, silt loam, light silty clay loam, or light clay loam. The C horizon typically is stratified. Texture of the C horizon commonly is gravelly or very gravelly loam, gravelly or very gravelly sandy loam, or gravelly loamy sand.

Canfield series

The Canfield series consists of deep, moderately well drained soils that have a dense, slowly permeable fragipan. These soils formed in loam glacial till on uplands. Slope ranges from 2 to 12 percent.

Canfield soils are commonly adjacent to Ravenna and Wooster soils. They are similar to Rittman soils. Unlike Canfield soils, Ravenna soils have low-chroma color immediately below the Ap horizon. Wooster soils do not have low-chroma mottles in the top 10 inches of the argillic horizons. Rittman soils have a higher clay content in the B2t horizons than Canfield soils.

Typical pedon of Canfield silt loam, 2 to 6 percent slopes, in Perry Township, 1,500 feet east of County Road 251 and 60 feet north of Township Road 1,550, SE1/4 sec. 28, T. 22 N., R. 15 W.

Ap—0 to 10 inches; dark brown (10YR 4/3) silt loam; weak fine granular structure; friable; neutral; abrupt smooth boundary.

B1—10 to 13 inches; yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure; friable; many pale brown (10YR 6/3) silt coatings, and very few clay films on peds; 2 percent coarse fragments; strongly acid; clear smooth boundary.

B21t—13 to 17 inches; yellowish brown (10YR 5/4) heavy silt loam; common medium distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; common pale brown (10YR 6/3) silt coatings, and common medium thick brown (10YR 5/3) clay films on surfaces of peds; 2 percent coarse fragments; very strongly acid; clear smooth boundary.

B22t—17 to 21 inches; yellowish brown (10YR 5/4) heavy loam; common medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; medium acid; thin patchy brown (10YR 5/3) clay films; 2 percent coarse fragments; strongly acid; clear wavy boundary.

Bx1—21 to 28 inches; yellowish brown (10YR 5/4) loam; common fine distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; moderate very coarse (6 inches) prismatic structure parting to moderate medium platy; very firm, brittle; continuous thin and patches of thick gray (10YR 5/1) clay films on prisms; 3 percent coarse fragments; medium acid; clear wavy boundary.

Bx2—28 to 35 inches; yellowish brown (10YR 5/4) loam; common coarse faint yellowish brown (10YR 5/6) and few fine distinct gray (10YR 5/1) and grayish brown (10YR 5/2) mottles; weak very coarse (4 inches) prismatic structure parting to weak medium platy, which in turn parts to moderate very fine subangular blocky peds; very firm, very brittle; medium gray (10YR 5/1) clay films are continuous on faces of prisms and very patchy on plate surfaces; 8 percent coarse fragments; medium acid; clear smooth boundary.

B3—35 to 44 inches; yellowish brown (10YR 5/4) loam; common fine faint yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; very few thin brown (10YR 5/3) clay films; 5 percent coarse fragments; slightly acid; diffuse wavy boundary.

C—44 to 60 inches; yellowish brown (10YR 5/4) loam; few fine faint grayish brown (10YR 5/2) mottles; massive; firm; 5 percent coarse fragments, some with strong brown (7.5YR 5/8) stains; slightly acid.

Thickness of the solum ranges from 40 to 66 inches. The depth to the top of the fragipan ranges from 15 to 30 inches. The reaction in and above the fragipan ranges from medium acid to very strongly acid in places where the effects of liming are not evident. Reaction at the 60-inch depth is slightly acid to mildly alkaline. Coarse fragments typically make up 1 to 5 percent of the soil, by volume, above the fragipan and 5 to 15 percent in and below the fragipan.

In wooded areas, the A1 horizon is very dark grayish brown and is 1 to 4 inches thick. It is underlain by a brown (10YR 5/3) or yellowish brown (10YR 5/4) A2 horizon. The A horizon is silt loam or loam. The B2t horizon has hue of 10YR, value of 4 or 5, and chroma of 4 to 6. The texture is loam or silt loam, and the clay content is 18 to 27 percent. The Bx horizon is 14 to 30 inches thick. It is brown (10YR 4/3), dark yellowish brown (10YR 4/4), or yellowish brown (10YR 5/4 or 5/6) and has low-chroma mottles. Light brownish gray (10YR 6/2) or pale brown (10YR 6/3) silt coatings are on prisms in the upper part of the fragipan in some pedons. The fragipan in some pedons has dark-colored manganese concretions. Texture of the fragipan is loam or silt loam, and the clay content is 20 to 27 percent. The C horizon is loam or silt loam, and in some places it has strata of sandy loam.

Cardington series

The Cardington series consists of deep, moderately well drained soils that have moderately slow permeability. These soils formed in moderately fine textured glacial till that has a medium calcium carbonate content. They

are on till plains, where they occupy knolls, hilltops, and the side slopes of small valleys. Slope ranges from 2 to 12 percent.

Cardington soils are commonly adjacent to Alexandria and Bennington soils. They are similar to Ellsworth soils. Alexandria soils do not have low-chroma mottles in the top 10 inches of the argillic horizons. Unlike Cardington soils, Bennington soils have low-chroma color immediately below the Ap horizon. Ellsworth soils have a slightly higher clay content and more pronounced prismatic structure in the B2t horizon, and their zone of maximum clay content is nearer the top of the B2t horizon than in the Cardington soils.

Typical pedon of Cardington silt loam, 2 to 6 percent slopes, in Clear Creek Township, 2,250 feet north and 2,600 feet east of the SW corner of sec. 27, T. 25 N., R. 20 W.

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam; weak fine granular structure; friable; few small pebbles; neutral; abrupt smooth boundary.

B1—8 to 10 inches; yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure; firm; common brown (10YR 5/3) silt coatings on peds; neutral; clear smooth boundary.

B21t—10 to 14 inches; yellowish brown (10YR 5/6) silty clay loam; few fine distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; thin patchy brown (10YR 5/3) clay films and common light brownish gray (10YR 6/3) coatings; few angular pebbles; strongly acid; clear irregular boundary.

B22t—14 to 18 inches; yellowish brown (10YR 5/6 and 5/4) heavy clay loam; few fine distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; patchy moderately thick brown (10YR 5/3) silt coatings with patches of grayish brown (10YR 5/2) clay films; few angular pebbles; strongly acid; gradual smooth boundary.

B23t—18 to 24 inches; yellowish brown (10YR 5/4 and 5/6) clay loam; common medium distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; moderately thick patchy brown (10YR 5/3) clay films and occasional thicker grayish brown (10YR 5/2) clay seams; few pebbles; neutral; gradual wavy boundary.

B3—24 to 30 inches; yellowish brown (10YR 5/4) clay loam; common medium and fine distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; few pebbles; neutral; clear smooth boundary.

C1—30 to 48 inches; yellowish brown (10YR 5/4) clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; massive; firm; few angular pebbles; common lime accumulations; strong effervescence; mildly alkaline; gradual smooth boundary.

C2—48 to 60 inches; yellowish brown (10YR 5/4) clay loam; few fine prominent yellowish red (5YR 5/8) and few medium faint yellowish brown (10YR 5/6) mottles; massive; firm; few pebbles; strong effervescence; moderately alkaline.

Thickness of the solum and the depth to carbonates range from 28 to 44 inches. The reaction in the upper part of the solum ranges from strongly acid to very strongly acid, except in places where the effect of liming is evident.

The Ap horizon ranges from dark grayish brown (10YR 4/2) silt loam in places that are only slightly eroded to yellowish brown (10YR 5/4) silty clay loam if erosion is severe. In an unplowed area, the A1 horizon is very dark grayish brown (10YR 3/2) or very dark brown (10YR 2/2) and is 1 to 4 inches thick. There is an A2 horizon of brown (10YR 5/3) or pale brown (10YR 6/3) silt loam in most uncultivated places, and a remnant of an A2 horizon remains in some cultivated places. The B1 horizon is silt loam or silty clay loam. The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. Texture of the B2t horizons is clay loam or silty clay loam. Subhorizons have 30 to 40 percent clay, and the weighted average clay content of the top 20 inches is slightly more than 35 percent. Peds are coated with clay films that typically are of lower chroma than the ped interiors. The C horizon is silty clay loam, clay loam, or loam, and its clay content is 24 to 32 percent.

Carlisle series

The Carlisle series consists of deep, dark-colored, very poorly drained organic soils that have moderately rapid to moderately slow permeability. These soils formed in well-decomposed plant remains and are in basin-like areas along the sides of the major stream valleys. These soils are level.

Carlisle soils are commonly adjacent to Luray and Sloan soils. They are similar to Linwood soils. Both the Luray and the Sloan soils formed in mineral material rather than in organic deposits. Both the Carlisle and the Linwood soils have an organic surface layer, but in Linwood soils the organic material is thinner than in the Carlisle soils.

Typical pedon of Carlisle muck, in Montgomery Township, 2,100 feet west and 950 feet south of the NE corner of sec. 36, T. 22 N., R. 16 W.

Oa1—0 to 11 inches; black (10YR 2/1) (no change on rubbing) sapric material; 15 percent fiber, 5 percent rubbed; moderate fine crumb structure; friable; 25 percent mineral; neutral; clear smooth boundary.

Oa2—11 to 27 inches; black (N 2/0), black (10YR 2/1) rubbed, sapric material; 20 percent fiber, 5 percent rubbed; weak fine subangular blocky structure; fri-

able; 20 percent mineral; neutral; clear smooth boundary.

Oa3—27 to 38 inches; black (10YR 2/1), very dark grayish brown (10YR 3/2) rubbed, sapric material; 40 percent dark brown (10YR 4/3) and dark yellowish brown (10YR 4/4) fiber; 5 percent fiber rubbed; weak very fine subangular blocky structure; very friable; few small woody coarse fragments; 10 percent mineral; neutral; clear smooth boundary.

Oa4—38 to 47 inches; very dark brown (10YR 2/2), very dark grayish brown (10YR 3/2) rubbed, sapric material; 25 percent fiber, 5 percent rubbed; weak very fine subangular blocky structure; friable; few woody coarse fragments; 25 percent mineral; neutral; clear smooth boundary.

Oa5—47 to 54 inches; very dark grayish brown (10YR 3/2), dark grayish brown (10YR 4/2) crushed, sapric material; 25 percent fiber, 5 percent crushed; weak very fine subangular blocky structure; friable; 30 percent mineral; neutral; abrupt wavy boundary.

IIC—54 to 60 inches; gray (5Y 5/1) silt loam; massive; friable; weak effervescence; mildly alkaline.

The thickness of the organic material is at least 51 inches. The organic horizons are dominantly sapric material. The hue ranges from 10YR to 7.5YR, the value is 2 or 3, and the chroma ranges from 0 to 2. Fiber content ranges from 10 to 50 percent before rubbing and is less than 10 percent after rubbing. Fibers are both herbaceous and woody; woody fibers become more numerous with depth. Reaction is in the neutral range when measured in water and medium acid to neutral when measured in calcium chloride. Some pedons have layers of hemic material less than 8 inches thick and of limnic material less than 2 inches thick.

In places a mineral C horizon is present at a depth of 51 to 60 inches; it is gray or grayish brown silt loam or silty clay loam. The reaction is neutral or mildly alkaline, and the material is weakly calcareous in many places.

Chili series

The Chili series consists of deep, well drained loamy soils that have gravel in and below the subsoil. The soils have moderately rapid permeability. They formed in outwash materials deposited by glacial melt water. They are on stream terraces, kames, and moraines. Slope ranges from 2 to 55 percent.

Chili soils are commonly adjacent to Bogart and Jimtown soils. Bogart soils have low-chroma mottles in the top 10 inches of the argillic horizons. Unlike the Chili soils, the Jimtown soils have low-chroma color immediately below the Ap horizon.

Typical pedon of Chili loam, 2 to 6 percent slopes, in Orange Township, 1,850 feet east and 2,600 feet south of NW corner of sec. 32, T. 25 N., R. 16 W.

Ap—0 to 10 inches; dark brown (10YR 4/3) loam; weak medium granular structure; friable; 8 percent fine gravel; slightly acid (limed); abrupt smooth boundary.

B1—10 to 14 inches; yellowish brown (10YR 5/4) loam; weak medium and coarse subangular blocky structure; friable; 10 percent fine pebbles; medium acid; clear wavy boundary.

B21t—14 to 27 inches; yellowish brown (10YR 5/6) gravelly loam; moderate medium subangular blocky structure; firm; thin patchy clay films; coarse fragments coated and bridged with clay; 20 percent fine gravel; medium acid; clear wavy boundary.

B22t—27 to 33 inches; yellowish brown (10YR 5/4) gravelly loam; weak coarse subangular blocky structure; friable; few thin patchy clay films; coarse fragments coated and bridged with clay; 20 percent fine gravel (less than 1 inch) and 10 percent coarser gravel (1 inch to 2 1/2 inches); strongly acid; clear wavy boundary.

B23t—33 to 38 inches; dark yellowish brown (10YR 4/4) gravelly loam; massive; firm; sticky; coarse fragments heavily coated and bridged with clay; 30 percent fine gravel; medium acid; clear smooth boundary.

B3—38 to 54 inches; yellowish brown (10YR 5/4) gravelly sandy loam; massive; very friable; thin strata of dark yellowish brown (10YR 4/4) gravelly loam in which coarse fragments are coated and bridged with clay; 35 percent gravel; medium acid; clear wavy boundary.

C—54 to 60 inches; yellowish brown (10YR 5/4) gravelly loamy sand; single grain; loose; thin brown (10YR 5/3) strata of sand; 40 percent gravel; medium acid.

The solum is 40 to 60 inches thick. The base of the B2t horizon is at a depth of 32 to 48 inches. The upper part of the solum ranges from medium acid to very strongly acid in areas that are not limed. The solum is less acid with depth and is medium acid to neutral in the lower part.

The Ap horizon is dark grayish brown (10YR 4/2) in some pedons. In an uncultivated area, the A1 horizon is 2 to 4 inches thick and is very dark grayish brown (10YR 3/2) or very dark brown (10YR 2/2). In most uncultivated areas, there is an A2 horizon, and a remnant of that horizon remains in some cultivated places. The A2 horizon is brown (10YR 5/3) or pale brown (10YR 6/3) and is up to 5 inches thick.

The A horizon is loam, silt loam, or gravelly loam. Its gravel content is 2 to 25 percent. The B1 horizon is brown or yellowish brown loam or gravelly loam. It is 5 to 25 percent gravel. The B2t horizon consists of 2 to 6 subhorizons that differ in color, texture, or gravel size and content. The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. The overall clay content in the upper 20 inches of the B2t horizon ranges from 18 to 25 percent, and the gravel content is 15 to 35

percent. The subhorizons have clay and gravel content outside these ranges. Texture is most typically gravelly loam but also includes gravelly sandy loam, sandy loam, loamy sand, clay loam, loam, and gravelly clay loam. The B3 horizon is similar in color to the B2t horizon; it has less clay bridging than the B2t horizon. It is gravelly loam or gravelly sandy loam. The C horizon is highly stratified. The texture of the fines and the content and size of gravel are variable. The overall gravel content of the C horizon ranges from 25 to 60 percent.

Condit series

The Condit series consists of deep, poorly drained soils that have slow permeability. These soils formed in moderately fine textured glacial till that has a medium calcium carbonate content. They are on flat till plains, in depressions, and at the head of natural drainage courses. Slope ranges from 0 to 2 percent.

Condit soils commonly are adjacent to Bennington, Cardington, and Pewamo soils. They are similar to Sebring soils. Bennington soils are less gray in the B horizons than Condit soils. Cardington soils do not have mottling immediately below the Ap horizon or low-chroma coatings on surfaces of peds in the argillic horizons. Pewamo soils have a mollic epipedon. Sebring soils formed in lacustrine deposits and have more silt and less clayey argillic horizons and a more stratified C horizon than Condit soils.

Typical pedon of Condit silt loam, in Troy Township, 900 feet east and 2,000 feet south of the junction of Ohio Route 511 and Township Road 150, lot 23, T. 1 N., R. 19 W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam; moderate medium and coarse granular structure; friable; slightly acid; abrupt smooth boundary.

B1g—9 to 14 inches; gray (10YR 5/1) light silty clay loam; common medium distinct yellowish brown (10YR 5/4) mottles; weak very coarse subangular blocky structure parting to weak fine subangular blocky; firm; few fine pebbles; slightly acid; clear smooth boundary.

B21tg—14 to 22 inches; dark gray (10YR 4/1) heavy silty clay loam; common medium distinct yellowish brown (10YR 5/4) and few coarse prominent yellowish brown (10YR 5/8) mottles; moderate medium and fine subangular blocky structure; firm; dark gray (10YR 4/1) ped coatings that have thin patchy clay films; few fine pebbles; medium acid; gradual smooth boundary.

B22tg—22 to 28 inches; gray (10YR 5/1) heavy silty clay loam; common coarse prominent yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; gray (10YR 5/1) coatings on peds with dark gray (10YR 4/1) streaks and thin patchy clay films; few pebbles; medium acid; gradual smooth boundary.

B23t—28 to 34 inches; gray (10YR 5/1) silty clay loam; common medium distinct yellowish brown (10YR 5/4 and 5/6) mottles; moderate coarse subangular blocky structure; firm; gray (10YR 5/1) faces of peds and thin patchy clay films; 4 percent fine pebbles; many dark Fe-Mn concretions as much as 1/4 inch in diameter; medium acid; gradual wavy boundary.

B24t—34 to 42 inches; gray (10YR 5/1) silty clay loam; many coarse prominent yellowish brown (10YR 5/4 and 5/6) mottles; moderate coarse subangular blocky structure; firm; thick gray (10YR 5/1) coatings on peds and a few thin patchy clay films; 4 percent pebbles; slightly acid; gradual wavy boundary.

C1—42 to 55 inches; gray (10YR 5/1) silty clay loam; common medium and coarse distinct yellowish brown (10YR 5/4 and 5/6) mottles; massive except for a few vertical faces of peds; firm; 6 percent pebbles; neutral; clear irregular boundary.

C2—55 to 63 inches; yellowish brown (10YR 5/4) silty clay loam; common coarse faint yellowish brown (10YR 5/6) and common coarse distinct gray (10YR 5/1) mottles; massive; firm; 5 percent pebbles; few white lime accumulations; strong effervescence; moderately alkaline.

Thickness of the solum and depth to carbonates range from 36 to 55 inches. Reaction ranges from medium acid to very strongly acid at the top of the B horizon and grades to a range of slightly acid to mildly alkaline at its base.

The Ap horizon is dark grayish brown (10YR 4/2) or dark gray (10YR 4/1). Part of the B2t horizon above a depth of 30 inches has hue of 5Y to 10YR, value of 4 or 5, and chroma of 1 or 2. There are high-chroma mottles, but they occupy less than 40 percent of the matrix. Below a depth of 30 inches the chroma is 3 or 4 in some pedons. Surfaces of peds are coated with a mixture of organic stains and clay films that have hue of 10YR or yellower, value of 3 to 5, and chroma of 2 or less. The argillic horizon is heavy silty clay loam or clay loam. The C horizon is loam, clay loam, or silty clay loam, and its clay content is 25 to 35 percent.

Conotton series

The Conotton series consists of deep, well drained soils that have rapid permeability. These soils formed in gravelly or cobbly, low-lime outwash on the steeper parts of kames and terraces. Conotton soils are mapped only in undifferentiated map units with Chili soils. Slope ranges from 12 to 35 percent.

Conotton soils are commonly adjacent to Chili and Oshtemo soils. Chili soils have less gravel or cobbles in

the upper part of the B2t horizon. Oshtemo soils have less gravel and more sand than the Conotton soils.

Typical pedon of Conotton gravelly loam in an area of Chili and Conotton gravelly loams, 18 to 35 percent slopes, in Green Township, 50 feet east and 2,400 feet north of the SW corner of sec. 29, T. 20 N., R. 12 W.

Ap—0 to 6 inches; dark brown (10YR 4/3) gravelly loam; weak fine crumb structure; friable; 20 percent gravel; 2 percent cobbles; medium acid; abrupt smooth boundary.

B1—6 to 10 inches; yellowish brown (10YR 5/4) gravelly loam; weak medium subangular blocky structure; very friable; few dark brown (10YR 4/3) coatings; 20 percent gravel; 2 percent cobbles; strongly acid; clear wavy boundary.

B21t—10 to 16 inches; brown (7.5YR 5/4) gravelly loam; massive; friable, sticky; 30 percent gravel; 5 percent cobbles; coarse fragments heavily coated and bridged with clay; strongly acid; gradual wavy boundary.

B22t—16 to 24 inches; strong brown (7.5YR 5/6) gravelly loam; single grain; friable, sticky; 35 percent gravel; 5 percent cobbles; coarse fragments heavily coated and bridged with clay; medium acid; clear smooth boundary.

B23t—24 to 32 inches; yellowish brown (10YR 5/6) gravelly loam; single grain; very friable; 40 percent gravel; 2 percent cobbles; coarse fragments coated and bridged with clay; medium acid; clear wavy boundary.

B3t—32 to 42 inches; yellowish brown (10YR 5/4 and 5/6) very gravelly loam; single grain; loose; 60 percent gravel; slightly acid; clear smooth boundary.

IIC—42 to 60 inches; yellowish brown (10YR 5/4) very gravelly sand; single grain; loose; thin layers of sandy loam and loam; 80 percent gravel; 5 percent cobbles; slightly acid.

Thickness of the solum ranges from 40 to more than 60 inches, and the depth to carbonates is at least 60 inches. Reaction in the upper part of the solum ranges from medium acid to very strongly acid if the soil has not been limed. The lower part of the B horizons and the C horizon range from medium acid to neutral. Coarse fragments, rounded gravel and cobbles, make up 15 to 35 percent of the A horizon, 35 to 60 percent of the B2 horizons, and 50 to 80 percent of the B3 and C horizons.

In an undisturbed area, the A1 horizon is very dark grayish brown (10YR 3/2) or very dark brown (10YR 2/2), and it ranges from 1 to 4 inches thick. The Ap horizon is dark grayish brown (10YR 4/2) or dark brown (10YR 4/3) in an uneroded area and ranges to yellowish brown (10YR 5/4) in severely eroded places. There is an A2 horizon in most uncultivated areas. The B1 horizon ranges from 4 to 12 inches thick and is brown or yellowish brown gravelly or very gravelly loam or sandy loam. The B2t horizons have hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. The texture is gravelly or very gravelly loam or sandy loam. The overall clay content of the upper 20 inches of the B2t horizon ranges from 10 to 20 percent, and the amount of coarse fragments ranges from 35 to 60 percent. The coarse fragments are of gravel and cobble size, and the proportions of each vary considerably. The C horizon is loose sand, gravel, and cobbles and has 50 to 90 percent coarse fragments.

Conotton Variant

The Conotton Variant consists of deep, well drained gravelly soils that have moderately rapid permeability. These soils formed in gravelly to cobbly, nonacid glacial outwash. These soils are on kames. Slope ranges from 10 to 20 percent.

Conotton Variant soils differ from typical Conotton soils because they are less acid and have more clay in the fine material between the gravel and cobbles in the B2t horizons. These soils are similar to Chili soils, but they have more gravel in the A and B horizons and are less acid.

Typical pedon of Conotton Variant, gravelly loam, 10 to 20 percent slopes, in Lake Township, 1,300 feet west and 600 feet south of the NE corner of sec. 15, T. 20 N., R. 15 W.

Ap—0 to 8 inches; dark brown (10YR 4/3) gravelly loam; weak medium granular structure; friable; 25 percent gravel; 5 percent cobbles; neutral; abrupt smooth boundary.

B21t—8 to 14 inches; dark yellowish brown (10YR 4/4) heavy gravelly loam; weak medium and coarse subangular blocky structure; friable; few clay films; coarse fragments heavily coated and bridged with clay; 35 percent gravel; few cobbles; neutral; clear smooth boundary.

B22t—14 to 24 inches; brown (7.5YR 4/4) gravelly clay loam; moderate very coarse subangular blocky structure; friable; few clay films; coarse fragments heavily coated and bridged with clay; 25 percent gravel; 15 percent cobbles; neutral; clear irregular boundary.

B23t—24 to 34 inches; brown (7.5YR 4/4) heavy gravelly loam; weak very coarse subangular blocky structure; very friable; coarse fragments coated and bridged with clay; 40 percent gravel; 5 percent cobbles; neutral; clear wavy boundary.

B3t—34 to 44 inches; yellowish brown (10YR 5/4) very gravelly loam; massive; very friable; few fragments lightly coated and bridged with clay; 50 percent gravel; 10 percent cobbles; neutral; clear irregular boundary.

IIC—44 to 60 inches; yellowish brown (10YR 5/4) very gravelly sand; single grain; loose; 60 percent gravel; strong effervescence; moderately alkaline.

The solum is 40 to 60 inches thick and ranges from slightly acid to mildly alkaline. The C horizon is neutral to moderately alkaline and typically is calcareous. Coarse fragments consist of rounded and angular fragments of gravel and cobble size. Most coarse fragments are sandstone, but some are limestone. Coarse fragments make up 15 to 50 percent of the A and B1 horizons, 35 to 75 percent of the B2t horizons, and 50 to 80 percent of the B3 and C horizons.

The A1 horizon is dark brown (10YR 4/3) or dark grayish brown (10YR 4/2). The Ap horizon typically is dark brown (10YR 4/3) but ranges to yellowish brown (10YR 5/4) in eroded spots. In some pedons the A2 horizon is brown (10YR 5/3) or pale brown (10YR 6/3). The B2t horizons have hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. The texture is gravelly or very gravelly loam or clay loam, and there is 20 to 35 percent clay in the fraction less than 2 millimeters. In most pedons the B2t horizon is made up of several subhorizons that differ slightly in texture, color, or size and amount of gravel. The B3 and C horizons have a range of color and texture similar to that of the B2t horizons.

Coshocton series

The Coshocton series consists of deep, moderately well drained soils that have moderately slow or slow permeability. These soils formed in colluvium and weathered shale on the top and upper side slopes of unglaciated hills. Slope ranges from 2 to 15 percent.

Coshocton soils in Ashland County have sandier A, B1, and B2 horizons and lower base saturation at the paralithic contact than the soils that are typical of the series. These soils are not used intensively for farming, so the differences do not have much effect on use and management.

Coshocton soils are commonly adjacent to Lordstown, Rigley, and Schaffenaker soils. Their B horizons have much more clay than those of these other soils; they are mottled at a shallower depth, and they are underlain by shale rather than by sandstone.

Typical pedon of Coshocton loam, 6 to 15 percent slopes, in Hanover Township, 400 feet south and 180 feet west of the junction of Township Roads 1079 and 3375, SW1/4NW1/4 sec. 30, T. 19 N., R. 16 W.

Ap—0 to 9 inches; dark brown (10YR 4/3) loam; weak fine granular structure; friable; 5 percent sandstone fragments; strongly acid; abrupt smooth boundary.

B1—9 to 13 inches; yellowish brown (10YR 5/6) coarse sandy loam; weak fine subangular blocky structure; friable; 5 percent sandstone fragments; strongly acid; clear wavy boundary.

B21t—13 to 20 inches; yellowish brown (10YR 5/6) sandy clay loam; common medium distinct grayish brown (10YR 5/2) mottles; moderate medium and coarse subangular blocky structure; firm; common thin brown (10YR 5/3) clay films and occasional light brownish gray (10YR 6/2) mottles on faces of peds; 15 percent of volume consists of irregularly shaped masses of sandy clay loam or sandy loam; few sandstone fragments; very strongly acid; gradual smooth boundary.

B22t—20 to 28 inches; yellowish brown (10YR 5/6) sandy clay loam; many fine distinct gray (10YR 5/1) mottles; moderate coarse subangular blocky structure; firm; common thin yellowish brown (10YR 5/4) clay films on peds; common dark Fe-Mn concretions; few pockets of sandy loam; 5 percent angular gravel; few sandstone fragments; very strongly acid; abrupt wavy boundary.

IIB23t—28 to 37 inches; brownish yellow (10YR 6/6) clay loam; common coarse prominent gray (10YR 5/1) and light gray (10YR 6/1) mottles; strong very coarse prismatic structure parting to moderate very thick platy; very firm; prism coats are pinkish gray (7.5YR 7/2), light gray (10YR 7/2), and yellowish brown (10YR 5/6) and have thin patchy clay films; faces of plates are grayish brown (10YR 5/2); sand grains evident in some vertical cleavages; very strongly acid; abrupt wavy boundary.

IIC—37 to 45 inches; variegated dark gray (5YR 4/1), pinkish gray (7.5YR 6/2), light brownish gray (10YR 6/2), and very pale brown (10YR 7/3) very shaly silty clay loam; weak thick platy structure; 55 percent shale fragments; very strongly acid; abrupt wavy boundary.

R—45 to 60 inches; hard shale, siltstone, and very fine grained sandstone; base color light brownish gray (2.5Y 6/2); many stains of other colors.

Thickness of the solum ranges from 30 to 40 inches. Lithic contact is at a depth greater than 40 inches.

Colluvial deposits are 18 to 36 inches thick over weathered shale. Reaction throughout the solum ranges from very strongly acid to extremely acid if the soil has not been limed. Base saturation at the paralithic contact ranges from 20 to 35 percent. Coarse fragments in the upper part of the solum make up 5 to 20 percent of the volume and are mostly medium- to coarse-grained sandstone fragments. Fragments of hard rock make up less than 10 percent of the lower part of the profile, but there are many soft shale chips.

In an uncultivated area, the A1 horizon is 2 to 4 inches thick and is very dark brown (10YR 2/2) or very dark grayish brown (10YR 3/2). There is an A2 horizon in most uncultivated areas, and a remnant remains in some that are cultivated. The Ap horizon is dark grayish brown

(10YR 4/2) or dark brown (10YR 4/3) in uneroded places and ranges to brown (10YR 5/3) in those that are eroded. The Ap horizon typically is silt loam or loam, but it ranges to sandy loam in places where the soil material farther up the slope is sandy. The B1 horizon has hue of 10YR, value of 4 to 6, and chroma of 3 to 6 and is not mottled. It is silt loam, loam, light clay loam, sandy clay loam, or sandy loam.

The part of the B2t horizon that formed in colluvium has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. The texture is silty clay loam, clay loam, or sandy clay loam, and there are thin layers or pockets of sandy loam in some pedons.

The lower part of the Bt horizons formed in weathered shale. It has a wide range of color and in most pedons is highly variegated. It is heavy silty clay loam, heavy clay loam, or clay. The C horizon is highly variegated weathered shale.

Ellsworth series

The Ellsworth series consists of deep, moderately well drained soils that have slow permeability. These soils formed in moderately fine textured to fine textured glacial till that has a medium amount of calcium carbonate. They are on the higher and steeper parts of the landscape. Slope ranges from 2 to 30 percent.

Ellsworth soils are commonly adjacent to Mahoning soils. They are similar to Cardington soils. Mahoning soils have low-chroma color within the peds that are immediately below the Ap horizon, and thus they differ from the Ellsworth soils. Ellsworth soils have a slightly higher clay content and a more pronounced prismatic structure in the B2t horizon than Cardington soils. They have their maximum clay content closer to the top of the B2t horizon.

Typical pedon of Ellsworth silt loam, 6 to 12 percent slopes, eroded, in Sullivan Township, 300 feet west of Township Road 581 and 750 feet south of the Lorain County line, lot 71, T. 1 N., R. 18 W.

Ap—0 to 7 inches; dark brown (10YR 4/3) heavy silt loam; weak fine granular structure; friable; few pebbles; few chunks of yellowish brown (10YR 5/3) silty clay loam; neutral (limed); abrupt smooth boundary.

B21t—7 to 11 inches; dark yellowish brown (10YR 4/4) heavy silty clay loam; common medium faint yellowish brown (10YR 5/4) and few fine distinct grayish brown (10YR 5/2) mottles; moderate medium prismatic structure parting to moderate fine subangular blocky; firm; brown (10YR 5/3), yellowish brown (10YR 5/4), and grayish brown (10YR 5/2) coatings on peds and thin patchy clay films; few fine pebbles; strongly acid; gradual wavy boundary.

B22t—11 to 18 inches; yellowish brown (10YR 5/4) heavy silty clay loam; many coarse faint yellowish brown (10YR 5/6) and few fine distinct gray (10YR 5/1) and grayish brown (10YR 5/2) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; brown (10YR 5/3) and grayish brown (10YR 5/2) clay films continuous on faces of prisms and very patchy on horizontal faces of peds; few pebbles; strongly acid; clear wavy boundary.

B23t—18 to 26 inches; yellowish brown (10YR 5/4) clay loam; common fine faint grayish brown (10YR 5/2) and few coarse distinct yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure parting to weak medium subangular blocky; firm; thin patchy brown (10YR 5/3) and grayish brown (10YR 5/2) clay films; 5 percent pebbles; medium acid; clear wavy boundary.

B3t—26 to 32 inches; yellowish brown (10YR 5/4) clay loam; few fine faint yellowish brown (10YR 5/6) and gray (10YR 5/1) mottles; weak coarse subangular blocky structure; firm; few thin grayish brown (10YR 5/2) clay films; 5 percent pebbles; neutral; clear wavy boundary.

C—32 to 60 inches; yellowish brown (10YR 5/4) clay loam; few fine distinct yellowish brown (10YR 5/8) and few fine faint grayish brown (10YR 5/2) mottles; massive; firm; many medium distinct light gray (10YR 7/1) lime concretions; 5 percent pebbles; strong effervescence; moderately alkaline.

Thickness of the solum and depth to carbonates range from 28 to 40 inches. Reaction in the upper part of the solum is strongly acid or very strongly acid if the soil has not been limed. Acidity in the B2t horizon decreases with depth, and the reaction at its base is slightly acid to neutral.

The Ap horizon ranges from dark grayish brown (10YR 4/2) silt loam in uneroded places to brown (10YR 5/3) silty clay loam in those that are severely eroded. There is a very dark grayish brown (10YR 3/2) A1 horizon, 1 inch to 3 inches thick, in the uncultivated places. The B2t horizons have hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 to 5. The B2t horizons are silty clay loam, clay loam, or silty clay; their weighted average clay content is 36 to 42 percent. The C horizon is clay loam or silty clay loam, and its clay content is 30 to 40 percent.

Fitchville series

The Fitchville series consists of deep, somewhat poorly drained soils that have moderately slow permeability. These soils formed in silty stratified material that was deposited by glacial melt water. They are on flats and low knolls of the terraces and lakebeds. Slope ranges from 1 to 4 percent.

Fitchville soils are commonly adjacent to Glenford, Luray, and Sebring soils. They are similar to Tiro soils. Glenford soils do not have mottling immediately below

the Ap horizon and do not have low-chroma coatings on the surface of peds in the argillic horizons. Luray soils have a mollic epipedon. Sebring soils have dominant low-chroma colors in the argillic horizons. The lower part of the Tiro soils formed in compact glacial till.

Typical pedon of Fitchville silt loam, 1 to 4 percent slopes, in Ruggles Township, 650 feet north and 2,600 feet west of the junction of County Road 500 and U.S. Route 250, lot 28, T. 1 N., R. 20 W.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam; weak medium granular structure; friable; medium acid; abrupt smooth boundary.

B1—6 to 10 inches; yellowish brown (10YR 5/4) silt loam; common coarse faint brown (10YR 5/3) and yellowish brown (10YR 5/6) and common fine distinct gray (10YR 5/1) mottles; weak medium subangular blocky structure; friable; common light brownish gray (10YR 6/2) silt coatings; strongly acid; clear irregular boundary.

B21t—10 to 15 inches; yellowish brown (10YR 5/4) silty clay loam; many coarse faint grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; faces of peds coated with grayish brown (10YR 5/2) clay films and pale brown (10YR 6/3) silt coatings; very strongly acid; clear wavy boundary.

B22t—15 to 21 inches; yellowish brown (10YR 5/6) silty clay loam; common coarse faint yellowish brown (10YR 5/4) and common medium distinct gray (10YR 5/1) mottles; moderate coarse subangular blocky structure parting to moderate fine subangular blocky; firm; grayish brown (10YR 5/2) faces of peds with patchy clay films; very strongly acid; clear irregular boundary.

B23t—21 to 31 inches; yellowish brown (10YR 5/4) light silty clay loam; common coarse faint yellowish brown (10YR 5/6) and common fine distinct gray (10YR 5/1) mottles; weak coarse subangular blocky structure parting to weak fine subangular blocky; firm; slightly brittle; grayish brown (10YR 5/2) faces of peds have thin patchy clay films; many dark Fe-Mn concretions; strongly acid; clear smooth boundary.

B31t—31 to 37 inches; yellowish brown (10YR 5/4) heavy silt loam; common coarse faint grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; weak medium and coarse subangular blocky structure; firm; grayish brown (10YR 5/2) faces of peds have thin very patchy clay films; few thick dark grayish brown (10YR 4/2) clay flows in pores; common dark Fe-Mn concretions; medium acid; gradual smooth boundary.

B32—37 to 46 inches; yellowish brown (10YR 5/4) silt loam; common coarse faint grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; weak stratification evident; firm; patchy grayish brown (10YR 5/2) coatings on peds; few Fe-Mn concretions; slightly acid; clear wavy boundary.

C—46 to 60 inches; mottled grayish brown (10YR 5/2) and yellowish brown (10YR 5/4 and 5/6) silt loam; few thin strata of very fine sandy loam; massive; friable; neutral.

Thickness of the solum ranges from 40 to 60 inches. Reaction in the upper part of the solum ranges from medium acid to very strongly acid unless the soil has been limed. The lower part of the solum is medium acid to neutral, and the C horizon is slightly acid to mildly alkaline.

In uncultivated places, the A1 horizon is 2 to 4 inches thick and is very dark grayish brown (10YR 3/2). In some uncultivated places there is an A2 horizon. This horizon is brown (10YR 5/3) or grayish brown (10YR 5/2 or 2.5Y 5/2) and has mottles of higher chroma. The B1 horizon is brown and has contrasting mottles. The B2t horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 to 6. Mottles that have chroma of 2 or less are in 10 to 50 percent of the matrix. Surfaces of peds have hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2. The B2t horizon is silty clay loam or silt loam. The B3 and C horizons commonly are stratified.

Glenford series

The Glenford series consists of deep, moderately well drained soils on stream terraces and in former lakebeds. These soils have moderately slow permeability. They formed in deposits that have a high content of silt and very fine sand and are stratified. Slope ranges from 0 to 12 percent.

Glenford soils are commonly adjacent to Fitchville, Luray, and Sebring soils. They are similar to Lykens soils. Fitchville soils have low-chroma color immediately below the Ap horizon, in contrast to the Glenford soils. Luray soils have a mollic epipedon. Sebring soils have dominant low-chroma color in the argillic horizons. Lykens soils are similar to Glenford soils in the upper part of the solum but are underlain by compact glacial till at a depth of 24 to 42 inches.

Typical pedon of Glenford silt loam, 2 to 6 percent slopes, in Green Township, 800 feet north and 1,200 feet west of the SE corner of sec. 35, T. 20 N., R. 16 W.

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam; weak fine granular structure; friable; medium acid; abrupt smooth boundary.

B1—8 to 10 inches; yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure; friable; few pale brown (10YR 6/3) silt coatings; strongly acid; clear irregular boundary.

B21t—10 to 14 inches; yellowish brown (10YR 5/6) light silty clay loam; moderate medium subangular blocky

structure; firm; thin patchy dark yellowish brown (10YR 4/4) clay films; strongly acid; gradual wavy boundary.

B22t—14 to 23 inches; yellowish brown (10YR 5/6) silty clay loam; common medium distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; thin patchy dark yellowish brown (10YR 4/4) clay films; strongly acid; clear smooth boundary.

B23t—23 to 32 inches; yellowish brown (10YR 5/6) silt loam; common fine faint grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; friable; thin very patchy dark yellowish brown (10YR 4/4) clay films; few Fe-Mn concretions; strongly acid; gradual smooth boundary.

B3—32 to 42 inches; yellowish brown (10YR 5/4) silt loam; few medium faint grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; friable; thin strata of very fine sandy loam; medium acid; gradual wavy boundary.

C—42 to 60 inches; yellowish brown (10YR 5/4) stratified silt loam and fine sandy loam; few medium faint grayish brown (10YR 5/2) mottles; massive; very friable; slightly acid.

Thickness of the solum ranges from 36 to 60 inches. The depth to carbonates is at least 48 inches. Reaction ranges from medium acid to very strongly acid in the upper part of the solum unless the soil has been limed, from medium acid to neutral in the lower part of the solum, and from medium acid to mildly alkaline in the C horizon. Coarse fragments make up little of the soil above a depth of 48 inches but as much as 15 percent of the thin strata below that depth.

The Ap horizon is dark brown (10YR 4/3) or dark grayish brown (10YR 4/2). In uncultivated places, the A1 horizon is 2 to 4 inches thick and is typically very dark grayish brown (10YR 3/2). An A2 horizon is in most uncultivated places and in some that are cultivated. It is brown (10YR 5/3) or pale brown (10YR 6/3) silt loam. The B1 horizon is yellowish brown (10YR 5/4 or 5/6) or dark yellowish brown (10YR 4/4). The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. The B2t horizon is heavy silt loam or light silty clay loam. The B3 and C horizons typically are stratified. Silt loam, silty clay loam, and very fine sandy loam are dominant, but there are strata of loam, sandy loam, and light silty clay in the C horizon of some pedons.

Holly series

The Holly series consists of deep, poorly drained soils on flood plains. These soils have moderate or moderately slow permeability. They formed in recent alluvial deposits and are subject to flooding and ponding. Slope ranges from 0 to 2 percent.

Holly soils are commonly adjacent to Shoals and Sloan soils. Shoals soils do not have the dominant low-chroma color in the B horizon above a depth of 30 inches that is characteristic of Holly soils. Sloan soils have a mollic epipedon.

Typical pedon of Holly silt loam, in Mohican Township, 2,400 feet south and 2,100 feet east of the NW corner of sec. 15, T. 21 N., R. 15 W.

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam; weak medium granular structure; friable; neutral; abrupt smooth boundary.

B1g—10 to 20 inches; dark gray (10YR 4/1) silt loam; common medium faint grayish brown (10YR 4/2) and common fine distinct dark yellowish brown (10YR 4/4) mottles; weak medium subangular blocky structure; friable; neutral; abrupt wavy boundary.

B2g—20 to 25 inches; dark gray (10YR 4/1) light silty clay loam; common fine faint grayish brown (10YR 4/2) mottles; weak medium subangular blocky structure; firm; neutral; clear irregular boundary.

B3g—25 to 32 inches; dark gray (10YR 4/1) heavy silt loam; common fine prominent yellowish brown (10YR 5/8) mottles; weak medium subangular blocky structure; firm; neutral; clear smooth boundary.

C1g—32 to 42 inches; gray (10YR 5/1) heavy silt loam; many coarse prominent yellowish brown (10YR 5/8) mottles; massive; firm; neutral; gradual boundary.

C2g—42 to 60 inches; gray (10YR 5/1) light silt loam; common coarse distinct brown (10YR 5/3) and common medium prominent yellowish brown (10YR 5/6) mottles; massive; friable; few strata of fine sandy loam; few thin pebble lines; neutral.

Thickness of the solum ranges from 24 to 40 inches. Reaction in the solum ranges mostly from slightly acid to neutral, but in a few places the solum is strongly acid. The C horizon is neutral or mildly alkaline. Carbonates are below a depth of 3 feet in some areas. The content of coarse fragments typically is less than 10 percent in the solum and less than 30 percent in the C horizon. Thin strata that are as much as 60 percent gravel are in the C horizon of some pedons.

In uncultivated places, the A1 horizon is very dark gray (10YR 3/1), very dark grayish brown (10YR 3/2), or black (10YR 2/1), and is 2 to 5 inches thick. The Ap horizon is dark gray (10YR 4/1) or dark grayish brown (10YR 4/2). In some pedons, the color of the A horizon is 1 unit higher in value after crushing because of organic coatings on the granules. One or more buried A1 horizons less than 6 inches thick are in some pedons. The B horizon has hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 1 or less. Dark organic coatings are on structure units of the B horizon in some pedons. The B horizon is dominantly silt loam or silty clay loam, but

subhorizons of other texture are common, especially in places where the material is highly stratified. The C horizon typically is stratified. It typically is gray or grayish brown and has mottles of various colors. It is dominantly silt loam, silty clay loam, or loam, but there are thin strata of other texture in many areas.

Jimtown series

The Jimtown series consists of deep, somewhat poorly drained soils that have moderate permeability. These soils are on terraces and outwash plains. They formed in stratified loamy and gravelly outwash. Slope ranges from 0 to 6 percent.

Jimtown soils are commonly adjacent to Chili and Wheeling soils. Chili and Wheeling soils do not have low-chroma mottles in the B horizon.

Most of the Jimtown soils in Ashland County have more clay in the B horizon and have carbonates at a shallower depth than do the typical soils of this series elsewhere. These differences, however, do not significantly affect the use and behavior of the soils.

Typical pedon of Jimtown silt loam, 0 to 2 percent slopes, in Sullivan Township, 1,200 feet south of County Road 40 and 2,200 feet west of Ohio Route 58 in the SE1/4 of lot 69, T. 1 N., R. 18 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable; few fine pebbles; slightly acid; abrupt smooth boundary.

B1g—8 to 12 inches; grayish brown (10YR 5/2) silt loam; many fine faint brown (10YR 5/3) and yellowish brown (10YR 5/4) mottles; weak fine subangular blocky structure; friable; very thick light brownish gray (10YR 6/2) silt coatings; 6 percent fine pebbles; medium acid; clear wavy boundary.

B21t—12 to 22 inches; yellowish brown (10YR 5/4) light clay loam; many coarse distinct gray (10YR 5/1) and grayish brown (10YR 5/2) and common medium faint yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate fine subangular blocky; firm; thin patchy grayish brown (10YR 5/2) and gray (10YR 5/1) clay films and thick continuous light brownish gray (10YR 6/2) silt coatings on faces of peds; few Fe-Mn concretions; 3 percent fine pebbles; strongly acid; clear wavy boundary.

B22t—22 to 38 inches; yellowish brown (10YR 5/4) light clay loam; common coarse distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; firm; thin patchy gray (10YR 5/1) and grayish brown (10YR 5/2) clay films and many light brownish gray (10YR 6/2) silt coatings on faces of peds; numerous irregularly shaped pockets and lenses of sandy clay loam and sandy loam in which sand grains are coated and bridged with clay; 5 percent fine pebbles; medium acid; clear irregular boundary.

B3—38 to 45 inches; yellowish brown (10YR 5/4) heavy loam; many coarse distinct gray (10YR 5/1) and yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; friable; gray (10YR 5/1) faces of peds; thin strata of sandy loam and clay loam; 10 percent small rounded pebbles; slightly acid; abrupt irregular boundary.

C—45 to 60 inches; yellowish brown (10YR 5/4) stratified sandy loam, fine sandy loam, and loam; common coarse faint grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; massive; friable; 10 percent pebbles mostly in thin layers; weak effervescence; mildly alkaline.

Thickness of the solum ranges from 36 to 48 inches, and the depth to free carbonates ranges from 36 to more than 50 inches. The upper part of the solum is medium acid to strongly acid if the soil has not been limed; the lower part is neutral to moderately alkaline. The amount of gravel ranges from less than 25 percent in the A horizon and the upper part of the B horizon to 10 to 40 percent in the lower part of the B horizon and 10 to 70 percent in the C horizon.

In wooded areas, the A1 horizon is very dark grayish brown (10YR 3/2) or very dark gray (10YR 3/1) and is 2 to 4 inches thick. The A horizon is loam in some pedons. The B2t horizon typically is stratified and consists of several subhorizons that differ in color, texture, and content of gravel. This horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. The material is loam, silt loam, light clay loam, or sandy loam, and in some places it is gravelly. In the upper 20 inches, the B2t horizon has a weighted average clay content of 18 to 27 percent and an overall gravel content of less than 30 percent. The C horizon is loam, sandy loam, or fine sandy loam, and in some places it is gravelly.

Killbuck series

The Killbuck series consists of deep, poorly drained soils that have moderately slow permeability. These soils formed in thin deposits of silty recent alluvium overlying older buried soils of alluvial or lacustrine origin. They are in the low parts of flood plains and are subject to flooding. Slope ranges from 0 to 2 percent.

Killbuck soils are commonly adjacent to Holly and Sloan soils. Holly soils do not have a buried dark layer. In Sloan soils, the dark layer is at the surface. Other soils in the county that have a light-over-dark sequence of layers are the Algiers and the Wallkill soils. Killbuck soils are wetter than Algiers soils and are grayer above the buried dark layer. In Wallkill soils the buried dark layer is organic material, and in the Killbuck soils it is mineral.

Typical pedon of Killbuck silt loam, in Montgomery Township, 1,200 feet north and 1,650 feet west of the SE corner of sec. 23, T. 22 N., R. 19 W.

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam; weak coarse subangular blocky structure parting to weak coarse granular; friable; medium acid; clear smooth boundary.

B1g—10 to 15 inches; dark grayish brown (2.5Y 4/2) light silt loam; common medium distinct dark yellowish brown (10YR 4/4) and brown (7.5YR 4/4) and many fine faint dark gray (10YR 4/1) mottles; weak fine subangular blocky structure; friable; slightly acid; clear smooth boundary.

B2g—15 to 20 inches; dark gray (10YR 4/1) heavy silt loam; many medium distinct brown (7.5YR 4/4) mottles; weak fine prismatic structure parting to weak fine subangular blocky; friable; dark gray (10YR 4/1) coatings on peds; neutral; clear smooth boundary.

IIAb—20 to 30 inches; black (N 2/0) to very dark gray (N 3/0) (rubbed) light silty clay; common fine distinct olive brown (2.5Y 4/4), common fine distinct gray (N 5/0), and common medium prominent yellowish brown (10YR 5/6) mottles; weak medium prismatic structure; firm; few fine pebbles; neutral; clear wavy boundary.

IIB2bg—30 to 53 inches; grayish brown (2.5Y 5/2) silty clay loam; many fine and medium distinct strong brown (7.5YR 5/6) and many medium distinct gray (10YR 5/1) mottles; weak coarse prismatic structure, becoming massive with depth; firm; few strong brown (7.5YR 5/6) concretions; slightly acid; gradual smooth boundary.

IICg—53 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam; common fine distinct yellowish brown (10YR 5/4) and few coarse prominent brown (7.5YR 4/4) mottles; massive; firm; neutral.

The thickness of the silty recent alluvium above the Ab horizon ranges from 15 to 30 inches. Reaction in the solum ranges from medium acid to mildly alkaline. In some pedons, the layers that formed in recent alluvium are less acid than the buried soil. The depth to carbonates is at least 4 feet. Commonly there are no coarse fragments above a depth of at least 40 inches; thin pebble lines are below this depth in some pedons.

In an unplowed area, thickness of the A1 horizon ranges from 2 to 6 inches; hue is 10YR, value is 1 to 4, and chroma is 1 or 2. Thickness of the Bg horizon ranges from 6 to 24 inches. This horizon has hue of 10YR, 2.5Y, 5Y, or N; value of 3 to 5; and chroma of 2 or less. The material is silt loam or light silty clay loam, and there are thin lenses of sandy loam in some pedons. The IIB and C horizons are extremely variable in color and in texture. Their color ranges from neutral gray to highly mottled. The texture is dominantly loam, silt loam, or silty clay loam, but strata of other texture are in many pedons.

Linwood series

The Linwood series consists of very poorly drained organic soils that have moderate permeability. These soils formed in 20 to 50 inches of well decomposed plant remains over loamy mineral soil. Linwood soils are in depressions on flood plains, terraces, and till plains. They are nearly level.

Linwood soils are commonly adjacent to Luray and Sloan soils, and they are similar to Carlisle soils. Both the Luray and the Sloan soils have a dark surface layer that consists of mineral material; the surface layer of the Linwood soils is organic. Linwood and Carlisle soils are alike in the upper layers, but the organic material of the Carlisle soils is more than 50 inches thick, and that of the Linwood soils is thinner.

Typical pedon of Linwood muck, in Mohican Township, 2,400 feet east and 250 feet south of the NW corner of sec. 16, T. 21 N., R. 15 W.

Oa1—0 to 7 inches; black (N 2/0; 10YR 2/1 rubbed) sapric material; 15 percent fiber, 5 percent after rubbing (80 percent herbaceous, 20 percent woody); moderate coarse granular structure; friable; sodium pyrophosphate extract color is light yellowish brown (10YR 6/4); 20 percent mineral; pH 6.0 in KC1; clear irregular boundary.

Oa2—7 to 15 inches; black (N 2/0) (no change on rubbing) sapric material; few yellowish red (5YR 4/6) fibers; 15 percent fiber, 5 percent rubbed (2/3 herbaceous, 1/3 woody); weak medium subangular blocky structure; friable; sodium pyrophosphate extract color is light yellowish brown (10YR 6/4); few coarse fragments (wood); 10 percent mineral; pH 5.8 in KC1; clear smooth boundary.

Oa3—15 to 26 inches; black (10YR 2/1) (10YR 2/2 rubbed) sapric material; common dark yellowish brown (10YR 3/4 and 4/4) fibers; 40 percent fiber, 5 percent rubbed (half woody, half herbaceous); moderate medium subangular blocky structure; firm; sodium pyrophosphate extract color is pale brown (10YR 6/3); few coarse fragments (wood); 5 percent mineral; pH 6.4 in KC1; abrupt smooth boundary.

IIC1g—26 to 42 inches; dark gray (10YR 4/1) silt loam; massive; friable, very soft; strong effervescence; moderately alkaline; clear smooth boundary.

IIIC2g—42 to 60 inches; dark gray (10YR 4/1) stratified loam and fine sandy loam; few coarse faint dark brown (10YR 4/3) mottles; massive; very friable; 5 percent gravel; strong effervescence; moderately alkaline.

The thickness of the organic material ranges from 20 to 50 inches. The organic horizons have hue of 10YR or

2.5Y or the color is neutral, value of 2, and chroma of less than 2. Value and chroma are increased by not more than one unit by rubbing. Sapric (highly decomposed) materials make up more than 75 percent of the organic horizons. Typically, there are both woody and herbaceous fibers. The mineral horizons of the soil are dominantly loam or silt loam; the content of clay is 18 to 25 percent, and the content of sand coarser than very fine sand is more than 15 percent. The mineral part of the soil is highly stratified if it is of alluvial origin, and in some pedons there are sandy or gravelly layers. Reaction in the organic part of the soil ranges from strongly acid to mildly alkaline. The mineral part is neutral to moderately alkaline and in most places is calcareous.

Lobdell series

The Lobdell series consists of deep, moderately well drained soils on flood plains. These soils are moderately permeable. They formed in materials deposited by streams in recent times, and they are subject to flooding. Slope ranges from 0 to 2 percent.

Lobdell soils are commonly adjacent to Holly, Shoals, and Sloan soils. Holly soils have dominant chroma of 1 in the B horizon above a depth of 30 inches. Shoals soils have some low-chroma color below the Ap horizon. Sloan soils have a mollic epipedon.

Typical pedon of Lobdell silt loam, in Hanover Township, 1,500 feet south and 60 feet west of the NE corner of sec. 15, T. 19 N., R. 16 W.

Ap—0 to 9 inches; dark brown (10YR 4/3) silt loam; weak fine granular structure; friable; dark grayish brown (10YR 4/2) coatings; slightly acid; abrupt smooth boundary.

B1—9 to 16 inches; brown (10YR 5/3) silt loam; weak fine subangular blocky structure; friable; medium acid; clear smooth boundary.

B2—16 to 30 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct gray (10YR 5/1) and grayish brown (10YR 5/2) mottles; weak fine subangular blocky structure; friable; medium acid; abrupt smooth boundary.

IIAb—30 to 34 inches; dark brown (10YR 4/3) loam; moderate fine granular structure; friable; medium acid; clear wavy boundary.

IIC—34 to 60 inches; yellowish brown (10YR 5/4) and brown (10YR 5/3) stratified loam, silt loam, and sandy loam; common coarse faint yellowish brown (10YR 5/6) and common medium distinct grayish brown (10YR 5/2) mottles; massive; individual strata friable or very friable; few pebble lines; slightly acid.

Thickness of the solum ranges from 24 to 40 inches. The upper part of the solum is slightly acid to strongly acid. The lower part of the solum and the C horizon are medium acid to neutral. Coarse fragments make up less than 15 percent of the solum and less than 35 percent of the C horizon.

In an uncultivated area, the A1 horizon is 2 to 4 inches thick and is very dark grayish brown (10YR 3/2) or very dark gray (10YR 3/1). The Ap horizon is dark grayish brown (10YR 4/2) or dark brown (10YR 4/3). The B horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. Low-chroma mottles are below a depth of 15 to 24 inches. The B horizon generally is loam or silt loam. The C horizon in most places is stratified. The C horizon is brown, yellowish brown, or grayish brown loam, silt loam, or sandy loam.

Lordstown series

The Lordstown series consists of moderately deep, well drained soils that have moderate permeability. They formed in material that weathered from sandstone and siltstone and are underlain by bedrock at a depth of 20 to 40 inches. These soils are on the top and sides of hills controlled by the bedrock and are mostly in the unglaciated part of the county. Slope ranges from 2 to 40 percent.

Lordstown soils are commonly adjacent to Berks, Coshocton, Loudonville, and Rigley soils. All these soils are underlain by rock at about the same depth. The B horizon of the Berks soils is more stony than that of the Lordstown soils. Coshocton soils are more clayey and more mottled than Lordstown soils. The A, B1, and B2 horizons of the Loudonville soils formed in glacial till, and the similar horizons of the Lordstown soils formed in residuum of sandstone. The solum of the Rigley soils has more medium and coarse sand and less silt than that of the Lordstown soils.

Typical pedon of Lordstown silt loam, 2 to 6 percent slopes, in Hanover Township, 1,250 feet south and 400 feet west of the NE corner of sec. 17, T. 19 N., R. 16 W.

Ap1—0 to 2 inches; very dark grayish brown (10YR 3/2) silt loam; moderate very fine crumb structure; very friable; 10 percent coarse fragments; strongly acid; clear irregular boundary.

Ap2—2 to 4 inches; dark brown (10YR 4/3) silt loam; weak fine granular structure; very friable; 12 percent coarse fragments; very strongly acid; gradual wavy boundary.

B1—4 to 10 inches; brown (10YR 5/3) channery silt loam; weak thin platy structure; very friable; 15 percent coarse fragments; few darkened root channels; very strongly acid; clear wavy boundary.

B21—10 to 16 inches; brown (7.5YR 5/4) and yellowish brown (10YR 5/6) channery silt loam; weak fine subangular blocky structure; friable; 15 percent coarse fragments; strongly acid; gradual smooth boundary.

B22—16 to 23 inches; yellowish brown (10YR 5/6) channery fine sandy loam; weak fine subangular blocky

structure; friable; 20 percent coarse fragments; very strongly acid; clear smooth boundary.

C—23 to 27 inches; yellowish brown (10YR 5/4) channery fine sandy loam; massive; very friable; 35 percent coarse fragments, one-third of which can be crushed to fine or very fine sand; very strongly acid; abrupt irregular boundary.

R—27 inches; light olive brown (2.5Y 5/4) fine and very fine grained sandstone; beds 1/2 inch to 1 1/4 inches thick; vertical fractures 4 to 8 inches apart; some dark stains on rock.

Thickness of the solum and the depth to bedrock both range from 20 to 40 inches but are not the same in all pedons. Reaction throughout the solum ranges from strongly acid to very strongly acid; base saturation is less than 60 percent in all the horizons. Coarse fragments are less than 35 percent of the soil volume above a depth of at least 20 inches. They typically make up 5 to 15 percent of the A and the B1 horizons, 15 to 35 percent of the B2 horizons, and 15 to 55 percent of the B3 and C horizons. A transitional layer of broken rock and soil material lies above the solid rock in many pedons.

In a cultivated area, the Ap horizon is dark grayish brown (10YR 4/2) or dark brown (10YR 4/3). The A1 horizon is 1 to 4 inches thick and is very dark grayish brown (10YR 3/2), very dark brown (10YR 2/2), or dark brown (10YR 3/3). In some pedons, the A1 horizon is underlain by an A2 horizon of brown (10YR 5/3) or pale brown (10YR 6/3) silt loam. The B1 horizon is loam or silt loam. Its color is brown (10YR 5/3) or yellowish brown (10YR 5/4). The B2 horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. Surfaces and interiors of peds have the same range of color. The B3 horizon is similar to the B2 horizon in color, but it is weaker in structure. The weighted average clay content of the B horizons ranges from 12 to 18 percent. The texture is silt loam, loam, or fine sandy loam. The amount of clay in the subhorizons ranges from 10 to 22 percent.

Loudonville series

The Loudonville series consists of moderately deep, well drained soils that have moderate permeability. These soils formed in glacial till that is underlain by bedrock at a depth of 20 to 40 inches. Slope ranges from 2 to 25 percent.

Loudonville soils are commonly adjacent to Berks soils; but the Berks soils are more stony throughout the solum, and they formed in material that weathered from sandstone. They are similar to Wheeling soils, but the Wheeling soils are more than 40 inches deep over bedrock.

Typical pedon of Loudonville silt loam, 12 to 18 percent slopes, in Green Township, 300 feet west and 920 feet south of the NE corner of sec. 20, T. 20 N., R. 16 W.

Ap—0 to 7 inches; dark brown (10YR 4/3) silt loam; weak fine granular structure; friable; very dark grayish brown (10YR 3/2) organic coatings; 5 percent angular and rounded fragments, mostly sandstone; many roots; medium acid; abrupt smooth boundary.

B1—7 to 11 inches; yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure; friable; 6 percent angular pebbles; common roots; medium acid; clear wavy boundary.

B21t—11 to 21 inches; yellowish brown (10YR 5/6) loam; moderate medium subangular blocky structure; firm; thin patchy yellowish brown (10YR 5/4) and brown (10YR 5/3) clay films; 8 percent angular pebbles 1/2 inch to 2 inches in diameter; common roots; medium acid; clear wavy boundary.

B22t—21 to 29 inches; yellowish brown (10YR 5/4) loam; moderate medium subangular blocky structure; firm; very slightly brittle; thin patchy brown (10YR 5/3) clay films; 5 percent subrounded fragments 1 to 2 inches in diameter and 1 percent rounded stones more than 3 inches in diameter; few Fe-Mn concretions; common roots; medium acid; clear wavy boundary.

IIB3—29 to 33 inches; yellowish brown (10YR 5/4) loam; common medium faint grayish brown (10YR 5/2) and few medium distinct strong brown (7.5YR 5/8) mottles; weak coarse subangular blocky structure; firm; very few brown (10YR 5/3) clay films; 5 percent pebbles and a few flat sandstone fragments; medium acid; abrupt wavy boundary.

IIR—33 inches; light olive brown (2.5Y 5/4) fine-grained sandstone; beds 1/2 inch to 2 inches thick; vertical cleavages 8 to 12 inches apart; few stains on surfaces.

Thickness of the solum and depth to rock range from 20 to 40 inches, but in some pedons they are not the same. The material of the solum ranges from medium acid to very strongly acid. Base saturation ranges from 35 percent to as much as 60 percent just above the lithic contact. Small angular pebbles make up 0 to 5 percent of the A horizon and 2 to 15 percent of the B2 horizons. The B3 horizon is as much as 60 percent flat angular sandstone fragments, but none of the horizons above a depth of 20 inches is more than 35 percent coarse fragments.

In a cultivated area, the Ap horizon is dark grayish brown (10YR 4/2) or dark brown (10YR 4/3). In an uncultivated area, the A1 horizon is 2 to 4 inches thick and is very dark grayish brown (10YR 3/2) or very dark brown (10YR 2/2). There is an A2 horizon in many uncultivated places. It is brown (10YR 5/3), pale brown (10YR 6/3), or yellowish brown (10YR 5/4). The B1 horizon is loam or silt loam. The B2t horizon has hue of

7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. It is loam, silt loam, clay loam, or silty clay loam. In some pedons the B2t horizon rests directly on bedrock, but more typically there is a B3 or a C horizon between the B2t horizon and the rock. The IIB3 horizon, and the IIC horizon if one is present, are typically loam, but they range from loamy sand to silt loam. The underlying rock is thin-bedded, fine-grained sandstone and siltstone.

Luray series

The Luray series consists of deep, moderately slowly permeable soils that are very poorly drained. These soils formed in silty materials that were deposited in shallow lakes after the glaciers melted. These materials have a high content of silt and very fine sand. These soils are on flat areas and in depressions. Slope ranges from 0 to 2 percent.

Luray soils are commonly adjacent to Fitchville and Sebring soils. Neither the Fitchville soils nor the Sebring soils has a mollic epipedon.

Typical pedon of Luray silty clay loam, in Mohican Township, 600 feet south and 200 feet east of the NW corner of sec. 16, T. 21 N., R. 15 W.

Ap—0 to 9 inches; black (10YR 2/1) silty clay loam; weak medium granular structure; firm; slightly acid; abrupt smooth boundary.

A12—9 to 14 inches; very dark gray (10YR 3/1) silty clay loam; few fine faint dark grayish brown (2.5Y 4/2) mottles; strong fine subangular blocky structure; firm; neutral; clear irregular boundary.

B21tg—14 to 20 inches; dark gray (10YR 4/1) silty clay loam; weak medium prismatic structure parting to strong fine angular blocky; firm; thick very dark gray (N 3/0) clay-organic coatings on peds; common dark yellowish brown (10YR 4/4) iron concretions; clear wavy boundary.

B22tg—20 to 25 inches; grayish brown (2.5Y 5/2) silty clay loam; common coarse distinct yellowish brown (10YR 5/6) mottles; weak very coarse (10 to 12 inches in diameter) prismatic structure parting to moderate medium prismatic which further parts to weak coarse subangular blocky; firm; thick dark gray (N 4/0) clay-organic coatings on larger peds; gray (5Y 5/1) clay films on smaller peds; few very dark gray (5Y 3/1) root channels; neutral; clear wavy boundary.

B23tg—25 to 32 inches; grayish brown (10YR 5/2) heavy silt loam; many coarse prominent yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; dark gray (10YR 4/1) clay-organic coatings on vertical faces of peds; gray (5Y 5/1) clay films on horizontal faces of peds; neutral; clear wavy boundary.

C1—32 to 45 inches; mottled grayish brown (10YR 5/2) and yellowish brown (10YR 5/4, 5/6, and 5/8) silt loam; massive; friable; neutral.

C2—45 to 60 inches; gray (N 5/0) silt loam and loam; common medium distinct yellowish brown (10YR 5/4) mottles; massive; friable; weak effervescence; moderately alkaline.

Thickness of the solum ranges from 30 to 45 inches, and the depth to carbonates ranges from 40 to 70 inches. The solum ranges from medium acid to neutral, and the C horizon ranges from slightly acid to moderately alkaline.

The total thickness of the A1 horizon ranges from 10 to 18 inches. The hue is 10YR or 2.5Y, the value 2 or 3, and the chroma 1 or 2. Tongues of the dark soil, 2 to 6 inches in diameter, extend to a depth as great as 3 feet in some pedons. The part of the A1 horizon below the plow layer is distinctly or prominently mottled if the chroma is 2. The A1 horizon is silt loam or silty clay loam. A B1 horizon is in some pedons. The B2tg horizon has hue of 10YR or yellower or is neutral. It has value of 4 or 5 and chroma of 0 to 2. The B2tg horizons are silt loam or silty clay loam. The part of the C horizon above a depth of 40 inches is silt loam or silty clay loam. The part below that depth is variable; in places it is silty clay loam and has strata of fine sandy loam or sandy loam.

Lykens series

The Lykens series consists of deep, moderately well drained soils that have slow or moderately slow permeability. These soils formed in a thin mantle of silty, water-laid soil material that lies over compact glacial till. A thin layer of gritty loam or clay loam separates these two materials. Lykens soils are on low knolls of the till plains.

Lykens soils are commonly adjacent to Cardington and Rittman soils. They are similar to Glenford soils. Cardington and Rittman soils formed entirely in glacial till. Glenford soils do not have compact glacial till within a depth of 5 feet. The C horizon of Glenford soils is more silty than that of Lykens soils.

Typical pedon of Lykens silt loam, 2 to 6 percent slopes, in Clear Creek Township, 1,700 feet north and 1,100 feet east of the SW corner of sec. 36, T. 25 N., R. 20 W.

Ap—0 to 9 inches; dark brown (10YR 4/3) (rubbed) silt loam; weak fine granular structure; friable; dark grayish brown (10YR 4/2) coatings; neutral; abrupt smooth boundary.

B1—9 to 12 inches; yellowish brown (10YR 5/4) silt loam; moderate fine subangular blocky structure; friable; few thin clay films; neutral; clear smooth boundary.

B21t—12 to 18 inches; yellowish brown (10YR 5/4) silty clay loam; few fine faint yellowish brown (10YR 5/6)

mottles; moderate medium subangular blocky structure; firm; brown (10YR 5/3) coatings on peds; thin patchy clay films; 1 percent fine pebbles; medium acid; clear smooth boundary.

B22t—18 to 24 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct grayish brown (10YR 5/2) and strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; brown (10YR 5/3) coatings on peds with patches of grayish brown (10YR 5/2); thin patchy and moderate very patchy dark yellowish brown (10YR 4/4) clay films; 1 percent fine pebbles; very strongly acid; abrupt smooth boundary.

IIB23t—24 to 29 inches; dark brown (10YR 4/3) clay loam; common medium distinct grayish brown (10YR 5/2), few medium distinct grayish brown (10YR 5/2), and few medium distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; thin patchy clay films; few vertical faces that have brown (10YR 5/3) coatings; 5 to 10 percent dark concretions; 5 to 8 percent fine pebbles; medium acid; abrupt wavy boundary.

IIIB31—29 to 33 inches; dark brown (10YR 4/3) clay loam; common medium distinct grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; 3 percent stones (2 to 4 inches in diameter); few concretions; slightly acid; diffuse wavy boundary.

IIIB32—33 to 36 inches; brown (10YR 5/3) clay loam; few fine faint grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; 3 percent pebbles; neutral; diffuse wavy boundary.

IIIC1—36 to 41 inches; brown (10YR 5/3) clay loam; few fine faint grayish brown (10YR 5/2) mottles; weak thick platy structure; firm; 3 to 4 percent pebbles; mildly alkaline; clear irregular boundary.

IIIC2—41 to 60 inches; brown (10YR 5/3) clay loam; few fine faint grayish brown (10YR 5/2) mottles; weak very thick platy structure; firm; 5 percent pebbles; few lime blotches; strong effervescence; moderately alkaline.

Thickness of the solum ranges from 30 to 50 inches, and the depth to carbonates is at least 40 inches. Reaction in the solum ranges from medium acid to very strongly acid if the soil has not been limed. Reaction in the B3 horizon is strongly acid to neutral. There are very few coarse fragments in the upper, silty part of the solum. Coarse fragments make up as much as 25 percent of the loamy part of the solum and 2 to 5 percent of the underlying glacial till.

The depth of the water-deposited material over glacial till ranges from 24 to 42 inches. The silty material is at least twice as thick as the loamy material. The B2t horizon and all or part of the B3 horizon formed in the loamy material. The C horizon and part of the B3 horizon in some pedons formed in the glacial till.

The Ap horizon is dark grayish brown (10YR 4/2) or dark brown (10YR 4/3). In an uncultivated area, the A1 horizon is 1 to 4 inches thick and is very dark grayish brown (10YR 3/2) or very dark brown (10YR 2/2). The A2 horizon is as much as 7 inches thick in some uncultivated areas but is absent in some that have been cultivated. It is brown (10YR 5/3) or pale brown (10YR 6/3) silt loam. The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. Surfaces of peds are brown (10YR 5/3) or yellowish brown (10YR 5/4). The silty part of the B2t horizon is silt loam or silty clay loam, and the loamy part is clay loam, sandy loam, or loam.

The color of the B3 horizon is similar to that of the B2t horizon. The C horizon is calcareous loam, clay loam, or silty clay loam.

Mahoning series

The Mahoning series consists of deep, somewhat poorly drained soils that have slow or very slow permeability. These soils formed in moderately fine or fine textured glacial till that has a medium content of calcium carbonate. They are on moraines. Slope ranges from 0 to 6 percent.

Mahoning soils are commonly adjacent to Ellsworth soils. They are similar to Bennington, Jimtown, and Tiro soils. The argillic horizons of Bennington soils have slightly less clay and weaker prismatic structure. The part of the B2t horizon that has the most clay is closer to the surface in Mahoning soils than in Bennington soils. The argillic horizons of Ellsworth soils do not have dominant low-chroma color on the surfaces of peds. Jimtown soils have less clay in the argillic horizons, and they have a more gravelly C horizon than Mahoning soils. Tiro soils formed in a silty mantle that lies over glacial till, and Mahoning soils formed entirely in till.

Typical pedon of Mahoning silt loam, 2 to 6 percent slopes, in Sullivan Township, 50 feet south and 2,250 feet east of the junction of County Road 40 and Township Road 581, lot 52, T. 1 N., R. 18 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam; weak coarse granular structure; few pebbles; medium acid; abrupt smooth boundary.

B&A—8 to 11 inches; 60 percent yellowish brown (10YR 5/4) silty clay loam (B2t); few fine faint grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; firm; surrounded by 40 percent grayish brown (10YR 5/2) silt loam (A2); very weak fine subangular blocky structure; friable; material of the whole horizon is 5 percent pebbles; strongly acid; clear irregular boundary.

B21t—11 to 20 inches; yellowish brown (10YR 5/4) heavy silty clay loam; common medium faint yellow-

ish brown (10YR 5/6) and grayish brown (10YR 5/2) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; firm; faces of peds coated with grayish brown (10YR 5/2) clay films and few brown (10YR 5/3) silt coatings; 8 percent pebbles; strongly acid; diffuse wavy boundary.

B22t—20 to 26 inches; yellowish brown (10YR 5/4) heavy silty clay loam; common medium faint yellowish brown (10YR 5/6) and few fine faint grayish brown (10YR 5/2) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; grayish brown (10YR 5/2) coatings on peds; patchy clay films; 6 percent pebbles; slightly acid; clear wavy boundary.

B3—26 to 31 inches; yellowish brown (10YR 5/4) silty clay loam; common medium faint grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; few vertical faces of peds have grayish brown (10YR 5/2) coatings and thin very patchy clay films; 5 percent pebbles; neutral; clear wavy boundary.

C1—31 to 38 inches; yellowish brown (10YR 5/4) clay loam; common coarse faint grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; massive; firm; few light gray (10YR 7/1) accumulations of lime; 8 percent pebbles; strong effervescence; moderately alkaline; gradual boundary.

C2—38 to 60 inches; yellowish brown (10YR 5/4) clay loam; common coarse faint grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) and few coarse prominent yellowish red (5YR 5/8) mottles; massive; firm; many light gray (10YR 7/1) lime streaks; 10 percent pebbles; strong effervescence; moderately alkaline.

Thickness of the solum ranges from 28 to 44 inches, and the depth to carbonates ranges from 24 to 42 inches. In many pedons, the lower part of the solum is calcareous. Reaction ranges from very strongly acid to neutral in the Ap horizon and the upper part of the B horizon to mildly alkaline in the lower part of the B horizon. The amount of coarse fragments, most of them angular pebbles and shale fragments, ranges from 0 to 10 percent, by volume, throughout the soil.

The color of the Ap horizon ranges from dark grayish brown (10YR 4/2) in some pedons to dark brown (10YR 4/3) in others where the soil is eroded. In an uncultivated area, the A1 horizon is very dark grayish brown (10YR 3/2) and is 2 to 4 inches thick. An A2 horizon as much as 4 inches thick is in some uncultivated places. It is grayish brown (10YR 5/2) or light brownish gray (10YR 6/2) silt loam and has high-chroma mottles. The B2t horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 or 4. Coatings on peds have hue of 10YR or 2.5Y or are neutral (N). They have value of 4 to 6 and chroma of 2 or less. These coatings have clay films, and in some pedons they are degraded silty coatings. The B2t horizon is heavy silty clay loam, clay loam, light silty clay, or clay, and its weighted average clay content is 37 to 42 percent. The C horizon is calcareous clay loam or silty clay loam, and its clay content is 30 to 40 percent.

Orrville Variant

The Orrville Variant consists of moderately deep, somewhat poorly drained soils that formed in alluvium and are subject to flooding. These soils have moderately rapid permeability. The alluvial materials are 20 to 40 inches thick over bedrock of sandstone or shale. Slope ranges from 0 to 2 percent.

Orrville Variant soils are commonly adjacent to Lobdell soils. Lobdell soils are deeper to bedrock than the Orrville Variant soils and do not have low-chroma colors immediately below the Ap horizon.

Typical pedon of Orrville Variant silt loam, in Hanover Township, 1,400 feet west and 1,200 feet north of the SE corner of sec. 23, T. 19 N., R. 16 W.

A1—0 to 4 inches; dark brown (10YR 4/3) silt loam; weak fine granular structure; very friable; slightly acid; diffuse wavy boundary.

B1—4 to 7 inches; brown (10YR 5/3) silt loam; many coarse faint dark grayish brown (10YR 4/2) mottles; weak medium subangular blocky structure; friable; some dark brown (10YR 4/3) coatings; medium acid; clear wavy boundary.

B21—7 to 13 inches; yellowish brown (10YR 5/4) silt loam; many medium faint grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; friable; medium acid; clear irregular boundary.

B22—13 to 19 inches; grayish brown (10YR 5/2) silt loam; many coarse faint yellowish brown (10YR 5/4) and common medium distinct brown (7.5YR 4/4) mottles; weak coarse subangular blocky structure; friable; medium acid; clear wavy boundary.

Cg—19 to 25 inches; grayish brown (2.5Y 5/2) heavy loam; many coarse faint dark gray (10YR 4/1) and many coarse prominent strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; firm; 10 percent angular sandstone fragments; slightly acid; abrupt smooth boundary.

R—25 inches; grayish brown (2.5Y 5/2) sandstone bedrock; beds 1/4 inch to 2 inches thick; vertical cleavages 8 to 16 inches apart.

The solum is 18 to 36 inches thick, and the depth to rock ranges from 24 to 40 inches. The upper part of the solum is slightly acid to strongly acid; the lower part, just above bedrock, is medium acid or slightly acid. Coarse fragments make up, on the average, less than 35 percent of the soil between a depth of 10 inches and the

lithic contact; they make up more than 35 percent of the soil in the thin subhorizons.

The A1 horizon is dark brown (10YR 4/3) or dark grayish brown (10YR 4/2) silt loam or loam 2 to 5 inches thick. The B horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 to 4; it is mottled. Horizons that have dominant chroma of 2 or less or of more than 2 are within a depth of 20 inches. The B and C horizons are loam or silt loam. They are 18 to 27 percent clay and more than 15 percent sand coarser than very fine sand.

Oshtemo series

The Oshtemo series consists of deep, well drained soils that have moderately rapid permeability. These soils formed in outwash on terraces. Slope ranges from 2 to 12 percent.

Oshtemo soils are commonly adjacent to Bogart and Chili soils. Bogart soils have low-chroma mottles less than 10 inches below the top of the argillic horizon. Both Bogart and Chili soils have more clay and less sand in the B horizons than the Oshtemo soils.

Typical pedon of Oshtemo sandy loam, 2 to 6 percent slopes, in Montgomery Township, 650 feet south and 1,400 feet west of the NE corner of sec. 10, T. 22 N., R. 19 W.

Ap—0 to 10 inches; dark brown (10YR 4/3) sandy loam; weak medium granular structure; very friable; 3 percent gravel; neutral (limed); abrupt smooth boundary.

B21t—10 to 18 inches; yellowish brown (10YR 5/6) sandy loam; weak coarse subangular blocky structure parting to single grain; very friable; slightly sticky; thin very patchy brown (7.5YR 4/4) clay films; few sand grains coated and bridged with clay; 5 percent gravel; medium acid; gradual smooth boundary.

B22t—18 to 32 inches; yellowish brown (10YR 5/6) sandy loam and strata of gravelly sandy loam; weak very coarse prismatic structure parting to weak coarse subangular blocky; very friable; slightly sticky; 5 percent gravel; medium acid; clear smooth boundary.

B23t—32 to 42 inches; dark yellowish brown (10YR 4/4) gravelly sandy loam; single grain; very friable; slightly sticky; sand and gravel coated and bridged with clay; 30 percent angular sandstone fragments 1 inch to 3 inches in diameter and 1/4 to 1/2 inch thick; medium acid; abrupt wavy boundary.

B24t—42 to 45 inches; dark yellowish brown (10YR 4/4) gravelly sandy loam; single grain; very friable; slightly sticky; sand and gravel coated and bridged with clay; 20 percent fine rounded gravel; medium acid; clear smooth boundary.

B3—45 to 60 inches; dark yellowish brown (10YR 4/4) loamy sand; single grain; loose; 5 percent fine gravel; neutral.

Thickness of the solum ranges from 42 to 66 inches. The depth to carbonates ranges from 50 to 66 inches. The material in the upper part of the solum ranges from slightly acid to strongly acid if the soil has not been limed. The B3 horizon is strongly acid to neutral, and the C horizon, if one is present, is neutral or calcareous. Fine gravel makes up as much as 30 percent of the solum and as much as 40 percent of the C horizon.

In an uncultivated area, the A1 horizon is very dark grayish brown (10YR 3/2) and is 1 to 3 inches thick. It is underlain by a brown (10YR 5/3) or yellowish brown (10YR 5/4) A2 horizon of sandy loam or loamy sand that is 2 to 5 inches thick. The B2t horizons have hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. The B2t horizons typically are sandy loam or gravelly sandy loam, but in some places they are light sandy clay loam or light gravelly sandy clay loam. The C horizon, if one is present, is loamy sand, sandy loam, or sand, and in most places it is stratified.

Pewamo series

The Pewamo series consists of deep, very poorly drained soils that have moderately slow permeability. These soils formed in moderately fine textured glacial till that has a medium content of calcium carbonate. They are in closed depressions on till plains and are typically on the lowest part of the landscape. Slope ranges from 0 to 2 percent.

Pewamo soils are commonly adjacent to Bennington and Condit soils. The Bennington and the Condit soils do not have a mollic epipedon.

Typical pedon of Pewamo silty clay loam, in Clear Creek Township, 650 feet south and 1,400 feet east of the NW corner of sec. 23, T. 25 N., R. 20 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2 crushed) silty clay loam; moderate fine granular structure; firm; very dark brown (10YR 2/2) coatings; neutral; abrupt smooth boundary.

A12—8 to 13 inches; black (10YR 2/1) silty clay loam; common medium distinct strong brown (7.5YR 5/6) mottles; moderate fine subangular blocky structure; firm; slightly acid; clear wavy boundary.

B1g—13 to 17 inches; dark gray (10YR 4/1) silty clay loam; many medium distinct strong brown (7.5YR 5/4) mottles; moderate fine subangular blocky structure; firm; very dark gray (10YR 3/1) coatings on peds; few fine pebbles; slightly acid; clear irregular boundary.

B21tg—17 to 24 inches; dark gray (10YR 4/1) silty clay loam; common coarse distinct yellowish brown (10YR 5/4) and strong brown (7.5YR 5/6) mottles;

moderate coarse subangular blocky structure parting to weak fine subangular blocky; firm; dark gray (10YR 4/1) faces of peds have very dark gray (10YR 3/1) streaks and thin patchy clay films; many Fe-Mn concretions; few pebbles; slightly acid; clear irregular boundary.

B22tg—24 to 34 inches; gray (10YR 5/1) silty clay loam; common medium and coarse distinct yellowish brown (10YR 5/4 and 5/6) mottles; moderate medium subangular blocky structure; firm; faces of peds have gray (5Y 5/1) coatings and thin patchy clay films; few concretions; few pebbles; slightly acid; clear wavy boundary.

B3—34 to 44 inches; gray (10YR 5/1) clay loam; many coarse prominent yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; faces of peds are gray (10YR 5/1); few concretions; few pebbles; neutral; gradual smooth boundary.

C—44 to 60 inches; gray (10YR 5/1) clay loam; common coarse distinct yellowish brown (10YR 5/4) and common coarse prominent yellowish brown (10YR 5/6) mottles; firm; massive; few pebbles; slight effervescence; mildly alkaline.

Thickness of the solum and depth to carbonates range from 28 to 48 inches. The material in the upper part of the solum is medium acid or slightly acid, and the reaction grades to neutral or mildly alkaline at the base of the solum. A few small angular pebbles are in the B2t and C horizons and, in some pedons, in the A and B1 horizons.

The A1 horizon is 10 to 14 inches thick. It is black (10YR 2/1), very dark gray (10YR 3/1), or very dark grayish brown (10YR 3/2). The A1 horizon typically is silty clay loam; in some pedons it is silty clay in the lower 3 to 6 inches. Distinct or prominent mottles are in the lower part of the A1 horizon in some pedons. There is no B1g horizon in some pedons. The B2t horizon has hue of 10YR or higher or is neutral (N); it has value of 4 or 5 and chroma of 2 or less. Surfaces of peds have a similar range in color, except the value is 2 or 3 if there are organic stains on the faces of peds. The B2t horizon is heavy clay loam, heavy silty clay loam, or light silty clay. The C horizon is calcareous glacial till that is clay loam or silty clay loam.

Ravenna series

The Ravenna series consists of deep, somewhat poorly drained soils on till plains. These soils formed in glacial till that is loam and has a low content of calcium carbonate. The lower part of the subsoil is a dense fragipan that is slowly permeable. The soil above the fragipan is moderately permeable. These soils are on flats and in depressions on low parts of the landscape. Slope ranges from 0 to 6 percent.

Ravenna soils are commonly adjacent to Canfield soils. Canfield soils do not have mottling immediately below the Ap horizon or low-chroma coatings on the surfaces of peds in the argillic horizon.

Typical pedon of Ravenna silt loam, 0 to 2 percent slopes, in Perry Township, 650 feet east and 700 feet south of the NW corner of sec. 27, T. 22 N., R. 15 W.

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable; 5 percent fine pebbles; neutral (limed); abrupt smooth boundary.

B&A—10 to 14 inches; yellowish brown (10YR 5/4) silt loam (B1); weak medium subangular blocky structure; friable; about 10 to 15 percent of the peds (A2) have grayish brown (10YR 5/2) coatings on faces; few coarse fragments; medium acid; clear irregular boundary.

B2t—14 to 23 inches; yellowish brown (10YR 5/4) silt loam; many coarse faint yellowish brown (10YR 5/6) and common coarse distinct gray (10YR 5/1) mottles; moderate medium subangular blocky structure; firm; peds coated with grayish brown (10YR 5/2) clay films and light brownish gray (10YR 6/2) silt coatings; few coarse fragments; medium acid; clear wavy boundary.

Bx1—23 to 28 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct yellowish brown (10YR 5/6) and gray (10YR 5/1) mottles; weak very coarse prismatic structure parting to weak thick platy; very firm; brittle; patchy grayish brown (10YR 5/2) clay films and common light brownish gray (10YR 6/2) silt coatings on faces of peds; 8 percent coarse fragments; strongly acid; clear smooth boundary.

Bx2—28 to 38 inches; yellowish brown (10YR 5/4) loam; many coarse faint yellowish brown (10YR 5/4) and common medium distinct gray (10YR 5/1) mottles; moderate very coarse prismatic structure parting to weak medium platy; very firm; brittle; dark gray (10YR 4/1) clay films on faces of peds; 10 percent coarse fragments; medium acid; clear wavy boundary.

B3—38 to 45 inches; yellowish brown (10YR 5/4 and 5/6) loam; common fine distinct gray (10YR 5/1) mottles; weak coarse subangular blocky structure; firm; occasional streaks of dark gray (10YR 4/1) coatings; 12 percent pebbles; slightly acid; clear irregular boundary.

C—45 to 60 inches; yellowish brown (10YR 5/4) loam; common medium distinct yellowish brown (10YR 5/6) and gray (10YR 5/1) mottles; massive; firm; few vertical gray (10YR 5/1) streaks; 8 percent pebbles; neutral.

Thickness of the solum ranges from 40 to 72 inches. The depth to carbonates is at least 60 inches. Reaction

in and above the fragipan ranges from medium acid to extremely acid. The material below the fragipan becomes less acid with depth and ranges from slightly acid to mildly alkaline at a depth of 60 inches.

In an uncultivated area, the A1 horizon is very dark grayish brown (10YR 3/2) or black (10YR 2/1) and is 2 to 4 inches thick. The B&A horizon is replaced by A2 and B1 horizons in some pedons. The A2 horizon has hue of 10YR, value of 5 or 6, chroma of 2 or 3, and high-chroma mottles. The B1 horizon is yellowish brown (10YR 5/4) or brown (10YR 5/3) and has low-chroma mottles and coatings. The B2t horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 to 5. It has mottles of low chroma. Surfaces of peds have dominant chroma of 2 or less. The B2t horizon is loam or silt loam; its clay content ranges from 20 to 27 percent, and its content of sand coarser than very fine sand is more than 15 percent. The top of the Bx horizon is at a depth of 18 to 30 inches. This horizon is loam or silt loam and is 15 to 24 inches thick. The C horizon is loam or silt loam, and its clay content ranges from 15 to 25 percent.

Rigley series

The Rigley series consists of deep, well drained soils that have moderately rapid permeability. These soils formed in colluvium that derived from medium- and coarse-grained sandstone, mostly on or below sandstone ridges in the unglaciated uplands.

The Rigley soils in Ashland County have a solum thinner than the one typical of the series, but this does not affect their use and management.

Rigley soils are commonly adjacent to Schaffenaker soils. Schaffenaker soils do not have an argillic horizon. They are moderately deep to bedrock.

Typical pedon of Rigley sandy loam, 6 to 12 percent slopes, in Hanover Township, 1,250 feet east and 2,250 feet north of the SW corner of sec. 28, T. 19 N., R. 16 W.

A1—0 to 1 inch; very dark gray (10YR 3/1) coarse sandy loam; moderate very fine granular structure; very friable; 10 percent uncoated sand grains; 5 percent coarse fragments; very strongly acid; clear irregular boundary.

A2—1 inch to 3 inches; dark brown (10YR 4/3) sandy loam; weak medium subangular blocky structure; very friable; 5 percent coarse fragments; very strongly acid; clear irregular boundary.

B1—3 to 6 inches; yellowish brown (10YR 5/4) sandy loam; weak very thick platy structure; very friable; 10 percent coarse fragments; very strongly acid; clear irregular boundary.

B21t—6 to 16 inches; yellowish brown (10YR 5/6) sandy loam; weak medium subangular blocky structure; friable; slightly sticky; thin patchy yellowish brown (10YR 5/4) clay films; sand grains coated and bridged with clay; 10 percent coarse fragments; very strongly acid; gradual smooth boundary.

B22t—16 to 28 inches; strong brown (7.5YR 5/6) sandy loam; moderate very coarse (3 to 5 inches) subangular blocky structure parting to moderate medium subangular blocky; friable; slightly sticky; thin yellowish brown (10YR 5/4) clay films are nearly continuous on very coarse blocks and very patchy on medium blocks; some sand grains in peds coated and bridged with clay; very coarse blocks partially coated with Fe-Mn stains; 10 percent coarse fragments; very strongly acid; clear wavy boundary.

B3—28 to 34 inches; yellowish brown (10YR 5/4) channery sandy loam; single grain; very friable; few sand grains coated and bridged with clay, especially those around coarse fragments; few medium distinct grayish brown (10YR 5/2) mottles above large coarse fragments; 15 percent coarse fragments; very strongly acid; clear irregular boundary.

Cr—34 to 42 inches; light yellowish brown (10YR 6/4) highly weathered sandstone, crushing to medium sand; many dark stains; massive; very firm in place but loose when crushed; 40 percent hard rock fragments; very strongly acid; gradual irregular boundary.

R—42 inches; light yellowish brown (10YR 6/4) slightly weathered medium- and coarse-grained sandstone; common dark stains; beds 1 inch to 6 inches thick and vertical cleavages 2 to 10 inches apart.

Thickness of the solum and depth to weathered rock range from 30 to 40 inches. The depth to hard rock is 40 to 60 inches. Reaction throughout the solum ranges from strongly acid to extremely acid; base saturation just above the paralithic or lithic contact is less than 35 percent. Coarse fragments similar to the underlying rock make up less than 15 percent of the A1, B1, and B2t horizons and from 5 to 30 percent of the B3 horizon. The soil in the upper 12 inches is as much as 20 percent stones 6 to 24 inches in diameter that have rolled onto this soil from adjacent ridges.

In the few places that are cultivated, the Ap horizon is brown (10YR 5/3) sandy loam. The A1 horizon, 1 to 3 inches thick, is very dark gray (10YR 3/1), very dark grayish brown (10YR 3/2), or very dark brown (10YR 2/2). The A2 horizon, 2 to 6 inches thick, is dark brown (10YR 4/5), dark grayish brown (10YR 4/2), or brown (10YR 5/3) and is not mottled. The B1 horizon is brown (10YR 5/3) or yellowish brown (10YR 5/4) and is not mottled. The A2 and B1 horizons are sandy loam or loamy sand. The B2t horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 4 to 8. Redder stains are on and around the sandstone fragments. Mottles that have chroma of 2 or less are below the upper 10 inches of the B2t horizon in many pedons. Mottles are most common just above the large flat sandstone fragments. The B3 horizon has about the same color as the B2t

horizon but is not sticky. The B3 horizon is sand, loamy sand, or sandy loam. Not all pedons have a Cr horizon.

Rittman series

The Rittman series consists of deep, moderately well drained soils that have a dense fragipan. The fragipan is slowly permeable; the soil above it is moderately permeable. These soils formed in medium textured to moderately fine textured glacial till that has a low to moderate content of calcium carbonate. They are on till plains, where they are on hilltops and on side slopes of valleys. Slope ranges from 2 to 18 percent.

Rittman soils are commonly adjacent to Condit and Wadsworth soils. They are similar to Canfield soils. Canfield soils have less clay in the B2t horizon. Condit soils have dominant low-chroma color in the argillic horizon. Wadsworth soils have low-chroma color on faces of peds in the layer immediately below the Ap horizon.

Typical pedon of Rittman silt loam, 2 to 6 percent slopes, in Milton Township, 2,500 feet north and 650 feet west of the SE corner of sec. 12, T. 24 N., R. 17 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable; medium acid; abrupt smooth boundary.

B21t—7 to 11 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium subangular blocky structure; firm; thin patchy yellowish brown (10YR 5/4) clay films on faces of peds; 5 percent coarse fragments; medium acid; clear irregular boundary.

B22t—11 to 20 inches; yellowish brown (10YR 5/4) silty clay loam; many coarse distinct yellowish brown (10YR 5/6) and common medium faint grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to moderate medium and coarse subangular blocky; firm; thin patchy yellowish brown (10YR 5/4) clay films that have streaks of grayish brown (10YR 5/2); 4 percent coarse fragments; strongly acid; abrupt wavy boundary.

Bx1—20 to 27 inches; yellowish brown (10YR 5/4) silty clay loam; common fine faint yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) mottles; weak very coarse (4 to 5 inches) prismatic structure parting to moderate very thick platy which in turn parts to moderate thin platy; very firm; very brittle; continuous moderately thick grayish brown (10YR 5/2) clay films on faces of prisms and thin patchy brown (10YR 5/3) clay films on plates; 5 percent dark ferro-manganese concretions; 4 percent coarse fragments; very strongly acid; clear wavy boundary.

Bx2—27 to 36 inches; dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6 and 5/4) light clay loam; common fine distinct gray (10YR 5/1) mottles; weak very coarse prismatic structure parting to moderate medium and coarse angular blocky; very firm; brittle; dark grayish brown (10YR 4/2) clay films are continuous and moderately thick on faces of prisms and thin and patchy on plates; dark ferro-manganese stains cover 10 percent of vertical and 25 percent of horizontal faces of peds; 5 percent coarse fragments; medium acid; clear smooth boundary.

B3—36 to 43 inches; yellowish brown (10YR 5/4) light clay loam; common medium faint yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; occasional vertical streaks of dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2) clay films; 5 percent coarse fragments; slightly acid; clear wavy boundary.

C—43 to 60 inches; brown (10YR 5/3) light clay loam; common medium faint grayish brown (10YR 5/2) mottles; weak columnar structure and few grayish brown vertical cleavage planes; firm; 8 percent coarse fragments; strong effervescence; moderately alkaline.

The thickness of the solum and the depth to carbonates range from 42 to 60 inches. These depths typically are the same, but in some pedons the upper part of the C horizon is not calcareous. The upper part of the solum ranges from strongly acid to extremely acid if the soil has not been limed. The reaction is less acid with increasing depth; the material at the base of the solum is slightly acid or neutral. Small angular pebbles make up 2 to 10 percent of the material above the fragipan and 2 to 15 percent of the material in and below the fragipan.

The Ap horizon ranges from dark grayish brown (10YR 4/2) in uneroded places to brown (10YR 5/3) in eroded places. In an unplowed area, an A1 horizon is 1 inch to 4 inches thick. It is very dark grayish brown (10YR 3/2) silt loam. It is underlain by an A2 horizon of brown (10YR 5/3) or yellowish brown (10YR 5/2) silt loam. The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. The B2t horizon is clay loam or silty clay loam; its content of clay is 28 to 35 percent, and its content of sand coarser than very fine sand is more than 15 percent. The top of the Bx horizon is at a depth of 18 to 36 inches; the Bx horizon is 14 to 30 inches thick. The fragipan has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It typically has mottles of both high and low chroma. Coatings on peds in the fragipan have hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2. Texture of the fragipan is clay loam, silty clay loam, or loam; the content of clay is 25 to 32 percent. There are many Fe-Mn concretions in the fragipan of many pedons. The B3 horizon is similar to the fragipan in color and texture but is not brittle. The C horizon is clay loam, silty clay loam, or heavy loam, and its content of clay is 25 to 32 percent.

Schaffenaker series

The Schaffenaker series consists of moderately deep, well drained soils that have rapid permeability. These soils formed in material that weathered from medium- and coarse-grained sandstone, and they are underlain by bedrock at a depth of 20 to 40 inches. Schaffenaker soils are in unglaciated areas on the top and sides of narrow ridges that rise above the surrounding landscape. Slope ranges from 10 to 40 percent.

Schaffenaker soils are commonly adjacent to Coshocton, Lordstown, and Rigley soils, all of which have a finer textured B horizon. Coshocton soils are deep over bedrock and have an argillic horizon. Rigley soils are deeper over bedrock than Schaffenaker soils and also have an argillic horizon. Lordstown soils have more fine and very fine sand and less medium and coarse sand than Schaffenaker soils.

Typical pedon of Schaffenaker loamy sand, 10 to 40 percent slopes, in Hanover Township, 1,250 feet east and 2,300 feet north of the SW corner of sec. 28, T. 19 N., R. 16 W.

O1—1 inch to 0; dark brown (7.5YR 3/2) partly decomposed leaf litter; material from 4 leaf falls evident.

A1—0 to 2 inches; very dark grayish brown (10YR 3/2) loamy sand; very weak medium granular structure; very friable; 20 percent bleached sand grains; very strongly acid; clear irregular boundary.

A&B—2 to 6 inches; 60 percent dark brown (10YR 4/3) loamy sand (A2); intermingled with 40 percent yellowish brown (10YR 5/4) loamy sand (B1); single grain; loose; 5 percent sandstone fragments; very strongly acid; clear wavy boundary.

B2—6 to 14 inches; yellowish brown (10YR 5/6) loamy sand; single grain; loose; 10 percent sandstone fragments; very strongly acid; clear irregular boundary.

B3—14 to 28 inches; yellowish brown (10YR 5/6) loamy sand; single grain; loose; 15 percent sandstone fragments 1 inch to 4 inches in diameter; yellowish red (5YR 5/6) stains on and around fragments; very strongly acid; abrupt wavy boundary.

R—28 inches; yellowish brown (10YR 5/4) Black Hand sandstone; many yellowish brown (10YR 5/6 and 5/8) and strong brown (7.5YR 5/6 and 5/8) stains; beds 1 inch to 4 inches thick; vertical cleavage spaced 6 to 15 inches; extremely firm.

Thickness of the solum and depth to solid rock range from 20 to 40 inches. Reaction throughout the solum ranges from strongly acid to extremely acid. All horizons above bedrock are sand or loamy sand, and the dominant size class of the sand is medium or coarse. Coarse fragments of rock make up as much as 15 percent of the A, B1, and B2 horizons and 5 to 30 percent of the B3 horizon. These coarse fragments are mostly pieces of weathered sandstone 1 inch to 4 inches in diameter.

The A1 horizon ranges from 1 inch to 5 inches in thickness. It is very dark gray (10YR 3/1), very dark grayish brown (10YR 3/2), or dark gray (10YR 4/1). Bleached grains of sand are evident, and they account for 10 to 40 percent of the soil mass. Some pedons have A2 and B1 horizons. The A2 horizon is dark brown (10YR 4/3) or brown (10YR 5/3), and typically it resists wetting. The B1 horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. It does not resist wetting. The B2 and B3 horizons have hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 4 to 8. The underlying rock has hue of 10YR, value of 5 or 6, and chroma of 4 to 8. Beds of the sandstone are 1 to 5 inches thick, and vertical cracks are 2 to 18 inches apart.

Sebring series

The Sebring series consists of deep, poorly drained soils that have moderately slow permeability. These soils formed in material that has much silt and very fine sand and was deposited in shallow lakes when the glaciers melted. Sebring soils are on flats, in closed depressions, and in minor natural drainageways. Slope ranges from 0 to 2 percent.

Sebring soils are commonly adjacent to Fitchville and Luray soils. Fitchville soils do not have dominant low-chroma color in the matrix of the argillic horizons. Luray soils have a mollic epipedon.

Typical pedon of Sebring silt loam, in Sullivan Township, 1,700 feet east and 2,400 feet south of the junction of County Road 40 and Township Road 581, in lot 69, T. 1 N., R. 18 W.

Ap—0 to 8 inches; dark gray (10YR 4/1) silt loam; weak medium granular structure; friable; slightly acid; abrupt smooth boundary.

B1—8 to 12 inches; grayish brown (10YR 5/2) light silty clay loam; many fine faint brown (10YR 5/3) mottles; weak medium subangular blocky structure; firm; medium acid; clear irregular boundary.

B21tg—12 to 20 inches; gray (10YR 5/1) silty clay loam; many fine prominent yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; gray (N 5/0) faces of peds and thin very patchy clay films; medium acid; clear wavy boundary.

B22tg—20 to 30 inches; grayish brown (2.5Y 5/2) light silty clay loam; common fine and medium prominent yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; gray (10YR 5/1) faces of peds and thin patchy clay films; medium acid; clear smooth boundary.

B23tg—30 to 37 inches; grayish brown (10YR 5/2) silt loam; many coarse distinct yellowish brown (10YR 5/4) and common fine prominent yellowish brown (10YR 5/6) mottles; weak medium subangular

blocky structure; firm; gray (10YR 5/1) faces of peds and few dark gray (10YR 4/1) clay films; slightly acid; clear wavy boundary.

C1—37 to 44 inches; gray (10YR 5/1) silt loam; many coarse prominent yellowish brown (10YR 5/4, 5/6, and 5/8) mottles; massive; friable; few thin strata of loam; neutral; abrupt wavy boundary.

C2—44 to 54 inches; grayish brown (10YR 5/2) silt loam; common fine and medium distinct yellowish brown (10YR 5/4 and 5/6) mottles; massive; firm; many thin strata of friable very fine sandy loam and fine sandy loam; neutral; clear wavy boundary.

C3—54 to 60 inches; yellowish brown (10YR 5/4) silt loam; many coarse distinct gray (10YR 5/1) and common medium distinct yellowish brown (10YR 5/6) mottles; massive; firm; few thin strata of very fine sandy loam; slight effervescence; mildly alkaline.

Thickness of the solum ranges from 30 to 50 inches. Reaction in the upper part of the solum ranges from medium acid to very strongly acid; in the lower part it ranges from slightly acid to neutral. Commonly there are no coarse fragments within a depth of at least 40 inches. Most of the coarse fragments (pebbles) are in thin layers below a depth of 48 inches.

In an uncultivated area, the A1 horizon is 1 inch to 3 inches thick and is very dark gray (10YR 3/1), very dark grayish brown (10YR 3/2), or black (10YR 2/1). The Ap horizon is dark gray (10YR 4/1), dark grayish brown (10YR 4/2), or gray (10YR 5/1). The B1 horizon in some pedons shows evidence of degradation. The B2t horizon has hue of 10YR or yellower or is neutral (N) and has value of 4 to 6 and chroma of 0 to 2. High-chroma mottles are on 10 to 40 percent of the broken peds, and they typically increase in number with depth. Faces of peds have hue of 10YR or yellower or neutral (N), value of 4 or 5, and chroma of 0 to 2. Clay films and a few organic stains are on surfaces of peds. The B2t horizons are silt loam or silty clay loam. In pedons that formed in stratified material, the subhorizons are loam or clay loam. The B3 horizon is similar to the B2t horizon in color and texture but has fewer clay films. The C horizon is typically mottled and has a wide range of color. The C horizon dominantly is silt loam or silty clay loam, but thin strata of other texture are common, especially below a depth of 48 inches.

Shoals series

The Shoals series consists of deep, moderately permeable soils that are somewhat poorly drained. These soils formed in recent alluvium and are subject to flooding. Slope ranges from 0 to 2 percent.

Shoals soils are commonly adjacent to Holly and Lobdell soils. Holly soils have dominant chroma of 1 within a depth of 30 inches. Lobdell soils do not have low-chroma color immediately below the Ap horizon.

Typical pedon of Shoals silt loam, in Mohican Township, 2,000 feet north and 2,300 feet east of the SW corner of sec. 15, T. 21 N., R. 15 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) (crushed) silt loam; moderate medium granular structure; friable; very dark grayish brown (10YR 3/2) organic coatings on granules; neutral; abrupt smooth boundary.

B1—7 to 16 inches; dark grayish brown (10YR 4/2) (crushed) silt loam; common fine distinct dark brown (10YR 4/3) mottles; moderate fine subangular blocky structure; friable; dark gray (10YR 4/1) fillings in root channels; slightly acid; clear wavy boundary.

B2—16 to 21 inches; brown (10YR 4/3) silt loam; common medium faint dark grayish brown (10YR 4/2) mottles; weak very coarse subangular blocky structure parting to weak thin platy; friable; dark grayish brown (10YR 4/2) coatings on peds; slightly acid; abrupt wavy boundary.

B3—21 to 31 inches; grayish brown (10YR 5/2) silt loam; common fine prominent strong brown (7.5YR 5/8) and common coarse faint brown (10YR 5/3) mottles; weak thick platy structure parting to weak very fine subangular blocky; friable; neutral; gradual smooth boundary.

C1—31 to 39 inches; grayish brown (10YR 5/2) silt loam; many coarse distinct strong brown (7.5YR 5/6) mottles; massive; friable; neutral; clear wavy boundary.

C2—39 to 60 inches; grayish brown (10YR 5/2) and brown (10YR 4/3) silt loam; many medium prominent strong brown (7.5YR 5/6) mottles; massive; very friable; thin strata of very fine sandy loam; few thin pebble lines; neutral.

Thickness of the solum ranges from 24 to 40 inches. The upper part of the solum is typically neutral but ranges from slightly acid to mildly alkaline. The lower part of the solum and the C horizon are neutral to moderately alkaline. Carbonates are below a depth of 30 inches in some places. Coarse fragments make up less than 10 percent of the solum and less than 25 percent of the C horizon. In some places, especially in the C horizon below a depth of 48 inches, there are thin strata that are as much as 60 percent gravel. Fresh soil that is not part of the solum has been deposited on the A1 or the Ap horizon in some places.

In an uncultivated area, the A1 horizon is 2 to 5 inches thick and, when crushed, it is very dark grayish brown (10YR 3/2), very dark gray (10YR 3/1), or black (10YR 2/1). The Ap horizon, when crushed, is dark grayish brown (10YR 4/2) or dark brown (10YR 4/3). The B horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. Most material of the B horizons has dominant

chroma of 2, but at least one subhorizon within the upper 20 inches of the B horizons has dominant chroma of 3 or more. Mottles that have chroma both higher and lower than that of the matrix color are in most parts of the B horizons. In the B horizons of some pedons but not in all, there are structure units that have dark organic coatings. The B horizons are dominantly silt loam or loam, and there are thin strata of other textures in some pedons. The C horizon typically shows evidence of stratification. The strata differ slightly in color, texture, or amount of coarse fragments. The C horizon is grayish brown, brown, or yellowish brown and has contrasting mottles. Its dominant texture is silt loam, loam, or sandy loam.

Sloan series

The Sloan series consists of deep, very poorly drained soils on flood plains. These soils formed in recent alluvium. They have moderately slow or moderate permeability and are subject to flooding. Slope ranges from 0 to 2 percent.

Sloan soils are commonly adjacent to Holly and Shoals soils. Neither the Holly soils nor the Shoals soils have a mollic epipedon.

Typical pedon of Sloan silty clay loam, in Lake Township, 1,100 feet east and 200 feet south of the NW corner of sec. 15, T. 20 N., R. 15 W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silty clay loam; weak coarse subangular blocky structure parting to weak fine granular; friable; neutral; abrupt smooth boundary.

A12—9 to 18 inches; black (10YR 2/1) silty clay loam; moderate very fine granular structure; friable; neutral; clear wavy boundary.

B1g—18 to 24 inches; dark gray (5Y 4/1) silty clay loam; common fine distinct light olive brown (2.5Y 5/4) mottles; weak coarse subangular blocky structure; firm; very dark gray (5Y 3/1) coatings on peds; neutral; clear smooth boundary.

IIB2g—24 to 36 inches; grayish brown (10YR 5/2) loam; moderate coarse subangular blocky structure; firm; common Fe-Mn concretions; neutral; gradual smooth boundary.

IIB3g—36 to 50 inches; grayish brown (10YR 5/2) stratified loam and silt loam; many coarse prominent yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; friable; neutral; clear smooth boundary.

IICg—50 to 60 inches; dark gray (10YR 4/1) stratified loam, silt loam, and silty clay loam; few medium distinct gray (10YR 6/1) and common medium distinct yellowish brown (10YR 5/6) mottles; massive; firm; weak effervescence; mildly alkaline.

Thickness of the solum ranges from 40 to 50 inches. Reaction in the solum ranges from slightly acid to moderately alkaline. The depth to carbonates is 40 to 50 inches. The C horizon is neutral to moderately alkaline. Coarse fragments typically make up less than 5 percent of the A and B horizons and less than 20 percent of the C horizon.

The A1 horizon is 12 to 22 inches thick and is black (10YR 2/1), very dark gray (10YR 3/1), or very dark grayish brown (10YR 3/2). The part of the A1 horizon below plow depth is typically the darkest and the most clayey part of the solum. The A horizon generally is silty clay loam, but in some pedons it is silt loam. Brown and yellowish brown mottles are in the lower part of the A1 horizon in some pedons. The B horizon has hue of 10YR to 5Y, value of 4 or 5, and chroma of 2 or less. It is silt loam, loam, or silty clay loam. The range of texture of the C horizon is similar to that of the B horizon. The C horizon in most places is stratified.

Tiro series

The Tiro series consists of deep, somewhat poorly drained soils that have moderate permeability in the upper part of the solum and slow or moderately slow permeability in the lower part. These soils formed in a thin mantle of water-deposited silty material that is underlain by compact glacial till. They are on flats and low knolls on till plains. Slope ranges from 1 to 4 percent.

Tiro soils are commonly adjacent to Bennington and Mahoning soils. They are similar to Fitchville soils. Bennington and Mahoning soils formed entirely in glacial till and do not have a mantle of silty water-deposited material. Fitchville soils are silty to a greater depth than the Tiro soils and are not underlain by glacial till within a depth of 5 feet.

Typical pedon of Tiro silt loam, 1 to 4 percent slopes, in Troy Township, 1,300 feet east and 1,600 feet north of the Baltimore and Ohio Railroad crossing on Township Road 791, lot 27, T. 1 N., R. 19 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable; medium acid; abrupt smooth boundary.

B&A—8 to 11 inches; 60 percent yellowish brown (10YR 5/4 and 5/6) silty clay loam (B1) and 40 percent grayish brown (2.5Y 5/2) silt loam (A2); weak medium subangular blocky structure; friable; very strongly acid; clear irregular boundary.

B21t—11 to 24 inches; yellowish brown (10YR 5/6) light silty clay loam; common coarse faint brown (10YR 5/3) and yellowish brown (10YR 5/4) and common medium distinct grayish brown (10YR 5/2) mottles; moderate coarse subangular blocky structure parting to moderate fine and very fine subangular blocky; firm; grayish brown (2.5Y 5/2) faces of peds have numerous light brownish gray (2.5Y 6/2) silt coat-

ings and thin patchy clay films; very strongly acid; clear wavy boundary.

B22t—24 to 30 inches; yellowish brown (10YR 5/6) heavy silt loam; many medium distinct gray (10YR 5/1) and grayish brown (10YR 5/2) and common coarse faint yellowish brown (10YR 5/4) mottles; moderate coarse subangular blocky structure parting to weak fine subangular blocky; friable; grayish brown (10YR 5/2) faces of peds have thin patchy clay films; very strongly acid; abrupt smooth boundary.

IIB31—30 to 35 inches; yellowish brown (10YR 5/4) loam; many coarse distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; few Fe-Mn concretions; 5 percent angular coarse fragments; slightly acid; abrupt smooth boundary.

IIB32—35 to 42 inches; yellowish brown (10YR 5/4) silty clay loam; many fine and medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; few gray (10YR 5/1) faces of peds; 3 percent angular pebbles; neutral; diffuse wavy boundary.

IIC—42 to 60 inches; yellowish brown (10YR 5/4) heavy clay loam; common fine distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; massive; firm; few fine angular pebbles; weak effervescence; mildly alkaline.

Thickness of the solum ranges from 30 to 55 inches; the depth to carbonates is at least 40 inches. Reaction in the upper part of the solum is medium acid to very strongly acid if the soil has not been limed. Acidity decreases with depth, and the reaction in the B3 horizon is slightly acid to mildly alkaline. There are very few coarse fragments in the silty upper part of the solum. Coarse fragments make up as much as 20 percent, by volume, of the soil in the loamy part of the solum and 3 to 10 percent of the underlying glacial till.

The thickness of water-deposited silty and loamy material over glacial till ranges from 24 to 40 inches. The thickness of the silty material is at least twice that of the loamy material. The silty material makes up the A1 or Ap horizon and the A2, B, B&A, and most of the B2t horizons. The loamy material is mostly in the B3 horizon, but it makes up a small part of the B2t horizon in some pedons. The glacial till is mostly in the C horizon, but it makes up part of the B3 horizon in some pedons.

In an uncultivated area, the A1 horizon is 2 to 4 inches thick and is very dark grayish brown (10YR 3/2). In most uncultivated areas there is an A2 horizon, and a remnant of an A2 horizon remains in some areas that have been cultivated. The A2 horizon is brown (10YR 5/3) or grayish brown (10YR 5/2) silt loam and has high-chroma mottles. The B2t horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 to 6. There are some low-chroma mottles. Faces of peds have a clay film coating that is grayish brown (10YR 5/2 or 2.5Y 5/2) or gray (10YR 5/1) and an occasional coating of silt. The B2t horizon is silt loam, silty clay loam, or loam. The IIB3 horizon has a range in color similar to that of the B2t horizon, but it has more sand and gravel and is more friable. The C horizon is calcareous loam, clay loam, or silty clay loam.

Wadsworth series

The Wadsworth series consists of deep, somewhat poorly drained soils on till plains. The soils formed in clay loam glacial till that has a low content of calcium carbonate. They have a dense fragipan in the lower part of the subsoil. Permeability is moderate or moderately slow above the fragipan and slow in and below the fragipan. Slope ranges from 0 to 6 percent.

Wadsworth soils are commonly adjacent to Condit and Rittman soils. Condit soils have dominant low-chroma color in the argillic horizons. Rittman soils do not have mottling immediately below the Ap horizon, and they have low-chroma coatings on the faces of peds in the argillic horizons.

Typical pedon of Wadsworth silt loam, 2 to 6 percent slopes, in Milton Township, 450 feet south and 400 feet west of the NE corner of sec. 13, T. 24 N., R. 17 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam; moderate fine granular structure; friable; medium acid; abrupt smooth boundary.

B1—8 to 13 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct gray (10YR 5/1) mottles; moderate fine and medium subangular blocky structure; friable; light brownish gray (10YR 6/2) faces of peds; strongly acid; clear smooth boundary.

B21t—13 to 19 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct gray (10YR 5/1) mottles; moderate medium subangular blocky structure; firm; grayish brown (10YR 5/2) and light brownish gray (10YR 5/2) faces of peds, thin patchy clay films, and degradational silty coatings; strongly acid; clear smooth boundary.

B22t—19 to 23 inches; yellowish brown (10YR 5/6) clay loam; few medium distinct light gray (10YR 6/1) mottles; moderate coarse prismatic structure parting to moderate fine and medium subangular blocky; firm; grayish brown (2.5Y 5/2) faces of peds and thin patchy clay films; few pebbles; strongly acid; clear smooth boundary.

Bx1—23 to 27 inches; dark yellowish brown (10YR 4/4) clay loam; common medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; moderate very coarse prismatic structure parting to weak medium platy; very firm; brittle; gray (10YR 5/1) faces of peds, continuous thin clay films,

and patchy moderately thick clay films; few fine pebbles; strongly acid; gradual smooth boundary.

Bx2—27 to 42 inches; dark yellowish brown (10YR 4/4) clay loam; few fine distinct light brownish gray (10YR 6/1) mottles; weak very coarse prismatic structure parting to weak medium platy; very firm; brittle; gray (10YR 5/1) faces of peds and thin continuous clay films; few dark Fe-Mn concretions; few fine pebbles; slightly acid; gradual wavy boundary.

B3—42 to 51 inches; dark yellowish brown (10YR 4/4) clay loam; few fine distinct light brownish gray (10YR 6/2) mottles; weak very coarse prismatic structure; firm; few gray (10YR 5/1) clay flows on prisms; few fine pebbles; neutral; gradual smooth boundary.

C—51 to 72 inches; dark yellowish brown (10YR 4/4) heavy loam; few fine distinct light brownish gray (10YR 6/2) mottles; massive; firm; weak effervescence; moderately alkaline.

The thickness of the solum and the depth to carbonates range from 34 to 60 inches. Typically the two are the same, but in some pedons the upper part of the C horizon is not calcareous. The upper part of the solum ranges from strongly acid to extremely acid if the soil has not been limed. The reaction is less acid with depth and ranges from medium acid to neutral at the base of the solum. Coarse fragments make up less than 4 percent of the horizons above the fragipan and 2 to 10 percent of the fragipan and the C horizon.

The Ap horizon is typically dark grayish brown (10YR 4/2), but it ranges to brown (10YR 5/3) in eroded spots.

The B1 horizon is 3 to 6 inches thick. In this horizon the peds have grayish brown (10YR 5/2) or light brownish gray (10YR 6/2) silt coatings. The matrix of the B1 horizon is brown (10YR 5/3) or yellowish brown (10YR 5/4), and there are low-chroma mottles.

The B2t horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. It also has low-chroma mottles. The faces of peds are dominated by hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. Clay films and degradational silty coatings are on the faces of peds. The B2t horizon is clay loam or silty clay loam, and its clay content is 27 to 34 percent.

The Bx horizon is at a depth of 18 to 28 inches, and it is 12 to 30 inches thick. Coatings of the prisms have hue of 10YR or grayer (some are neutral), value of 4 to 6, and chroma of 2 or less. Interiors of prisms have hue of 10YR or 2.5Y, value of 4 or 5, chroma of 3 to 6, and low-chroma mottles. Some dark-colored ferro-manganese stains are on the peds and also are concentrated along horizontal cleavage planes. The fragipan is heavy loam, light clay loam, or silty clay loam. Clay content of the fragipan is 25 to 32 percent.

The B3 horizon is 4 to 12 inches thick. It is similar to the fragipan in color and texture but is less firm and is not brittle.

The C horizon is calcareous clay loam, silty clay loam, or heavy loam. Its clay content is 25 to 32 percent.

Wallkill series

The Wallkill series consists of deep, very poorly drained soils that have moderate permeability. These soils formed in recent alluvial deposits of mineral soil that lie on older organic soil. They are nearly level soils along sides of the major stream valleys.

Wallkill soils have a color sequence of light over dark. Only the Algiers and the Killbuck soils in this county have this same color sequence, but in those soils the buried dark layer is mineral rather than organic soil. Carlisle and Linwood soils also consist partly of organic material, but the organic material is on the surface; in the Wallkill soils it is buried.

Typical pedon of Wallkill silt loam, in Perry Township, 1,300 feet north and 1,400 feet west of the SE corner of sec. 20, T. 22 N., R. 15 W.

Ap—0 to 8 inches; dark gray (10YR 4/1) silt loam; common medium distinct brown (7.5YR 4/4) mottles; weak coarse granular structure; friable; slightly acid; abrupt smooth boundary.

C1g—8 to 18 inches; grayish brown (2.5Y 5/2) silt loam; many coarse distinct brown (7.5YR 4/4) mottles; massive; firm; medium acid; clear wavy boundary.

C2g—18 to 22 inches; dark gray (5Y 4/1) silt loam; many medium distinct brown (7.5YR 4/4) and strong brown (7.5YR 5/6) mottles; massive; firm; medium acid; abrupt smooth boundary.

IIOa1—22 to 27 inches; black (N 2/0) sapric material; 25 percent fiber, 5 percent after rubbing; weak fine and medium subangular blocky structure; friable; reddish brown (5YR 5/4) fibrous stains; 30 percent mineral material; slightly acid; clear wavy boundary.

IIOa2—27 to 45 inches; black (5Y 2/1) sapric material; 30 percent fiber, 5 percent after rubbing; weak fine and medium subangular blocky structure; friable; very dark grayish brown (10YR 3/2) fibrous stains; 20 percent mineral material; neutral; clear smooth boundary.

IIOa3—45 to 60 inches; black (5Y 2/1) sapric material; 20 percent fiber, 2 percent after crushing; weak thin platy structure; friable; few thin layers of dark gray (5Y 4/1) silt loam; mildly alkaline.

The thickness of mineral soil over the organic material ranges from 16 to 36 inches. The Ap or the A1 horizon is dark grayish brown (10YR 4/2) or dark gray (10YR 4/1) silt loam. The Cg horizon has hue of 10YR to 5Y, value of 4 or 5, and chroma of 1 or 2; there are high-chroma mottles. The texture is silt loam or loam, and there are thin sandy or gravelly layers in some pedons. In some pedons there is a Bg horizon that has weak

subangular blocky structure. The reaction of the mineral material is medium acid to neutral.

The organic layers are at least 20 inches thick. They are dominantly sapric material, although there are thin layers of hemic material in some pedons. Reaction of the organic material ranges from slightly acid to mildly alkaline. The organic material is underlain by calcareous gray or grayish brown loam or silt loam at a depth that ranges from 36 to 72 inches. The amount of coarse fragments generally is less than 5 percent except in material that was deposited recently.

Wheeling series

The Wheeling series consists of well drained loamy soils that are underlain by sand or gravel at a depth of 20 to 40 inches. These soils have moderate permeability. They are on stream terraces and outwash plains. Slope ranges from 0 to 12 percent.

Wheeling soils are commonly adjacent to Bogart soils. They are similar to Loudonville soils. Bogart soils have 2-chroma mottling in the upper 10 inches of the Bt horizons. Loudonville soils are underlain by bedrock at a depth of 20 to 40 inches.

Typical pedon of Wheeling silt loam, 2 to 6 percent slopes, in Montgomery Township, 600 feet south and 1,800 feet west of the NE corner of sec. 36, T. 24 N., R. 16 W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam; weak fine granular structure; friable; neutral (limed); abrupt smooth boundary.

B1—9 to 11 inches; yellowish brown (10YR 5/4) silt loam; weak thin platy structure; friable; medium acid; clear wavy boundary.

B21t—11 to 20 inches; yellowish brown (10YR 5/4) silt loam; moderate fine subangular blocky structure; firm; moderately thick patchy brown (10YR 4/3 and 5/3) clay films; strongly acid; gradual smooth boundary.

B22t—20 to 28 inches; yellowish brown (10YR 5/4) heavy silt loam; moderate medium and coarse subangular blocky structure; firm; thin patchy dark brown (10YR 4/2) clay films; few pebbles; strongly acid; clear wavy boundary.

B23t—28 to 32 inches; yellowish brown (10YR 5/6) silt loam; moderate fine subangular blocky structure; friable; thin patchy dark yellowish brown (10YR 4/4) clay films; few pebbles; strongly acid; abrupt smooth boundary.

IIBt—32 to 52 inches; dark yellowish brown (10YR 4/4) stratified gravelly sandy loam, gravelly loamy sand, and gravelly loam; single grain; very friable, sticky; sand and gravel heavily coated and bridged with clay; 25 percent gravel; strongly acid; clear smooth boundary.

IIC—52 to 60 inches; dark yellowish brown (10YR 4/4) gravelly loamy sand; single grain; loose; 20 percent gravel; strongly acid.

Thickness of the solum ranges from 40 to 60 inches. Reaction in the solum ranges from medium to strongly acid if the effect of liming is not evident. The depth to carbonates is more than 60 inches.

The Ap horizon is dark grayish brown (10YR 4/2) or dark brown (10YR 4/3). The B1 horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 3 or 4. It is silt loam, and in some pedons it has greatly degraded. Part of the Bt horizon is in the loamy material, and part is in the lower sandy or gravelly material. The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. Clay films are on the peds in the upper part of the Bt horizon. Evidence that clay has moved to the lower part of that horizon is largely in the form of coats and bridges on sand grains and on coarse fragments. The upper part of the Bt horizon is silt loam or light silty clay loam. This material is less than 5 percent gravel. The lower part of the Bt horizon is gravelly sandy loam, gravelly clay loam, gravelly loam, or gravelly loamy sand, and the amount of gravel is 15 to 35 percent. A B3 horizon occurs some pedons. It is sandy loam or loamy sand and in some places is gravelly. The color of the B3 horizon is similar to that of the Bt horizon. Unlike the Bt horizon, the B3 horizon is not sticky. The C horizon is sandy loam, loamy sand, or sand, and in some places it is gravelly. The C horizon in most places is stratified.

Wooster series

The Wooster series consists of deep, well drained soils that formed in medium textured glacial till that has a low content of calcium carbonate. These soils are on hillsides on the till plains. They have a fragipan. Permeability is moderate above the fragipan and moderately slow in the fragipan. Slope ranges from 2 to 35 percent.

Wooster soils are commonly adjacent to Canfield and Ravenna soils. Canfield soils have low-chroma mottles within 10 inches of the top of the argillic horizon. Ravenna soils have low-chroma color immediately below the Ap horizon, and the Wooster soils do not.

Typical pedon of Wooster silt loam, 6 to 12 percent slopes, in Mohican Township, 450 feet north and 1,250 feet east of the SW corner of sec. 33, T. 21 N., R. 15 W.

Ap—0 to 7 inches; dark brown (10YR 4/3) silt loam; weak fine granular structure; friable; few fine pebbles; neutral (limed); abrupt smooth boundary.

B1—7 to 9 inches; yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure; friable; few fine pebbles; medium acid; clear wavy boundary.

B21t—9 to 15 inches; yellowish brown (10YR 5/6) loam; moderate medium subangular blocky structure; friable; thin very patchy yellowish brown (10YR 5/4)

clay films; 3 percent fine angular pebbles; medium acid; clear wavy boundary.

B22t—15 to 27 inches; yellowish brown (10YR 5/4) loam; weak coarse subangular blocky structure parting to moderate fine subangular blocky; friable; thin patchy brown (10YR 5/3) clay films; 3 percent pebbles; strongly acid; clear wavy boundary.

Bx1—27 to 36 inches; yellowish brown (10YR 5/4) loam; few medium faint grayish brown (10YR 5/2) mottles; moderate very coarse (4 to 5 inches) prismatic structure parting to weak thick platy; very firm; brittle; brown (10YR 5/3) and grayish brown (10YR 5/2) coatings on prisms and moderately thick patchy clay films; few Fe-Mn concretions; 7 percent sandstone fragments; strongly acid; clear wavy boundary.

Bx2—36 to 50 inches; dark yellowish brown (10YR 4/4) loam; common medium faint yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) mottles; moderate very coarse (4 to 6 inches) prismatic structure parting to weak very thick platy; very firm; very brittle; brown (10YR 5/3) coatings on prisms and grayish brown (10YR 5/2) coatings on plates; thin patchy dark yellowish brown (10YR 4/4) clay films; common medium distinct yellowish red (5YR 5/8) stains on some plates; 5 percent Fe-Mn concretions; about 8 percent shale and sandstone fragments 1/2 inch to 3 inches in diameter; few larger stones; medium acid; clear smooth boundary.

B3—50 to 60 inches; yellowish brown (10YR 5/4) loam; few fine faint grayish brown (10YR 5/2) mottles; moderate fine and medium subangular blocky structure; firm; few vertical cleavages; 8 percent coarse fragments; neutral.

Thickness of the solum ranges from 40 to 80 inches. The depth to carbonates is at least 60 inches. Reaction in and above the fragipan ranges from medium acid to very strongly acid. Reaction below the fragipan is slightly acid to mildly alkaline. Coarse fragments make up 5 to 20 percent of the soil mass. Weathered or broken sandstone is at a depth of more than 4 feet in some places but is not part of the solum.

The Ap horizon is dark brown (10YR 4/3) or dark grayish brown (10YR 4/2) if the soil is not eroded, and is brown (10YR 5/3) or yellowish brown (10YR 5/4) if erosion is severe. There is no B1 horizon in some pedons, especially those that are severely eroded. The B1 horizon typically is silt loam, but in some pedons it is loam. The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is loam or silt loam. The top of the Bx horizon is at a depth of 24 to 36 inches, and the Bx horizons are 12 to 24 inches thick. The material is brown or yellowish brown (hue of 10YR or 7.5YR). Some variegations in color and few or common low-chroma mottles are in the interior of peds in the Bx horizons of some pedons.

Structure of the Bx horizons is very coarse prismatic parting to weak blocky or platy. Dark-colored Fe-Mn concretions are few or common on faces of the prisms and few to many on the plates.

The fragipan is underlain by a B3 horizon, 6 to 15 inches thick, that shows some evidence of clay accumulation. The C horizon is loam or silt loam glacial till that has 15 to 25 percent clay.

Formation of the soils

This section discusses the factors of soil formation, relates them to the formation of soils in Ashland County, and explains the processes of soil formation.

Factors of soil formation

The 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. For the sake of convenience, these factors can be grouped into five general categories: parent material, plants and animals, climate, relief, and time. Because of differences among these factors, there are differences among the soils.

Parent material

Parent material is the raw material 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 Ashland 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 or in material that weathered from rock in place or in material that formed in 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 when the ice melted. Glacial till typically contains particles that range widely in size from fine clay to large stones. The smaller stones and pebbles have sharp angles, indicating that they have not been rounded by water action. The composition of the till depends on the nature of the area over which the ice passed before the ice reached the area where it deposited the till. Some boulders were carried for long distances, but the origin of most of the till material is in what is now Ohio. The till in the northern part of the county has large quantities of clay and lime. Bennington and Cardington soils, which formed in this till, have a silty clay loam or clay loam subsoil and have natural lime below a depth of about 3 feet. Farther south the till has less shale and limestone and more sandstone. Wooster

and Canfield soils, which formed in this till, have a loam subsoil and have no natural lime within a depth of 5 feet.

Soils that formed in glacial till are generally compact and have slow or moderately slow permeability. They generally make good foundation material 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 will 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.

Lacustrine deposits are not extensive in Ashland County. Soils such as Fitchville, Luray, and Glenford soils formed in deposits laid down in lakes that existed after the glaciers melted. The largest of these lakes was in the Jerome Fork Valley. Smaller lakes were scattered throughout the county.

Of greater extent in the county are soils that formed in outwash deposits. These deposits were laid down as melt water from the glaciers poured down the valleys between the rock hills. Because of the speed of the water, the smaller silt and clay particles were washed away, and the sand and gravel were left behind. Soils such as Chili and Bogart soils formed in these outwash deposits and are gravelly and porous.

The speed of water at many points did not remain constant during the period of deposition. Because of changes in the speed of water, thin layers of material were deposited in which the dominant particle size is different from that in the layers above and below. This type of depositing is called stratification, and the individual layers are called strata. For example, in many areas of Luray and Fitchville 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 as in Wheeling soils. The upper part of these soils formed in silty deposits laid down in still water; the lower part formed in sandy or gravelly deposits laid down by moving water.

Alluvium is soil material deposited by flowing streams. Texture is extremely variable because the speed and duration of floodwater vary considerably within small areas. Soil horizons are poorly expressed because the soil-forming process starts over again with each new deposit of material. 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, Shoals, and Holly soils formed in alluvium.

Weathered rock is an important soil material, especially in the southern part of the county. Most of the rock in Ashland County is classified as sandstone. The coarse-grained Massillon sandstone weathers to form a sand or loamy sand. An example is Schaffenaker soils. They are very droughty and have low productivity. A finer grained sandstone weathers to a deposit of silt loam; Lordstown soils formed in this type of deposit. In general, soils that formed in weathered sandstone are well drained and are low in clay content.

Carlisle soils and the upper part of Linwood soils formed in the residue of decomposed plant material. Plants died and fell into shallow lakes. Because wet conditions prevented oxidation and slowed decomposition, the residue accumulated. For example, Carlisle and Linwood soils have a very dark color because of their organic original material.

Plants and animals

The type of vegetation in which a soil developed has an influence on the color, structure, and organic matter content of the soil. Because grass is more effective than trees in returning organic matter to the soil, soils that developed under forest vegetation generally are lighter in color than those that developed under grass vegetation. Grass vegetation also promotes granular structure in the surface soil.

Most of the soils in Ashland County developed under hardwood forest vegetation. Soils such as Wooster, Alexandria, and Lordstown soils developed under a forest consisting mainly of hardwood species such as red oak, white oak, and black oak. Most of the poorly and very poorly drained soils such as Sebring and Condit soils formed under swamp forest vegetation.

The soil has many micro-organisms, such as bacteria and fungi, that aid in the breakdown of plant residues returned to the soil. 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 most 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 the organic matter into the soil. Leaf fall on a soil well populated with earthworms is usually incorporated into the soil by early the next spring. Parts of the leaf fall from 2 or 3 years back remain on the surface in some soils in which the earthworm population is low.

Man has accelerated erosion by cultivating and clearing the land. Cultivation also influences soil structure and tends to lower the organic matter content. Large areas of soils, such as Luray soils, have been drained artificially. Future soil development in such areas will take place under drier conditions than those under which the present soils developed. The change from the native forest

vegetation to a vegetation of cultivated crops can also be expected to influence future soil development. The addition of soil nutrients such as lime and fertilizer tends to change the chemical regime of the soil.

Climate

The climate in an area the size of Ashland County can be a factor in soil formation. But none of the soil differences in the county can be directly attributed to differences in climate.

Relief and landforms

Relief and original material control the natural drainage of the soils in Ashland 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 develop from 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 is generally deeper than 2 feet. Water passes through the soil material readily; Glenford soils are moderately well drained. The 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 accumulate in these areas, Luray soils are very poorly drained.

Relief varies considerably in Ashland County. In the northern part of the county, the most extensive landform is a nearly level to gently undulating till plain. Relief is stronger through the central part of the county where the glacier had less of a leveling effect on the rock hill. Relief is stronger in the southern part of the county because this part of the county was not glaciated. The proportion of well drained soils is considerably higher in the steeper southern part of the county than in the more level northern part of the county 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 Shoals soils, that formed in these deposits have less definite horizon development than older soils. But some of the oldest soils, such as Schaffenaker soils, have very weak horizon development because they are composed mainly of quartz, a very resistant mineral.

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 accumulation in Ashland County soils is the accumulation of organic matter, which is responsible for the dark color of the surface layer. When the original materials were laid down, the top layer was no darker than the rest. The return of organic residue from the plants that have grown on the soil has darkened the surface layer.

Loss of soil has also taken place. The original material of many Ashland County soils 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 Ashland County soils, clay has transferred from the A horizon to the B horizon. The A horizon, and especially the A2 horizon, is a zone of eluviation or loss. The B horizon is a zone of illuviation or gain. In soils like Cardington, Wooster, and Loudonville soils, the B horizon has more clay than the original material, and the A horizon has less. In some B horizons, there are thin films of clay in pores and on ped surfaces. This clay has been moved from the A to the B horizon.

Most of the transformations in the soils in Ashland County include clay minerals; therefore, they are not easily observed. Lordstown and Schaffenaker soils have masses that resemble rock fragments, but these fragments are easily crushed to soil material with the fingers.

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Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

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.

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	More than 9

Basal till. Compact glacial till deposited beneath the ice.

Base saturation. The degree to which material having base exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the exchange capacity.

Bedding planes. Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to frequent flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid. A soil having measurable amounts of calcium carbonate or magnesium carbonate.

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.

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.

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 coat, clay skin.

Coarse fragments. Mineral or rock particles up to 3 inches (2 millimeters to 7.5 centimeters) in diameter.

Coarse textured (light 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 bases of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures is difficult.

Complex, soil. A map unit of two or more kinds of soil occurring in such an intricate pattern that they cannot be shown separately on a soil map at the selected scale of mapping and publication.

Compressible. 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.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.
Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.
Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.
Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.
Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.
Soft.—When dry, breaks into powder or individual grains under very slight pressure.
Cemented.—Hard; little affected by moistening.

Contour stripcropping (or contour farming). 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 40 or 80 inches (1 or 2 meters).

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. Unstable walls of cuts made by earth-moving equipment. The soil sloughs easily.

Delta. An alluvial deposit, commonly triangular in shape, formed largely beneath water and deposited at the mouth of a river or stream.

Depth to rock. Bedrock at a depth that adversely affects 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 for 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, as for example in "hillpeats" and "climatic moors."

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 running 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 a bare surface.

Excess fines. Excess silt and clay. The soil does not provide a source of gravel or sand for construction purposes.

Favorable. Favorable soil features for the specified use.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

Fine textured (heavy 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.

Flooding. The temporary covering of soil with water from overflowing streams, runoff from adjacent slopes, and tides. Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; *November-May*, for example, means that flooding can occur during the period November through May. Water standing for short periods after rainfall or commonly covering swamps and marshes is not considered flooding.

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.

Forage. Plant material used as feed by domestic animals. Forage can be grazed or cut for hay.

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. Freezing and thawing of soil moisture. Frost action can damage 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 assorted and unassorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by melt water as it flows from glacial ice.

Glacial till (geology). Unassorted, 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 by water originating mainly from the melting of glacial ice. Many are interbedded or laminated.

Gleyed soil. A soil having one or more neutral gray horizons as a result of waterlogging and lack of oxygen. The term "gleyed" also designates gray horizons and horizons having yellow and gray mottles as a result of intermittent waterlogging.

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 from 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 (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, which is the upper limit of saturation.

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.

Habitat. The natural abode of a plant or animal; refers to the kind of environment in which a plant or animal normally lives, as opposed to the range or geographical distribution.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. The major horizons of mineral soil are as follows:

O horizon.—An organic layer, fresh and decaying plant residue, at the surface of a mineral soil.

A horizon.—The mineral horizon, formed or forming 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.

A2 horizon.—A mineral horizon, mainly a residual concentration of sand and silt high in content of resistant minerals as a result of the loss of silicate clay, iron, aluminum, or a combination of these.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or a combination of these; (2) by prismatic or blocky structure; (3) by redder or browner colors than those in the A horizon; or (4) by a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil lacks 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 from which the solum is presumed to have formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Hummocky. Refers to a landscape of hillocks, separated by low sags, having sharply rounded tops and steep sides. Hummocky relief resembles rolling or undulating relief, but the tops of ridges are narrower and the sides are shorter and less even.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered, but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing

crops or in orchards so that it flows in only one direction.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

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. Rock fragments 10 inches (25 centimeters) or more across. Large stones adversely affect the specified use.

Leaching. The removal of soluble material from soil or other material by percolating water.

Light textured soil. Sand and loamy sand.

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. Inadequate strength for supporting 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 greater than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous areas. Areas that have little or no natural soil, are too nearly inaccessible for orderly examination, or cannot otherwise be feasibly classified.

Moderately coarse textured (moderately light textured) soil. Sandy loam and fine sandy loam.

Moderately fine textured (moderately heavy 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. Types are terminal, lateral, end, 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 mixed with mineral soil material. The content of organic matter is more than 20 percent.

Munsell notation. A designation of color by degrees of the three single 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.

Nutrient, plant. Any element taken in by a plant, essential to its growth, and used by it in the production of food and tissue. Plant nutrients are nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, zinc, and perhaps other elements obtained from the soil; and carbon, hydrogen, and oxygen obtained largely from the air and water.

Outwash, glacial. Stratified sand and gravel produced by glaciers and carried, sorted, and deposited by water that originated mainly from the melting of glacial ice. Glacial outwash is commonly in valleys on landforms known as valley trains, outwash terraces, eskers, kame terraces, kames, outwash fans, or deltas.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Parent material. The great variety of unconsolidated organic and mineral material in which soil forms. Consolidated bedrock is not yet parent material by this concept.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture.

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. The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality that enables the soil to transmit water or air, measured as the number of inches per hour that water moves through the soil. Terms describing permeability are *very slow* (less than 0.06 inch), *slow* (0.06 to 0.20 inch), *moderately slow* (0.2 to 0.6 inch), *moderate* (0.6 to 2.0 inches), *moderately rapid* (2.0 to 6.0 inches), *rapid* (6.0 to 20 inches), and *very rapid* (more than 20 inches).

Phase, soil. A subdivision of a soil series or other unit in the soil classification system based on differences in the soil that affect its management. A soil series, for example, may be divided into phases on the basis of differences in slope, stoniness, thickness, or some other characteristic that affects management. These differences are too small to justify separate series.

pH value. (See Reaction, soil). A numerical designation of acidity and alkalinity in soil.

Piping. Moving water forms subsurface tunnels or pipelike cavities in 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 a semisolid to a plastic state.

Poorly graded. Refers to soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor outlets. Surface or subsurface drainage outlets difficult or expensive to install.

Productivity (soil). The capability of a soil for producing a specified plant or sequence of plants under a specified system of management. Productivity is measured in terms of output, or harvest, in relation to input.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. The degree 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. Soil scientists regard as soil only the part of the regolith that is modified by organisms and other soil-building forces. Most engineers describe the whole regolith, even to a great depth, as "soil."

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulates over disintegrating rock.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth. Shallow root zone. The soil is shallow over a layer that greatly restricts roots. See Root zone.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged in stream channels from a drainage area. The water that flows off the land surface without sinking in is called surface runoff; that which enters the ground 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. The rapid movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils, formed from a particular type of parent material, having horizons that, except for the texture of the A or surface horizon, are similar in all profile characteristics and in arrangement in the soil profile. Among these characteristics are color, texture, structure, reaction, consistence, and mineralogical and chemical composition.

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 runoff water.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slow intake. The slow movement of water into the soil.

Slow refill. The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones. Rock fragments 3 to 10 inches (7.5 to 25 centimeters) in diameter. Small stones adversely affect the specified use.

Soil. A natural, three-dimensional body at the earth's surface that 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: *very coarse sand* (2.0 millimeters to 1.0 millimeter); *coarse sand* (1.0 to 0.5 millimeter); *medium sand* (0.5 to 0.25 millimeter); *fine sand* (0.25 to 0.10 millimeter); *very fine sand* (0.10 to 0.05 millimeter); *silt* (0.05 to 0.002 millimeter); and *clay* (less than 0.002 millimeter).

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in mature 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 other plant and animal life characteristics of the soil 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.

Stratified. Arranged in strata, or layers. The term refers to geologic material. Layers in soils that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

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 that are separated from adjoining aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Surface soil. 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."

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 or management.

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 it can soak into the soil or flow slowly to a prepared outlet without harm. A terrace in a field is generally built so that the field can be farmed. A

terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea. A stream terrace is frequently called a second bottom, in contrast with a flood plain, and is seldom subject to overflow. A marine terrace, generally wide, was deposited by 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, silt loam, 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. 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 condition of the soil, especially the soil structure, as related to the growth of plants. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil (engineering). Presumably a fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to topdress roadbanks, lawns, and gardens.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Unstable fill. Risk of caving or sloughing in banks of fill material.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve. A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within 1 year; specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by melt water streams, in a glacial lake or other body of still water in front of a glacier.

Water table. The upper limit of the soil or underlying rock material that is wholly saturated with water.

Water table, apparent. A thick zone of free water in the soil. An apparent water table is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil.

Water table, artesian. A water table under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole.

Water table, perched. A water table standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

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 a soil or soil material consisting of particles well distributed over a wide range in size or diameter. Such a soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.