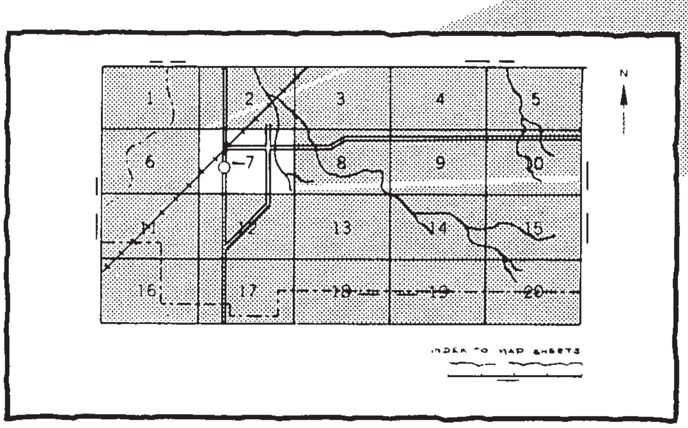
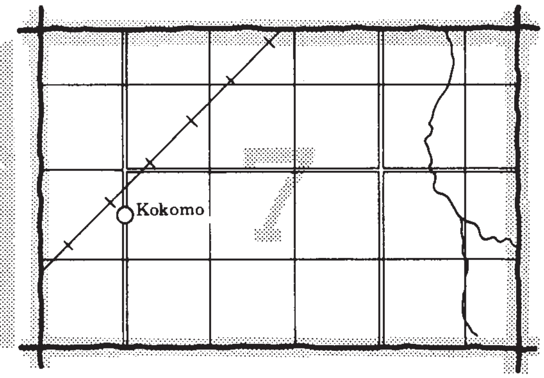
SOIL SURVEY
OF
FRANKLIN COUNTY, OHIO

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 USE

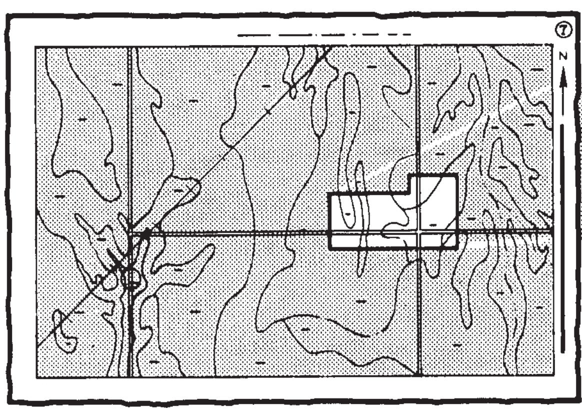
1. Locate your area of interest on the "Index to Map Sheets" (the last page of this publication).

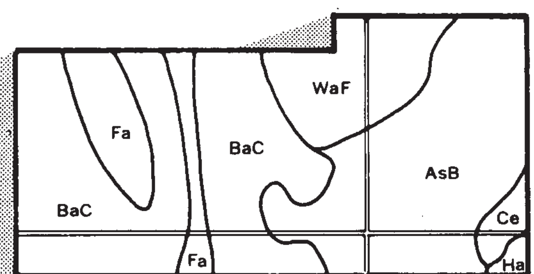




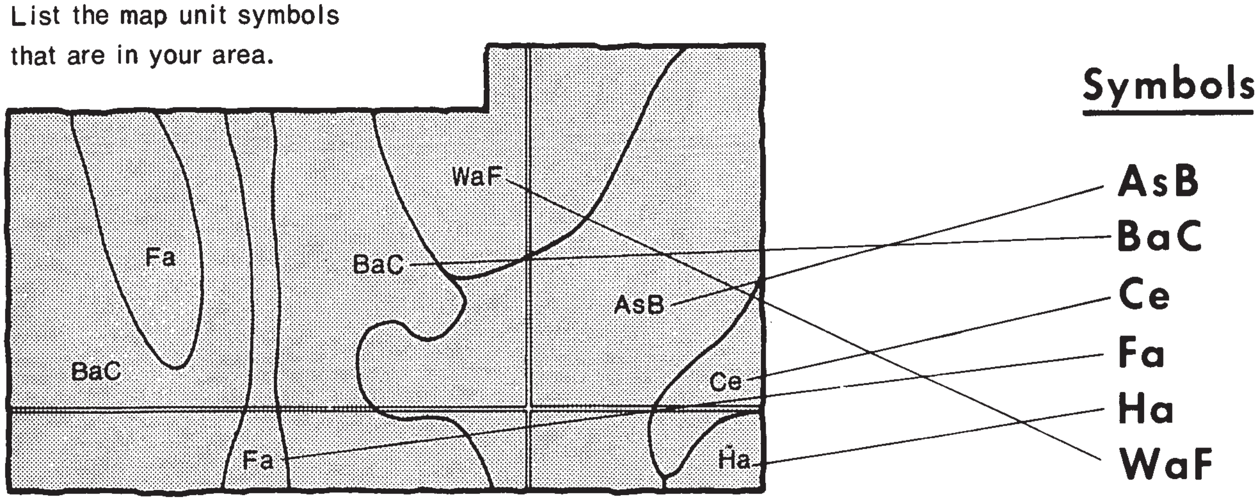
2. Note the number of the map sheet and turn to that sheet.

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



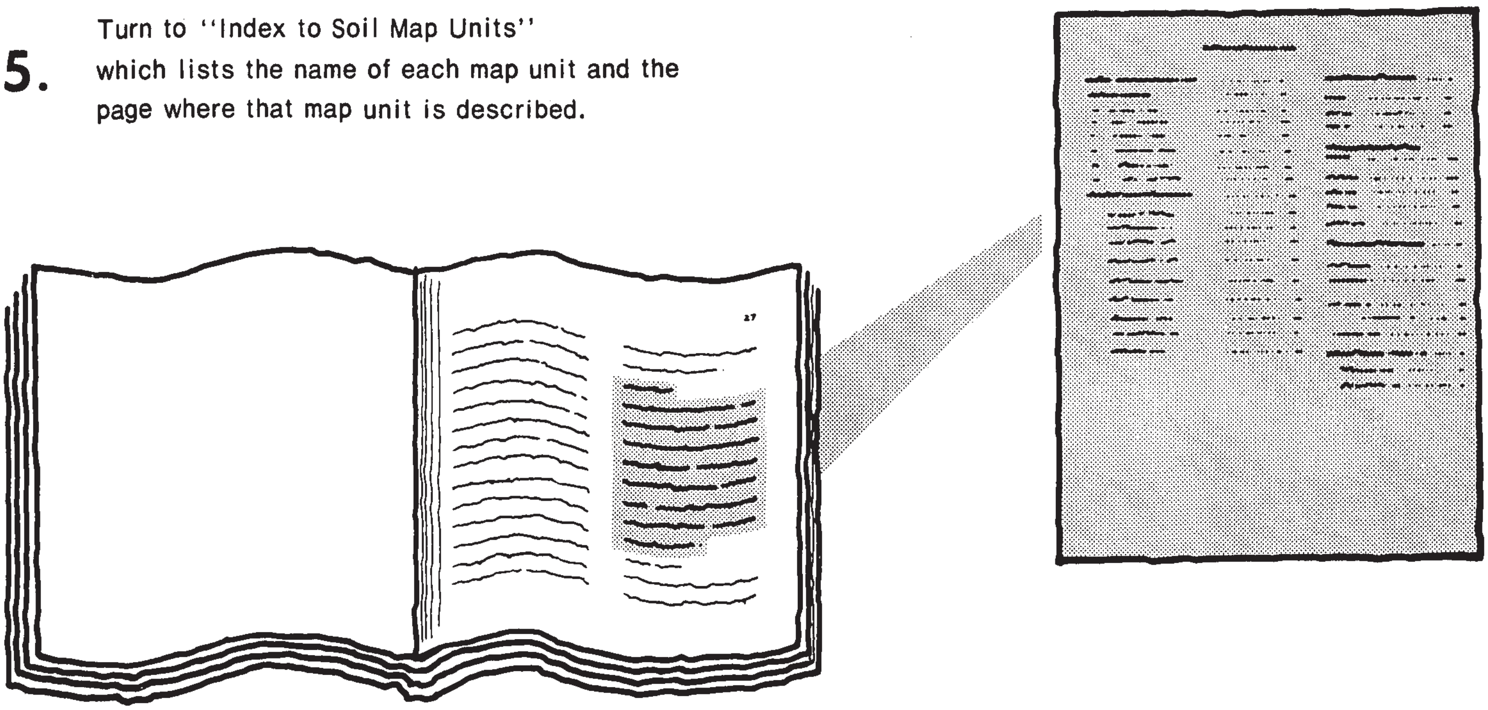


4. List the map unit symbols that are in your area.

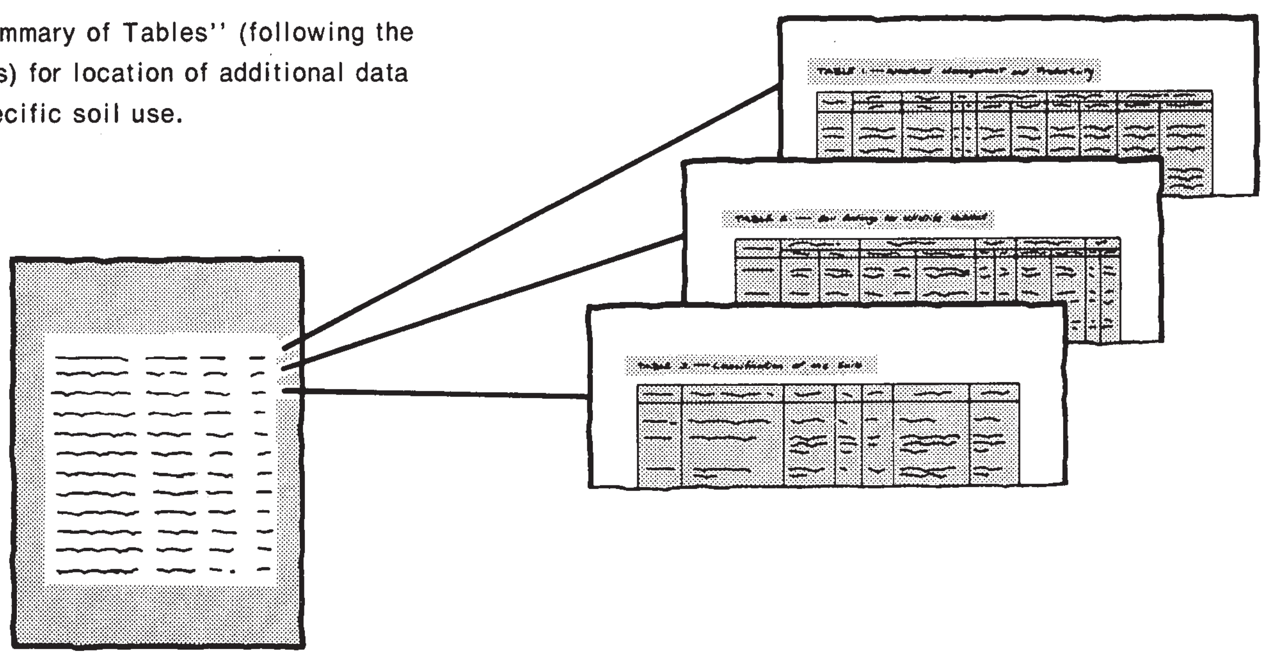


THIS SOIL SURVEY

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



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



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

This 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 completed in the period 1971-76. Soil names and descriptions were approved in 1977. Unless otherwise indicated, statements in the publication refer to conditions in the survey area in 1976. This survey was made cooperatively by the Soil Conservation Service; 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 Franklin Soil and Water Conservation District. The survey was materially aided by funds provided by the Franklin County 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.

Cover: Large areas of prime farmland in Franklin County are being shifted to urban, commercial, and residential uses. This field is Celina silt loam, 2 to 6 percent slopes.

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Issued February 1980

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Foreword

We introduce the Soil Survey of Franklin County. You will find, herein, basic information useful for any land planning program. Of prime importance are the predictions of soil behavior for selected land uses. Also highlighted are land use limitations and hazards that are inherent in the soil, improvements needed to overcome these limitations, and the impact that selected land use may have on the environment.

This soil survey has been prepared to fit the needs of 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 decisionmakers, engineers, developers, builders, and homebuyers can use it to plan use of land, select sites for construction, develop soil resources, and identify special practices thay may be needed to assure proper performance. Conservationists, recreationists, teachers, students, and specialists in wildlife management, waste disposal, and pollution control can use the soil survey to understand, protect, and enhance the environment.

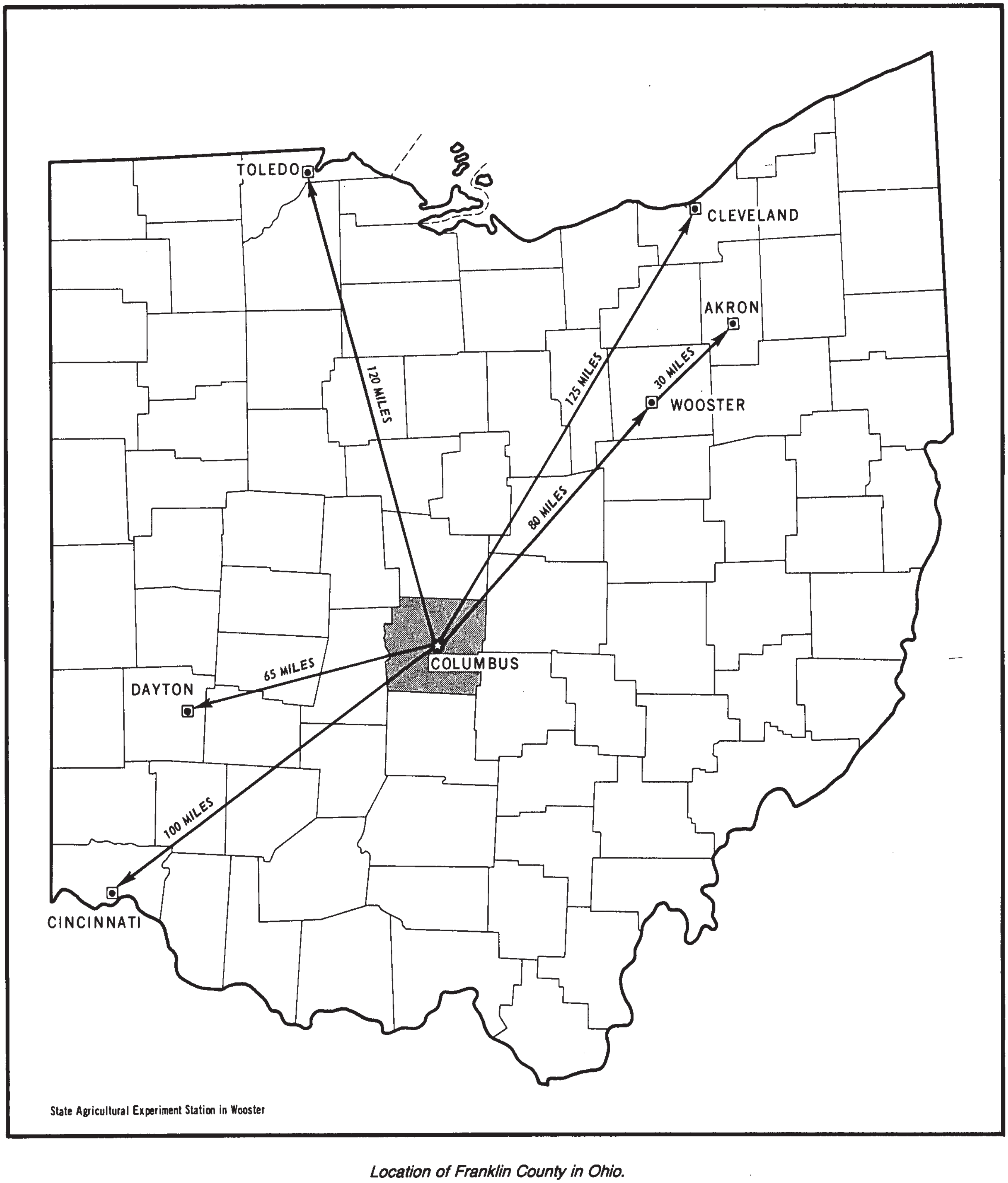
Many people assume that soils are all somewhat alike. They are unaware that great differences in soil properties can occur even within short distances. Soils may be seasonally wet or subject to flooding. They may be shallow to bedrock. They may be too unstable to be used as a foundation for buildings or roads. Very clayey or wet soils are poorly suited to 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. This publication also shows, on the general soil map, the location of broad groups of soils; the location of each kind of soil is shown on detailed soil maps at the back. It provides descriptions of each kind of soil in the survey area and gives much information about each soil for specific uses. Additional information or assistance in using this publication is available from the local office of the Soil Conservation Service or the Cooperative Extension Service.

We believe that this soil survey will help us have a better environment and a better life. The widespread use of this information can greatly assist us in the conservation, development, and productive use of our soil, water, and related resources.

Robert E. Quilliam

Robert E. Quilliam
State Conservationist
Soil Conservation Service



Location of Franklin County in Ohio.

SOIL SURVEY OF FRANKLIN COUNTY, OHIO

By Niles A. McLoda and Robert J. Parkinson, Soil Conservation Service

Fieldwork by N. A. McLoda, E. L. Milliron, L. D. Porter, R. J. Parkinson, R. J. Scherzinger, J. C. Gerken, and J. R. Vann, 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

FRANKLIN COUNTY is in the central part of Ohio. It covers about 538 square miles, or 344,064 acres. Columbus, the county seat and state capital, is near the center of the county. In 1970, the population of the county was 833,249 and the population of Columbus was 539,677.

About half of the land is used for farming. The major farming areas are in the western and southern parts of the county. Soybeans, corn, wheat, greenhouse-nursery, hogs, and vegetable sales account for most of the farm income.

The other half of the county is in the expanding metropolitan area of Columbus. This expansion is occurring mainly on prime farmland.

The county contains large areas of deep, nearly level and gently sloping soils that are well suited to farming. Poor natural drainage and moderately slow or slow permeability are the major limitations for agricultural and community development uses. Erosion is a major hazard on sloping to very steep soils.

General nature of the county

This section gives general information about the climate, physical features, history and development, agriculture, water supply, and transportation.

Climate

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

Table 1 gives data on temperature and precipitation for the survey area, as recorded at Columbus, Ohio, for the period 1951 to 1975. 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 31 degrees F, and the average daily minimum temperature is 23 degrees. The lowest temperature, which occurred at Columbus on January 17, 1977, is -19 degrees. In summer the average temperature is 72 degrees, and the average daily maximum temperature is 84 degrees. The highest recorded temperature, which occurred on July 14, 1974, is 104 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 (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

Of the total annual precipitation, 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 17 inches. The heaviest 1-day rainfall during the period of record was 4.79 inches at Columbus on January 21, 1959. Thunderstorms occur on about 40 days each year, and most occur in summer.

Average seasonal snowfall is 28 inches. The greatest snow depth at any one time was 13 inches. On the average, 12 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 35 in winter. The prevailing wind is from the south-southwest. Average windspeed is highest, 11 miles per hour, in March.

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

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

Physical features

Franklin County is within the glaciated till plain of Central Ohio (*7*). The principal stream is the Scioto River, which has several tributaries within the county, including the Olentangy River and Darby, Walnut, Blacklick, and Alum Creeks. All of these streams flow in a southerly direction toward the Ohio River. Elevation in the county ranges from about 1,130 feet above sea level in the northeast corner to about 670 feet above sea level along the southern border, where the Scioto River leaves the county.

The area that is now Franklin County was glaciated during at least two different glacial periods. Evidence of Illinoian glaciation has been found in the form of fine, well-sorted sands in buried valleys beneath the more recent Wisconsin age glacial till.

The Wisconsin glacier removed or buried most of the Illinoian deposits. Radiocarbon dating has shown that the Wisconsin ice sheet made two advances into the area. The first occurred about 50,000 years ago and left a layer of till when it melted. The second and last advance occurred about 16,000 years ago and left another layer of till over the first layer (*6*). As this last glacier melted and the ice front receded to the north, large amounts of sediment-laden melt water were discharged into the drainage system, depositing gravelly outwash material in the form of valley train deposits along the Scioto River and its tributaries. These deposits are above the present flood plain. The dominant soils formed in these deposits are Eldean, Ockley, Warsaw, and Wea soils.

The surface deposits in the county are mostly ground moraine—the nearly level to gently rolling landscape has an average of about 50 feet of till over bedrock. Within the ground moraine there are two distinct tills.

The northeastern third of the county consists of a medium-lime clay loam till that contains a high percentage of sandstone and coarse shale fragments from the underlying bedrock. The dominant soils formed here include Bennington, Cardington, and Pewamo soils.

The southwestern two-thirds of the ground moraine consists of a high-lime till that contains a high percentage of limestone and coarse dolomite fragments from the underlying limestone bedrock. Among the soils formed in this ground moraine are Kokomo, Celina, and Crosby soils.

End moraines are about 20 to 50 feet higher and are more rolling than the surrounding ground moraine. They formed while the ice front was stationary for a period of years and the glacier was melting. This had the effect of piling up till, much the same as that of the ground moraine, into broad ridges along the ice front.

Among the three end moraines in the county is the London Moraine in the southwest corner, within the high-lime till ground moraine. The soils of the London Moraine include Celina, Crosby, and Miamian soils. There is an extension of the Pickerington Moraine in the northeast part of the county located in the medium-lime till ground moraine. Among the soils of this moraine are Alexandria, Bennington, and Cardington soils. In the extreme northwest part of the county is the Powell Moraine which probably represents the last stationary ice front within the county. The till of this moraine is high in lime but of finer texture than the ground moraine to the south. The dominant soils formed in the glacial till in the Powell Moraine include Blount and Glynwood soils.

Kames and eskers, which are minor landscape features in the county, are hummocky hills or ridges above the surrounding till plain. They consist of a water-worked and stratified mixture of sand, gravel, and till. The largest area of kames is east of the Scioto River and about 6 miles south of Columbus. Eldean soils are common on kames and eskers.

The bedrock underlying the glacial deposits, and exposed in places by erosion or construction, is sedimentary. It has a north-south strike and a dip of 20 to 30 feet per mile to the east. Ages range from lower Devonian in the west to lower Mississippian in the east. Lithologies consist of dolomitic limestone, shale, and sandstone (*4*).

The oldest member of the Devonian system in the county is the Rasin River Formation, dolomitic limestone exposed in places in the valleys of Big and Little Darby Creeks on the west side of the county. The formations within the Devonian System to the east are younger and situated above the Rasin River. They include the Columbus and Delaware Limestones and the Ohio and Olentangy Shales. The limestone is along the Scioto River Valley and the shale is along the northern Olentangy River Valley.

The Mississippian System is exposed in the valleys of Big Walnut and Rocky Fork Creeks. The formations include, from oldest to youngest, Bedford Shale, Berea Sandstone, Sunbury Shale, and Cuyahoga Sandstone. These formations occur as alternating beds of shale and sandstone.

The consolidated bedrock has had very little effect on soil genesis within the county.

History and development

Settlers first took residence in the Franklin County area during 1797 on lands west of the Scioto River. This area was granted to Revolutionary War veterans from Virginia.

Franklin County was created by the Ohio State Legislature in 1803 and named for Benjamin Franklin, American statesman and inventor. Columbus was made capital of Ohio in 1812.

The Columbus Feeder Canal to the Ohio Canal System was completed in 1831, and the National Road entered Columbus in 1836. Railroad passenger service between Columbus and Xenia was first offered in 1850.

The approximate population of Franklin County was 10,300 in 1820; 63,524 in 1870; 283,951 in 1920; and 833,249 in 1970 (*5*).

Agriculture

Franklin County is an important agricultural county. About half of the total acreage is used for agriculture, but many areas of farmland are being converted to other uses. In 1976 there was a total of about 1,000 farms; these averaged slightly more than 150 acres in size (*14*). In the same year approximately 143,500 acres of crops were harvested.

Cash grain crops including soybeans and corn generate the most income, followed by the greenhouse and nursery industry. In January 1976 there were nearly 12,000 head of cattle and calves, about 2,100 milk cows, almost 10,000 hogs and pigs, and about 3,800 stock sheep in the county.

Water supply

Franklin County has an appreciable water supply, consisting of both surface water and ground water. The largest amount of water consumption is in Columbus and its surrounding suburbs, where the residential, commercial, and industrial needs for water are continually increasing. To meet this demand Columbus uses both surface water from reservoirs and ground water from municipal wells. In rural areas, water is obtained mainly from wells tapping underlying aquifers. The water supply should be established before construction on rural building lots.

Ground water quality and quantity are largely determined by the type of aquifer that supplies the water. Pumpage rates from 100 to 500 gallons per minute of relatively good water are common in all but the northeast part of the county. The high-yielding aquifers include Devonian and Silurian limestone in the western half of the county and permeable sand and gravel in the south-central and southeast parts of the county.

In central and southeastern Franklin County, the limestone aquifer underlies glacial drift and can be used to obtain quantities for industrial use, but the water is of relatively low quality. The wells in northeastern Franklin County that tap Mississippian sandstone have pumpage rates that usually vary from 5 to 25 gallons per minute. Aquifers of sand and gravel along the Scioto River south of Columbus and Walnut Creek can yield as much as 1,000 gallons per minute (*8*).

Transportation

Interstate highways 70 and 71 intersect in Franklin County. Several U.S. and state highways also pass through the county. These roads provide good access to all parts of the county.

Air transportation is available at Port Columbus International Airport and several smaller airports, including Don Scott Field, Bolton Field, and South Columbus Airport. The major part of Rickenbacher Air Force Base is located in the southeastern part of the county.

Railroads in the county include the Chessie System, the Penn Central, and the Norfolk and Western.

How this survey was made

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

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

The areas shown on a soil map are called map units. Most map units are made up of one kind of soil. Some are made up of two or more kinds. The map units in this survey area are described under "General soil map for broad land use planning" and "Soil maps for detailed planning."

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

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

General soil map for broad land use planning

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

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

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

Well drained, moderately well drained, and very poorly drained soils; on flood plains, terraces, and outwash plains

The two associations in this group cover about 11 percent of the county. The soils formed in alluvium, loess, and glacial outwash on relatively broad, flat flood plains, terraces, and outwash plains. Narrow strips of sloping and moderately steep soils are on slope breaks between terrace levels and between terraces and flood plains. A few hummocky areas are on outwash terraces. The soils are used mainly for farming and nurseries and for some residential, commercial, and industrial uses. Flooding, erosion, and seepage hazards and wetness are the major land use limitations.

1. Medway-Genesee-Sloan association

Deep; nearly level; well drained, moderately well drained, and very poorly drained soils formed in moderately coarse to moderately fine textured recent alluvium

This association is on flood plains and is bordered by sloping to very steep soils on slope breaks to terraces and uplands. It is characterized by narrow to relatively broad flat valley floors. The soils are subject to flooding.

This association covers about 6 percent of the county. It is about 20 percent Medway soils, 10 percent Genesee soils, 10 percent Sloan soils, and 60 percent soils of minor extent.

Medway soils commonly occur in broad areas on flood plains of the larger streams, narrow strips of Genesee soils are adjacent to the streams, and Sloan soils are in depressions. Genesee soils are dominant on the flood plains of smaller streams. Medway soils are moderately well drained, moderately permeable soils that are subject to occasional flooding. Genesee soils are well drained, moderately permeable soils that are subject to occasional flooding. Sloan soils are very poorly drained soils that are subject to frequent flooding. Permeability of the Sloan soils is moderate to moderately slow. All of these soils have a silt loam surface layer and high available water capacity.

Some of the minor soils in this association are Eel and Ross soils, which are intermingled with Medway and Genesee soils on the flood plains. Shoals soils are near slope breaks to terraces and uplands. Sleeth and Westland soils are on low terraces.

Most areas of this association are used for cash grain crops, nurseries, and sod farms. Some of the wetter areas are woodland or pasture. There are a few recreation areas and topsoil mining operations on this association that are important locally. The association has high potential for row crops and low potential for most building site development and sanitary facilities. Most areas have high potential as a source of topsoil and for woodland. The association has medium to low potential for recreation uses.

The flooding hazard and seasonal wetness are the main limitations. Flooding in winter and spring can severely damage winter grain crops. Row crops, however, can be planted and harvested during the nonflooding period in most years. Diking to control flooding is difficult. Sloan soils generally remain ponded after the floodwaters recede. The Medway and Genesee soils are suited to such recreation uses as picnic areas and paths and trails.

2. Eldean-Ockley-Warsaw association

Deep, nearly level to moderately steep, well drained soils formed in moderately coarse to moderately fine textured glacial outwash, alluvium, or loess

This association is characterized by broad, flat terrace benches with short, rather steep slope breaks between terrace levels (fig. 1). Some areas on outwash terraces are hummocky.

This association covers about 5 percent of the county. It is about 35 percent Eldean soils, 20 percent Ockley soils, 10 percent Warsaw soils, and 35 percent soils of minor extent.

Eldean soils commonly occur on kames, slope breaks, and slightly elevated droughty flats. Ockley and Warsaw soils are on broad flats and slightly undulating areas that are not as droughty. Eldean soils are nearly level to moderately steep, well drained soils. Permeability is moderate or moderately slow in the upper part and rapid or very rapid in the lower part. These Eldean soils have a low or moderate available water capacity. Ockley soils are nearly level to sloping, well drained soils that have moderate over very rapid permeability. The available water capacity is moderate or high. Warsaw soils are nearly level and gently sloping, well drained soils that have moderate permeability in the upper part and very rapid permeability in the lower part. The available water capacity is moderate. All these soils have a silt loam surface layer.

Minor soils in this association are Miamian and Hennepin soils on dissected areas of uplands. Sleeth and Westland soils are in flats and in depressions on stream terraces and outwash plains. Nearly level and gently sloping Wea soils are on stream terraces. Narrow strips of Medway soils on flood plains are also included.

Most areas of this association are used for cash grain or specialty crops. Some areas are used for residential, commercial, or industrial development, and a few areas are in orchards. The nearly level and gently sloping soils have high potential for cropland, building site development, and recreation uses. The moderately steep soils have low potential for these uses.

The nearly level and gently sloping soils are well suited to irrigation and to growing row crops year after year. Droughtiness of the Eldean and Warsaw soils and the erosion hazard on the gently sloping to moderately steep soils are the main concerns of management. All soils are well suited to planting and grazing early in spring. The nearly level to sloping soils are good sites for buildings; however, there is a possible pollution hazard to underground water supplies if the soils are used for sanitary facilities. Most areas are good sources of sand and gravel.

Well drained, moderately well drained, and somewhat poorly drained soils; on uplands

The three associations in this group cover about 12 percent of the county. The soils formed in glacial till and residuum from limestone bedrock on uplands. They are mainly deep to bedrock, but one association contains shallow and moderately deep soils. The nearly level to very steep soils are in areas dissected by waterways, ridges, valley side slopes, and knolls. The slope and limited depth to bedrock are the main limitations, and wetness is a secondary limitation in two of the associations.

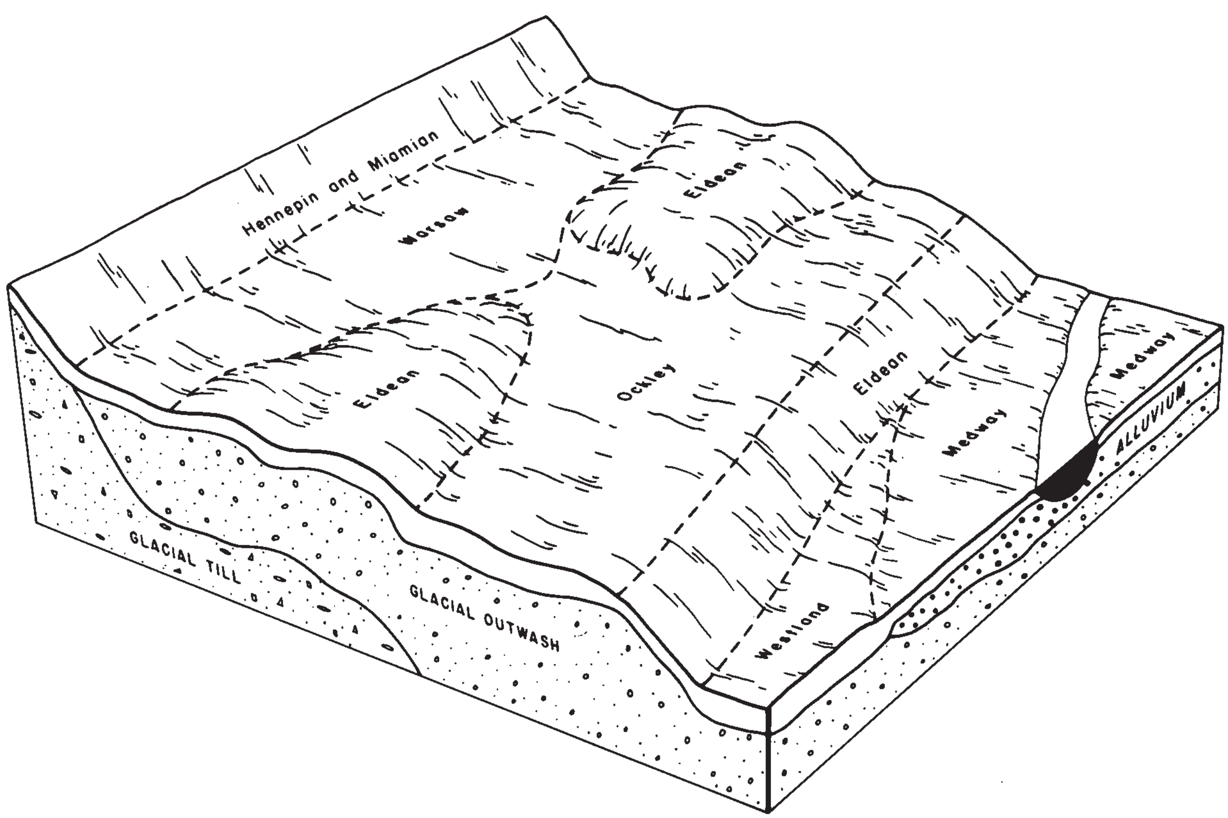


Figure 1.—Pattern of soils in the Eldean-Ockley-Warsaw association.

3. Miamian-Celina association

Deep, nearly level to very steep, well drained and moderately well drained soils formed in medium textured and moderately fine textured glacial till

This association is in areas dissected by drainageways, knolls, valley side slopes, and narrow to broad ridges. The soils are mainly gently sloping to steep. Some very steep soils are on valley walls, and some nearly level soils are on broad ridgetops.

This association covers about 7 percent of the county. It is about 40 percent Miamian soils, 25 percent Celina soils, and 35 percent soils of minor extent.

Miamian soils are on the higher knolls and the sides of ridges and valleys; Celina soils are on broad ridgetops and low knolls. Miamian soils are deep, gently sloping to very steep, well drained soils that have moderately slow permeability. They have a silt loam, silty clay loam, or clay loam surface layer. The available water capacity is moderate or low. Celina soils are deep, nearly level to sloping, moderately well drained soils that have moderately slow permeability. They have a silt loam surface layer and a moderate available water capacity. A seasonal high water table is between depths of 18 and 36 inches.

Minor soils in this association are Kokomo and Crosby soils on flats and along small waterways. Eldean soils are on terraces near the base of valley side slopes, and Hennepin soils are on the side slopes. Kendallville soils are adjacent to valley side slopes, and Medway soils are on flood plains of small streams.

Most areas of this association are woodland, pasture, or cropland. Some areas are used for homesites. The nearly level to sloping soils in this association have medium to high potential for most building site development and recreation uses. They have medium to low potential for sanitary facilities. The steep and very steep soils have low potential for all these uses.

The slope and the erosion hazard are the main limitations. Erosion on some of the Miamian soils has reduced the range of moisture content in which these soils have good workability. Some scenic building sites are on this association, but the moderately slow to slow permeability and the slope of the steeper soils severely limit the use of septic tank effluent fields. Plant cover should be maintained as much as possible during construction.

4. Milton-Ritchey-Miamian association

Deep, moderately deep, and shallow, gently sloping to moderately steep, well drained soils formed in medium textured and moderately fine textured glacial till and residuum from limestone

This association is characterized by gently sloping to moderately steep soils on limestone bedrock-controlled landforms along streams on the uplands. Bedrock outcroppings are common along the channel and on slope breaks.

This association covers about 2 percent of the county. It is about 25 percent Milton soils, 20 percent Ritchey soils, 15 percent Miamian soils, and 40 percent soils of minor extent.

The gently sloping and sloping Milton soils are between the Ritchey soils on slope breaks and dissected areas along streams and the Miamian soils on knolls and ridges. Milton soils are moderately deep, well drained soils that have moderate or moderately slow permeability. These Milton soils have a low available water capacity and a silt loam surface layer. Ritchey soils are shallow, well drained soils that have moderate permeability. The available water capacity is low. These Ritchey soils have a silt loam surface layer. Miamian soils are deep, well drained, gently sloping to moderately steep, moderately slowly permeable soils. The available water capacity is moderate to low. These Miamian soils have a silt loam, silty clay loam, or clay loam surface layer.

Minor soils in this association are Kokomo and Crosby soils on flats and slight depressions adjacent to the gently sloping Miamian soils on knolls and ridges. Celina, Glynwood, and Kendallville soils are on knolls and ridges.

Most areas of this association are in nonfarm uses, particularly residential and recreational. The steeper areas are used mainly for woodland, and the gently sloping and sloping soils are used for farming. The underlying limestone bedrock is quarried in a few areas. The gently sloping and sloping soils have high to medium potential for most farm uses, medium to low potential for building site development, and high to medium potential for most recreation uses. The moderately steep soils have low potential for farming, building site development, and sanitary facilities.

The slope, shallow and moderately deep depth to bedrock, and moderately slow permeability are the main limitations. Sanitary facilities are also limited by a possible pollution hazard of underground water supplies through fissures in the limestone bedrock. Blasting of bedrock is necessary for basements in areas of the Ritchey and Milton soils. Drought-tolerant trees and shrubs should be selected for planting on the Ritchey soils.

5. Cardington-Alexandria-Bennington association

Deep; gently sloping to steep; well drained, moderately well drained, and somewhat poorly drained soils formed in medium textured and moderately fine textured glacial till

This association is on undulating landforms with dissected areas along drainageways. The soils are mainly gently sloping to moderately steep.

This association covers about 3 percent of the county. It is about 50 percent Cardington soils, 25 percent Alexandria soils, 10 percent Bennington soils, and 15 percent soils of minor extent.

The Cardington soils commonly are on knolls and ridges between the Alexandria soils on hillsides and side slopes along drainageways and the Bennington soils on foot slopes and relatively broad ridgetops. Cardington soils are deep, moderately well drained, gently sloping and sloping soils that have moderately slow permeability. They have a seasonal high water table between depths of 24 and 36 inches. Alexandria soils are deep, well drained, gently sloping to moderately steep soils that have moderately slow permeability. Bennington soils are deep, somewhat poorly drained, gently sloping soils that have slow permeability. The Bennington soils have a seasonal high water table near the surface. All of these soils have a silt loam surface layer and a moderate available water capacity.

Minor soils in this association are Condit and Pewamo soils on flats and in depressional areas at the heads of small waterways. Narrow strips of Pewamo soils are also along waterways. Eldean soils are on terraces at the base of valley side slopes, and Eel and Sloan soils are on flood plains of small streams. Mitiwanga soils are on bedrock-controlled landscapes.

Most of this association is in residential, commercial, and light industrial uses. The current trend is toward increased urbanization. Many areas are in woodland or pasture. The gently sloping and sloping soils that are not in urban uses are used for cash grain and general farming. The gently sloping and sloping soils have medium to high potential for most farm uses. The gently sloping and sloping Alexandria soils have high potential, the Cardington soils medium potential, and the Bennington soils low potential for building site development. The Alexandria soils are also better suited to sanitary facilities than the Bennington soils. The moderately steep soils are suited to woodland and permanent pasture.

The slope, moderately slow or slow permeability, and the wetness of the Bennington and Cardington soils are the main limitations. Both surface and subsurface drains are commonly used to remove excess water from the Bennington soils. Bennington soils dry out slower in spring than the Cardington and Alexandria soils. Sanitary facilities should be connected to central sewers and treatment facilities, wherever possible.

Moderately well drained, somewhat poorly drained, and very poorly drained soils; on uplands

The five associations in this group cover about 77 percent of the county. The soils formed in glacial till. They are mainly nearly level, gently sloping, and sloping soils on knolls, ridges, and along drainageways. Farming is the main land use. Sizeable areas are also in residential, commercial, and industrial uses. Seasonal wetness, ponding, slow or moderately slow permeability, and low strength are the major limitations.

6. Bennington-Pewamo association

Deep, nearly level and gently sloping, somewhat poorly drained and very poorly drained soils formed in medium textured and moderately fine textured glacial till

The landscape of this association is characterized by relatively broad flats, depressions, low knolls, and ridges. When freshly tilled, the soils have a striking pattern of light and dark colors.

This association covers about 29 percent of the county. It is about 45 percent Bennington soils, 10 percent Pewamo soils, and 45 percent soils of minor extent.

Bennington soils commonly are on flats, low knolls, and ridges; Pewamo soils are in depressions and concave parts of the landscape. Bennington soils are deep, nearly level and gently sloping, somewhat poorly drained soils that have slow permeability. They have a silt loam surface layer and a moderate available water capacity. Pewamo soils are deep, nearly level, very poorly drained soils that have moderately slow permeability. They have a silty clay loam surface layer and a high available water capacity. Both of these soils have a seasonal high water table near the surface. The Pewamo soils are subject to ponding.

Minor soils in this association are Alexandria and Cardington soils on side slopes along waterways and on knolls and ridges. Condit soils are in depressions, and Mitiwanga soils are on bedrock-controlled uplands. Eel and Sloan soils are on flood plains along small streams.

This association is used for farm and nonfarm uses. Most of the urban part is residential; some is commercial or used for light industry. Farmed areas are mainly used for cash grain crops and sod farms. Some of the steeper areas are in woodland or pasture. In many areas the land use is being shifted from agricultural to urban.

The soils have high potential for farming and low potential for most building site development and sanitary facilities. They have low to medium potential for most recreation uses.

The seasonal wetness, ponding, slow or moderately slow permeability, and low strength are the main limitations. Surface and subsurface drains are commonly used to improve drainage. Maintaining tilth on all these soils and controlling erosion on the gently sloping Bennington soils are also major concerns for farming. Sanitary facilities should be connected to central sewers and treatment facilities. The Bennington soils are more suitable for building sites than the Pewamo soils.

7. Crosby-Kokomo-Celina association

Deep; nearly level to sloping; moderately well drained, somewhat poorly drained, and very poorly drained soils formed in medium textured and moderately fine textured glacial till

This association is on broad flats with depressions, knolls, and ridges. When freshly tilled, the soils have a striking pattern of light and dark colors.

This association covers about 12 percent of the county. It is about 35 percent Crosby soils, 20 percent Kokomo soils, 15 percent Celina soils, and 30 percent soils of minor extent.

The Crosby soils are commonly on flats and low knolls, and Kokomo soils are in depressions. Celina soils are on knolls, ridges, and side slopes along waterways. Crosby soils are deep, nearly level and gently sloping, somewhat poorly drained soils that have slow permeability. They have a silt loam surface layer. A seasonal high water table is between depths of 12 to 36 inches. The available water capacity is moderate. Kokomo soils are deep, nearly level, very poorly drained soils that have moderately slow permeability. They have a silty clay loam surface layer and a high available water capacity. These Kokomo soils have a seasonal high water table near the surface and are subject to ponding. Celina soils are deep, nearly level to sloping, moderately well drained soils that have moderately slow permeability. They have a silt loam surface layer and moderate available water capacity. A seasonal high water table is between depths of 18 and 36 inches.

Minor soils in this association are Kendallville and Miamian soils on knolls and ridges. Eel, Shoals, Genesee, and Sloan soils are on flood plains.

Most areas of this association are used for farming. Farming operations include cash grain, dairy, livestock, and some specialty crops. About 25 percent of the association is urban. Some of the wetter areas are woodlots. The nearly level and gently sloping soils have high potential for farming. The Crosby and Kokomo soils have low potential for building site development and sanitary facilities. Celina soils have medium potential for these uses. The Crosby and Celina soils have medium potential for recreation uses, and the Kokomo soils have low potential for recreational uses.

Seasonal wetness, slow or moderately slow permeability, and low strength are the major land use limitations. Surface and subsurface drains are commonly used to improve drainage. The Celina soils are more suitable for building sites than the Kokomo or Crosby soils. Sanitary facilities should be connected to central sewers and treatment facilities, wherever possible.

8. Crosby-Kokomo association

Deep, nearly level and gently sloping, somewhat poorly drained and very poorly drained soils formed mainly in medium textured and moderately fine textured glacial till

This association is on broad flats with slight rises, low knolls, and depressions. The soils are mainly nearly level and gently sloping with sloping areas along some drainageways. When freshly tilled, the soils have a striking pattern of light and dark colors.

This association covers about 24 percent of the county. It is about 60 percent Crosby soils, 20 percent Kokomo soils, and 20 percent soils of minor extent.

Crosby soils are on the slightly higher, convex parts of the landscape, and Kokomo soils are in lower positions. Crosby soils are deep, nearly level and gently sloping, somewhat poorly drained soils that have slow permeability. The available water capacity is moderate. These Crosby soils have a silt loam surface layer. A seasonal high water table is between depths of 12 and 36 inches. Kokomo soils are deep, nearly level, very poorly drained soils that have moderately slow permeability. They have a silty clay loam surface layer and a high available water capacity. These Kokomo soils have a seasonal high water table near the surface and are subject to ponding.

Minor soils in this association are Celina and Lewisburg soils on low knolls and ridges. Miamian soils are on side slopes along waterways.

Most areas of this association are used for cash grain crops. Some of the steeper areas are woodland or pasture. Many areas are being shifted to residential, commercial, and industrial uses. Most areas have high potential for farming and low potential for most building site development and sanitary facilities. The potential for most recreation uses is medium to low.

The seasonal wetness, slow or moderately slow permeability, and ponding are main limitations to use. Surface and subsurface drains are commonly used to improve drainage. Maintaining tilth on all these soils and controlling erosion on the gently sloping Crosby soils are also major concerns for farming. Sanitary facilities should be connected to central sewers and treatment facilities, wherever possible. Low strength is a limitation for building site development. The Crosby soils are more suitable for building sites than the Kokomo soils.

9. Kokomo-Crosby-Lewisburg association

Deep; nearly level and gently sloping; moderately well drained, somewhat poorly drained, and very poorly drained soils formed in medium textured and moderately fine textured glacial till

This association is characterized by broad flats with depressions, low knolls, and some discontinuous ridges (fig. 2). When freshly tilled, the soils have a striking pattern of dark and light colors.

This association covers about 10 percent of the county. It is about 35 percent Kokomo soils, 30 percent Crosby soils, 20 percent Lewisburg soils, and 15 percent soils of minor extent.

Crosby soils are on flats and slight rises between Kokomo soils in the lowest positions and Lewisburg soils on low knolls and ridges. Kokomo soils are nearly level, very poorly drained soils that have moderately slow permeability. They have a silty clay loam surface layer and a high available water capacity. These Kokomo soils have a seasonal high water table near the surface and are subject to ponding. Crosby soils are nearly level and

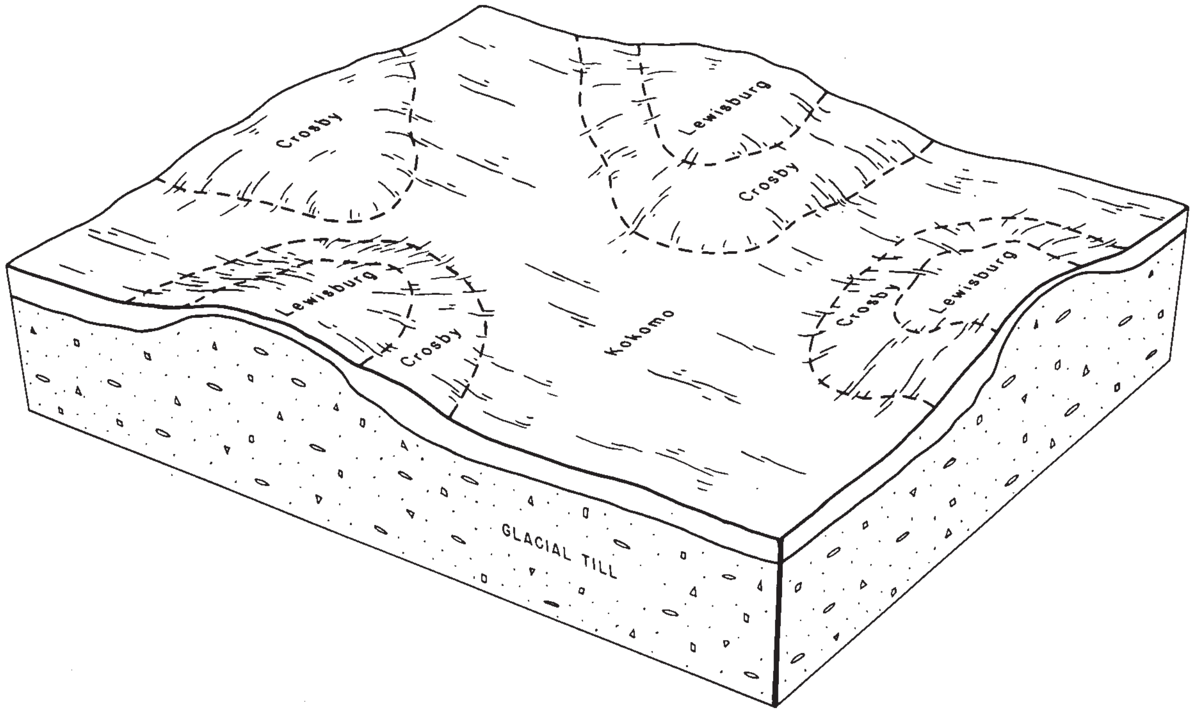


Figure 2.—Pattern of soils in the Kokomo-Crosby-Lewisburg association.

gently sloping, somewhat poorly drained soils that have slow permeability. The available water capacity is moderate. These Crosby soils have a silt loam surface layer. A seasonal high water table is between depths of 12 and 36 inches. Lewisburg soils are gently sloping, moderately well drained soils that have a silt loam surface layer. Permeability is moderate or moderately slow in the upper part and slow in the lower part. These Lewisburg soils have a moderate available water capacity. A seasonal high water table is between depths of 24 and 48 inches.

Some of the minor soils in this association are Celina soils on side slopes along waterways, low knolls, and ridges. Montgomery soils are in kettle holes and on flats and depressional areas in slack water basins.

Most areas of this association are used for cash grain crops. Some areas are in small woodlots or pasture. Many areas are being shifted to residential, commercial, and industrial uses. These soils have high potential for farming. The Kokomo and Crosby soils have low potential for building site development and sanitary facilities, and the Lewisburg soils have medium potential for these uses. The Crosby and Lewisburg soils have medium potential for recreation uses, and the Kokomo soils have low potential for these uses.

Soil wetness, slow or moderately slow permeability, and erosion hazard on the Lewisburg and Crosby soils are the main limitations. Surface and subsurface drains are commonly used to improve drainage. Maintaining tilth is also a management concern. The Lewisburg soils are more suitable for building sites than the Kokomo and Crosby soils.

10. Glynwood-Blount association

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

This association consists of nearly level to sloping soils on the Powell moraine. It is undulating with knolls and ridges, some of which are dissected along waterways.

This association covers about 2 percent of the county. It is about 30 percent Glynwood soils, 25 percent Blount soils, and 45 percent soils of minor extent.

Commonly, Glynwood soils are on the knolls and ridges, and Blount soils are on the less sloping parts of the landscape. Glynwood soils are deep, gently sloping and sloping, moderately well drained soils that have slow permeability. They have a silt loam surface layer and a moderate available water capacity. A seasonal high water table is at a depth between 18 and 36 inches. Blount soils are deep, somewhat poorly drained, nearly level and gently sloping soils that have slow permeability. They have a silt loam surface layer and a moderate available water capacity. A seasonal high water table is between depths of 12 and 36 inches.

Minor soils in this association are Milton soils in narrow bands along well-defined waterways and Pewamo soils in depressions and along small waterways.

Most areas of this association are used for cash grain crops. Some areas have been developed for residential use, and some of the steeper areas are wooded or in pasture. The nearly level and gently sloping soils have high potential for farming. The Glynwood soils have medium potential for most building site development and sanitary facilities, and the Blount soils have low potential for these uses. The soils have medium potential for most recreation uses.

The slow permeability, wetness, and low strength limits the use of these soils for building site development and sanitary facilities. Wetness of the Blount soils delays planting and limits the choice of crops. The Glynwood soils are more suitable for building sites than the Blount soils. Erosion is a hazard on unprotected areas.

Soil maps for detailed planning

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

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

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil, a brief description of the soil profile, and a listing of the principal hazards and limitations to be considered in planning management.

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

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

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

A *soil complex* consists of two or more soils (or one soil and a miscellaneous area) in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Lewisburg-Crosby complex, 2 to 6 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 similar interpretations can be made for use and management. The pattern and proportion of the soils in a mapped area are not uniform. An area can be made up of only one of the major soils, or it can be made up of all of them. Hennepin and Miamian loams, 18 to 25 percent slopes, eroded is an undifferentiated group in this survey area.

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

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

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

Soil descriptions

AdB—Alexandria silt loam, 2 to 6 percent slopes. This gently sloping, deep, well drained soil is on convex ridgetops, on side slopes above steeper areas, and along well-defined waterways in the uplands. Some areas are on long hillsides. Most areas are 4 to 20 acres in size.

Typically, the surface layer is brown, friable silt loam about 8 inches thick. The subsoil, which extends to a depth of about 39 inches, is yellowish brown, firm silty clay loam and dark yellowish brown, very firm clay and clay loam. The substratum to a depth of about 70 inches is glacial till of brown, firm clay loam and loam.

Included with this soil in mapping are small areas of very poorly drained Pewamo soils in depressions and along waterways, and narrow strips of somewhat poorly drained Bennington soils on the lower parts of side slopes and in more nearly flat areas. These inclusions make up 10 to 15 percent of most areas.

Permeability is moderately slow. The available water capacity, organic matter content, potential frost action, and shrink-swell potential in the subsoil are moderate. Runoff from cultivated areas is medium. Reaction ranges from very strongly acid in the upper part of the subsoil to neutral in the lower part. This soil has medium natural fertility and good tilth. The surface layer can be worked through a fairly wide range of moisture content. Roots are restricted below a depth of 34 to 44 inches by compact calcareous glacial till.

Most areas of this soil are farmed. This soil has high potential for crops, hay, and pasture and for building site development and recreation uses. It has medium to high potential for most sanitary facilities.

This soil is suited to row crops and small grains. Erosion is the main hazard for row crops. The surface layer crusts after hard rains. Minimizing tillage, planting cover crops, and using grassed waterways reduce soil loss. Incorporating crop residue or other organic matter into the surface layer helps improve tilth and fertility and increase water infiltration. These practices also reduce crusting and improve soil-seed contact.

The use of this soil for pasture or hay reduces erosion. Surface compaction, poor tilth, reduced growth, and increased runoff result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing, along with weed control, can help keep the pasture and soil in good condition.

This soil is well suited to trees and shrubs, and a few small areas are in native hardwoods. Seedlings grow well if competing vegetation is controlled or removed by cutting, spraying, girdling, or mowing.

This soil is suited as a site for buildings and for sanitary facilities if proper design and installation procedures are used. Runoff and erosion increase during construction, but can be minimized by maintaining plant cover wherever possible. Local roads can be improved by using a suitable base material. The moderately slow permeability limits the performance of septic tanks, but this problem can be partially overcome by increasing the size of the absorption field. Sanitary facilities should be connected to central sewers and treatment facilities, wherever possible.

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

AdC2—Alexandria silt loam, 6 to 12 percent slopes, eroded. This sloping, deep, well drained soil is on convex ridgetops, on side slopes above steeper areas, and along well-defined waterways in the uplands. In some places this soil is on short slopes in oval areas on hillsides. Erosion has removed part of the original surface layer, and tillage has mixed subsoil material with a higher clay content and more coarse fragments into the present surface layer. Most areas of this soil are 4 to 10 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 8 inches thick. The subsoil, which extends to a depth of about 42 inches, is brown and dark yellowish brown, firm and very firm silty clay loam and clay loam with mottles below about 25 inches. The substratum to a depth of about 70 inches is glacial till of brown, firm clay loam and loam that is mottled in the upper part. Narrow strips of 12 to 18 percent slope are along some drainageways.

Included with this soil in mapping are narrow bands of somewhat poorly drained Bennington and very poorly drained Pewamo soils along drainageways. These inclusions make up about 15 percent of most areas.

Permeability is moderately slow. The available water capacity is moderate even though it has been reduced by erosion. The organic matter content is moderately low. Potential frost action and shrink-swell potential in the subsoil are moderate. Runoff from cultivated areas is rapid. Reaction ranges from very strongly acid in the upper part of the subsoil to neutral in the lower part. This soil has medium natural fertility and good tilth. Roots are restricted below a depth of 30 to 41 inches by compact calcareous glacial till.

Many areas of this soil are farmed, and some are wooded. This soil has medium potential for crops and high potential for hay, pasture, and trees. It has medium potential for most building site development, recreation uses, and sanitary facilities.

This soil is suited to row crops and small grains. The erosion hazard is severe in cultivated areas. Including grasses and legumes in the cropping systems helps to control erosion. The surface layer crusts after hard rains. If plowed when wet and sticky, the soil is cloddy. Minimizing tillage, planting cover crops, and using grassed waterways reduce runoff and soil loss. Incorporating crop residue or other organic matter into the surface layer improves tilth and fertility and increases water infiltration. These practices also reduce crusting and improve soil-seed contact.

This soil is suited to pasture and hay. Surface compaction, poor tilth, reduced growth, and increased runoff result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing, along with weed control, can help keep the pasture and soil in good condition.

This soil is well suited to trees and shrubs; some areas are in native hardwoods. Seedlings grow well if competing vegetation is controlled or removed by cutting, spraying, girdling, or mowing.

This soil is suited to buildings and sanitary facilities if proper design and installation procedures are used. Slope, moderately slow permeability, low strength, and moderate shrink-swell potential are the main limitations.

Runoff and erosion increase during construction, but can be minimized by maintaining plant cover wherever possible. Septic tank systems can be improved by increasing the size of the absorption field. Leach lines should be installed on the contour. Sanitary facilities should be connected to central sewers and treatment facilities, wherever possible. Local roads can be improved by using a suitable base material.

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

AdD2—Alexandria silt loam, 12 to 18 percent slopes, eroded. This moderately steep, deep, well drained soil is on convex ridgetops and hillsides in the uplands. Erosion has removed part of the original surface layer, and tillage has mixed subsoil material with a higher clay content and more coarse fragments into the present surface layer. Most areas of this soil are 4 to 25 acres in size.

Typically, the surface layer is brown, friable silt loam about 7 inches thick. The subsoil, which extends to a depth of about 41 inches, is dark yellowish brown and yellowish brown, firm silty clay loam and clay loam. The substratum to a depth of about 70 inches is glacial till of dark yellowish brown, firm clay loam. Some high areas have a slope of 9 to 12 percent; some areas on the lower part of slopes have a slope of 18 to 22 percent.

Included with this soil in mapping along drainageways are narrow strips of moderately deep, somewhat poorly drained Mitiwanga soils and outcroppings of shale bedrock. These inclusions make up about 15 percent of most areas.

Permeability is moderately slow. The available water capacity of this soil is moderate even though it has been reduced by erosion. The organic matter content is moderately low. Potential frost action and shrink-swell potential in the subsoil are moderate. Runoff from cultivated areas is very rapid. Reaction ranges from very strongly acid in the upper part of the subsoil to neutral in the lower part. This soil has medium natural fertility and good tilth. Roots are restricted below a depth of 30 to 41 inches by compact calcareous glacial till.

Most areas of this soil are in permanent pasture and woodland. This soil has low potential for crops and medium to high potential for pasture. It has low potential for most building site development, sanitary facilities, and recreation uses.

The slope and severe hazard of erosion limit the use of this soil for crops. Row crops can be grown occasionally if erosion is controlled and good management is applied. If plowed when sticky and wet, the soil is cloddy. It puddles and crusts easily. Minimizing tillage, planting cover crops, and using grassed waterways reduce runoff and soil loss. Incorporating crop residue or other organic matter into the surface layer improves tilth and fertility and increases water infiltration. These practices also reduce crusting and improve soil-seed contact.

The use of this soil for pasture or hay reduces erosion. Surface compaction, poor tilth, and increased runoff result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing, along with weed control, can help keep the pasture and soil in good condition.

This soil is well suited to trees and shrubs; many areas are in native hardwoods. The slope limits the use of equipment somewhat. Seedlings grow well if competing vegetation is controlled or removed by cutting, spraying, girdling, or mowing. Logging roads and skid trails should be protected against erosion and established across the slope, where possible. This soil has good potential for woodland wildlife habitat.

This soil is severely limited for building site development, sanitary facilities, and recreation uses by the slope, moderately slow permeability, and low strength. These limitations can be partially or fully overcome by specially designed facilities. Sanitary facilities should be connected to central sewers and treatment facilities, wherever possible. Plant cover should be maintained on the site as much as possible during construction to reduce the erosion hazard. Trails in recreation areas should be laid out on the contour and protected against erosion.

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

AdE2—Alexandria silt loam, 18 to 25 percent slopes, eroded. This steep, deep, well drained soil is on convex ridgetops and side slopes along well-defined waterways in the uplands. Some areas are on short slope breaks below or above less sloping areas. Erosion has increased the percentage of coarse fragments in the surface layer. Most areas of this soil are 4 to 15 acres in size.

Typically, the surface layer is grayish brown, friable silt loam about 6 inches thick. The subsoil, which extends to a depth of about 32 inches, is dark yellowish brown and yellowish brown, firm silty clay loam and clay loam. The substratum to a depth of about 70 inches is glacial till of dark yellowish brown, firm clay loam. Some areas have a slope of 15 to 18 or 25 to 35 percent.

Included with this soil in mapping along drainageways are narrow strips of moderately deep, somewhat poorly drained Mitiwanga soils and outcroppings of shale bedrock. Small areas of moderately well drained Cardington soils, 8 to 15 percent slopes, are also included. These inclusions make up about 15 percent of most areas.

Permeability is moderately slow. The available water capacity is moderate even though it has been reduced by erosion. The organic matter content is low. Potential frost action and shrink-swell potential in the subsoil are moderate. Runoff is very rapid. Reaction ranges from very strongly acid in the upper part of the subsoil to neutral in the lower part. This soil has medium natural fertility and good tilth. Roots are restricted below a depth of 24 to 35 inches by calcareous glacial till.

Most areas of this soil are wooded; a few areas are in permanent pasture. This soil has low potential for crops and medium potential for pasture. It has low potential for most building site development, sanitary facilities, and recreation uses. It has high potential for woodland and habitat for wildlife.

This soil is too steep for cultivated crops, but can be used for permanent pasture of grasses and legumes. Surface compaction, poor tilth, and increased runoff result from overgrazing or grazing when the soil is soft and sticky because of wetness. Erosion is a severe hazard when adequate plant cover is not maintained or when pastures are reseeded. No-till seeding methods can reduce the risk of erosion. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing, along with weed control, can help keep the pasture and soil in good condition.

This soil is suited to trees and shrubs; most areas are in native hardwoods. The slope limits the use of equipment. Seedlings grow well if competing vegetation is controlled or removed by cutting, spraying, or girdling. Logging roads and skid trails should be constructed on the contour and protected against erosion.

This soil is severely limited for building site development, sanitary facilities, and most recreation uses because of the slope, moderately slow permeability, and low strength. Plant cover should be maintained on the site as much as possible during construction. Trails in recreation areas should be laid out on the contour and protected against erosion, wherever possible.

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

Ag—Algiers silt loam. This nearly level, deep, somewhat poorly drained soil is on flood plains and in slight depressions on terraces and uplands. It is frequently flooded from streambank overflow or runoff from higher adjacent soils. Slope is 0 to 2 percent. Most areas are 10 to 40 acres in size.

Typically, this soil has three layers of alluvium with a combined thickness of about 23 inches over a very poorly drained buried soil. These layers are brown, friable silt loam and loam. The buried soil has a very dark gray, mottled, friable silty clay loam surface layer about 4 inches thick and a black, friable silty clay loam subsurface layer about 4 inches thick. The subsoil of the buried soil is about 23 inches thick. The upper part of the subsoil is very dark brown and dark grayish brown, mottled, firm silty clay loam; the lower part is gray and grayish brown, mottled, firm clay loam. The substratum to a depth of about 70 inches is gray, mottled, friable loam.

Included with this soil in mapping are areas of very poorly drained Sloan soils in depressions and moderately well drained Eel soils on slight rises on flood plains. Also included are very poorly drained Westland soils in depressions on terraces and very poorly drained Kokomo soils at the head of small waterways in the uplands. These inclusions make up about 15 percent of most areas.

Permeability is moderate. The available water capacity is high. This soil has a moderate organic matter content and medium natural fertility. The potential frost action is high. Runoff is very slow. The buried soil is neutral or mildly alkaline throughout. Tilth is good. This soil has a seasonal high water table near the surface in winter, spring, and other extended wet periods. The root zone is deep.

Most areas of this soil are farmed. This soil has high potential for crops and woodland and low potential for most building site development, sanitary facilities, and recreation uses.

Flooding and wetness are the main limitations for farming. They delay planting and limit the choice of crops. Drained areas are suited to crops. Open ditches and subsurface drains are commonly used to lower the water table. Minimizing tillage, incorporating crop residue, and planting cover crops improve tilth and reduce crusting. Undrained areas can be used for hay and pasture, but maintaining tilth and desirable forage stands is difficult unless the soil is drained and grazing is controlled.

Undrained areas of this soil are suited to woodland and habitat for wildlife. Trees that are tolerant of some wetness should be selected for reforestation. Plant competition can be reduced by spraying, mowing, and disking.

The seasonal high water table and flooding hazard severely limit this soil for buildings and sanitary facilities. Diking to control flooding is difficult in most areas. Local roads can be improved by filling and using a suitable base material from outside the area.

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

BeA—Bennington silt loam, 0 to 2 percent slopes. This nearly level, deep, somewhat poorly drained soil is on narrow to broad upland areas between Cardington soils on low ridges and Pewamo soils in narrow strips along waterways. It is also in slight depressions and in fan-shaped areas at the heads of waterways. Most areas are 2 to 50 acres in size; some are more than 100 acres.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsoil, which extends to a depth of about 35 inches, is yellowish brown, mottled, firm silty clay loam and clay loam. The substratum to a depth of about 70 inches is glacial till of brown, mottled, firm clay loam. Some areas have slopes of 2 to 4 percent.

Included with this soil in mapping are small areas of very poorly drained Pewamo soils along waterways and in depressions that make up about 15 percent of most areas.

This soil has slow permeability in the subsoil and substratum. The available water capacity and organic matter content are moderate. The shrink-swell potential is moderate in the subsoil, and the potential frost action is high. Runoff is slow. Reaction ranges from very strongly acid in the upper part of the subsoil to mildly alkaline in the lower part. This soil has medium natural fertility and good tilth. The surface layer can be worked through a fairly wide range of moisture content. A perched seasonal high water table is near the surface in winter, spring, and other extended wet periods. The root zone is mainly moderately deep over compact glacial till.

Most areas of this soil are farmed. Drained areas have high potential for crops, hay, and pasture. This soil has low potential for most building site development and sanitary facilities. It has medium potential for most recreation uses.

This soil is suited to row crops and small grains. Wetness is the main limitation for farming. It delays planting and limits the choice of crops. Surface drains and land smoothing are commonly used to remove surface water. Subsurface drains are used to lower the seasonal high water table. Minimizing tillage and incorporating crop residue or other organic matter into the surface layer improve tilth and fertility and increase the rate of water infiltration. These practices also reduce crusting and improve soil-seed contact.

This soil is suited to pasture or hay. Surface compaction, reduced growth, poor tilth, and decreased infiltration rates result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing, along with weed control, can help keep the pasture and soil in good condition.

This soil is well suited to trees and shrubs that tolerate some wetness; a few areas are producing native hardwoods. Seedlings of adapted species grow well if competing vegetation is controlled or removed by cutting, spraying, girdling, or mowing.

This soil is severely limited for building site development, sanitary facilities, and most recreation uses by the slow permeability, seasonal wetness, and low strength. These limitations can be partially or fully overcome by specially designed facilities. Artificial drains are effective in reducing the wetness. Building sites should be landscaped for good surface drainage away from the foundations and septic tank absorption fields. Absorption fields should be located on the higher part of the landscape. Local roads can be improved by artificial drainage and suitable base material. Sanitary facilities should be connected to central sewers and treatment facilities, wherever possible.

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

BeB—Bennington silt loam, 2 to 6 percent slopes. This gently sloping, deep, somewhat poorly drained soil is on narrow to broad upland areas between well-defined drainageways and on low knolls and ridges. It is also in fan-shaped areas at the head of waterways. Most areas are 2 to 75 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 9 inches thick. The subsoil, which extends to a depth of about 35 inches, is yellowish brown, mottled, firm silty clay loam and silty clay. The substratum to a depth of about 70 inches is glacial till of brown and dark yellowish brown, firm clay loam and loam that is mottled in the upper part. Some areas are eroded.

Included with this soil in mapping are well drained Alexandria soils on low knolls and ridges and very poorly drained Pewamo soils in depressions and strips along waterways. These inclusions make up about 20 percent of most areas.

This soil has slow permeability in the subsoil and substratum. The available water capacity and organic matter content are moderate. The shrink-swell potential is moderate in the subsoil and the potential frost action is high. Runoff is medium. Reaction ranges from very strongly acid in the upper part of the subsoil to mildly alkaline in the lower part. This soil has medium natural fertility and good tilth. The surface layer can be worked through a fairly wide range of moisture content. A perched seasonal high water table is near the surface in winter, spring, and other extended wet periods. The root zone is mainly moderately deep over compact glacial till.

Most areas of this soil are farmed. Drained areas have high potential for crops, hay, and pasture. This soil has low potential for most building site development and sanitary facilities. It has medium potential for many recreation uses.

This soil is suited to row crops and small grains. Drainage and erosion are the main limitations for farming. Both surface and subsurface drains are used to remove excess water from this soil. Minimizing tillage and incorporating crop residue or other organic matter into the surface layer improves tilth and fertility and increases water infiltration. These practices also reduce crusting and improve soil-seed contact.

This soil is suited to pasture or hay. Surface compaction, reduced growth, poor tilth, and decreased infiltration rates result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing, along with weed control, will help keep the pasture and soil in good condition.

This soil is well suited to trees and shrubs that tolerate some wetness; a few areas are producing native hardwoods. Seedlings of adapted species grow well if competing vegetation is controlled or removed by cutting, spraying, girdling, or mowing.

This soil is severely limited for building site development, sanitary facilities, and most recreation uses because of slow permeability, seasonal wetness, and low strength. These limitations can be partially or fully overcome by specially designed facilities. Increased runoff and erosion are problems associated with construction. These can be reduced by maintaining plant cover, wherever possible. Artificial drains can be used to improve drainage. Building sites should be landscaped for good surface drainage away from foundations and septic tank absorption fields. Absorption fields should be located on the higher part of the landscape. Local roads can be improved by artificial drainage and suitable base material. Sanitary facilities should be connected to central sewers and treatment facilities, wherever possible.

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

BfA—Bennington-Urban land complex, 0 to 2 percent slopes. This map unit consists of a deep, nearly level, somewhat poorly drained Bennington soil and areas of Urban land on broad upland areas between major drainageways. The areas commonly have straight line boundaries with distinct corners and range from 40 to several hundred acres in size. Slope is dominantly less than one percent. Most areas contain about 45 percent Bennington silt loam and 30 percent Urban land. The Bennington soil and the Urban land areas are so intricately mixed, or so small in size, that it was not practical to separate them in mapping.

Typically, the Bennington soil has a surface layer of dark grayish brown, friable silt loam about 7 inches thick. The subsoil is about 25 inches thick. It is brown and yellowish brown, mottled, firm silty clay loam. The substratum to a depth of about 70 inches is brown, mottled, firm clay loam glacial till.

The Urban land part of the unit is covered by buildings and pavements. The buildings are mostly residential, ranging from single-family houses to apartment complexes. There are some industrial and commercial uses.

Included in mapping are areas that are altered by cutting and filling. Because of attempts to change natural drainage, more of the area has been filled than excavated. Also included are narrow strips of very poorly drained Pewamo soils in depressions and along waterways and small areas of moderately well drained Cardington soils on low knolls and ridges. These inclusions are dominantly Pewamo soils and make up about 20 percent of most areas.

Most areas of this map unit have been artificially drained through sewer systems, gutters, and subsurface drains. Bennington soil areas that are not drained have a seasonal high water table near the surface in winter, spring, and other extended wet periods. Permeability is slow; the organic matter content and available water capacity are moderate. The shrink-swell potential in the subsoil is moderate, and the frost action is high. Runoff is slow. The Bennington soil has medium natural fertility and good tilth. The root zone is mainly moderately deep over compact glacial till.

The Bennington soil is used for parks, open space, lawns, and gardens. It has a high potential for lawns, vegetable and flower gardens, trees, and shrubs. Without artificial drainage, the potential is low for building site development and sanitary facilities and medium for most recreation uses.

When drained, the Bennington soil is suited to most vegetables, flowers, trees, and shrubs common to the area. Water-tolerant plants grow well in undrained areas. Perennial plants selected for planting in drained areas should be tolerant of some wetness. The included spots of cut and fill land are not well suited to lawns and gardens. Subsoil material which is exposed on the surface has very poor tilth. It is sticky when wet and hard when dry.

The Bennington soil is severely limited for building site development and sanitary facilities by the slow permeability, seasonal wetness, and low strength. These limitations can be partially or fully overcome by specially designed facilities. Building sites should be landscaped for good surface drainage away from foundations and septic tank absorption fields. Both surface and subsurface drainage are commonly used. Septic tank absorption fields should be located on the higher part of the landscape. Local roads and streets can also be improved by covering or replacing the upper layer of the Bennington soil with a suitable base material. Central sewage treatment facilities are commonly used.

The Bennington soil is in capability subclass IIw and woodland suitability subclass 2o; Urban land is not assigned to a capability or woodland subclass.

BfB—Bennington-Urban land complex, 2 to 6 percent slopes. This map unit consists of a deep, gently sloping, somewhat poorly drained Bennington soil and Urban land in broad upland areas between drainageways. The areas commonly have straight line boundaries with distinct corners and range from 40 to several hundred acres in size. The slope ranges from 2 to 6 percent but is dominantly 2 to 4 percent. Most areas contain about 45 percent Bennington silt loam and 30 percent Urban land. The Bennington soil and the Urban land areas are so intricately mixed, or so small in size, that it was not practical to separate them in mapping.

Typically, the Bennington soil has a surface layer of dark grayish brown, friable silt loam about 7 inches thick. The subsoil is about 23 inches thick. It is yellowish brown and brown, mottled, firm silty clay loam. The substratum to a depth of about 70 inches is glacial till of yellowish brown, mottled, firm clay loam.

The Urban land part of the unit is covered by buildings and pavements. The buildings are mostly residential, ranging from single-family houses to apartment complexes. There are some industrial or commercial uses.

Included in mapping are areas that have been altered by cutting and filling. Because of attempts to change natural drainage, more of the area has been filled than excavated. Also included are small areas of moderately well drained Cardington soils on knolls and ridges and very poorly drained Pewamo soils along waterways. These inclusions are dominantly Cardington soils and make up about 30 percent of most areas.

Most areas of this map unit are artificially drained by sewer systems, gutters, and subsurface drains. Bennington soil areas that have not been drained have a seasonal high water table near the surface in winter, spring, and other extended wet periods. Permeability is slow. The organic matter content and available water capacity are moderate. The shrink-swell potential in the subsoil is moderate, and the potential frost action is high. Runoff is medium. The Bennington soil has medium natural fertility and good tilth. The root zone is mainly moderately deep over compact glacial till.

The Bennington soil is used for parks, open space, lawns, and gardens. It has high potential for lawns, vegetable and flower gardens, trees, and shrubs. Unless the soil is artificially drained the potential is low for building site development and sanitary facilities and medium for most recreation uses.

When drained, the Bennington soil is suited to most vegetables, flowers, trees, and shrubs common to the area. Water-tolerant plants grow well in undrained areas. Perennial plants selected for planting in drained areas should be tolerant of some wetness. The included spots of cut and fill land are not well suited to lawns and gardens. Subsoil material which is exposed on the surface has very poor tilth. It is sticky when wet and hard when dry.

The Bennington soil is severely limited for building site development and sanitary facilities by the slow permeability, seasonal wetness, and low strength. These limitations can be partially or fully overcome by special facilities whose design is based on specific onsite investigations. Both surface and subsurface drainage are commonly used. Building sites should be landscaped for good surface drainage away from foundations and septic tank absorption fields. Absorption fields should be located on the higher part of the landscape. Local roads and streets can be improved by covering or replacing the upper layer of the Bennington soil with a suitable base material. Increased runoff and erosion are problems associated with construction. These can be reduced by maintaining plant cover, wherever possible. Central sewage treatment facilities are commonly used.

The Bennington soil is in capability subclass IIe and woodland suitability subclass 2o; Urban land is not assigned to a capability or woodland suitability subclass.

BoA—Blount silt loam, 0 to 2 percent slopes. This nearly level, deep, somewhat poorly drained soil is in narrow to broad upland areas between low knolls and depressions. It is also in fan-shaped areas at the head of waterways and in bands along small waterways. In some places this soil is in slight depressions. Most areas are 6 to 25 acres in size; some areas are more than 90 acres.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsoil is yellowish brown, mottled, firm silty clay and silty clay loam about 25 inches thick. The substratum to a depth of about 70 inches is glacial till of brown, mottled, firm clay loam.

Included with this soil in mapping are small areas of very poorly drained Pewamo soils in depressions and along drainageways and moderately well drained Glynwood soils on low knolls. These inclusions make up about 15 percent of most areas.

This soil has slow permeability in the subsoil and in the substratum. The available water capacity, organic matter content, and shrink-swell potential are moderate. The potential frost action is high. Runoff is slow. Reaction ranges from strongly acid in the upper part of the subsoil to mildly alkaline in the lower part. This soil has medium natural fertility and crusts easily after heavy rains. The surface layer can be worked through a fairly wide range of moisture content. A perched seasonal high water table is 12 to 36 inches below the surface in winter, spring, and other extended wet periods. The root zone is mainly moderately deep over compact glacial till.

Most areas of this soil are farmed. Drained areas have high potential for crops, hay, and pasture. This soil has low potential for most building site development and sanitary facilities. It has medium potential for most recreation uses.

This soil is suited to row crops and small grains. Seasonal wetness is the main limitation for farming. Surface drains and land smoothing are commonly used to remove excess surface water. Subsurface drains are used to lower the seasonal high water table. Minimizing tillage and incorporating crop residue or other organic materials into the surface layer can improve tilth and fertility, reduce crusting, and increase infiltration.

This soil is suited to pasture and hay. Surface compaction, poor tilth, decreased infiltration, and reduced growth result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing, along with weed control, can help keep the pasture and soil in good condition.

This soil is well suited to trees and shrubs that can tolerate some wetness. A few areas are producing native hardwoods. Seeds, seedlings, and cuttings of adapted species survive and grow well if competing vegetation is controlled or removed by cutting, spraying, girdling, or mowing.

This soil is severely limited for building site development and sanitary facilities and is moderately limited for most recreation uses by the slow permeability, low strength, and seasonal high water table. These limitations can be partially or fully overcome by specially designed facilities. Ditches and subsurface drains are used to improve drainage. Building sites should be landscaped for good surface drainage away from foundations and septic tank absorption fields. Absorption fields should be located on the higher part of the landscape. Local roads can be improved by using artificial drainage and a suitable base material. Sanitary facilities should be connected to central sewers and treatment facilities, wherever possible.

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

BoB—Blount silt loam, 2 to 6 percent slopes. This gently sloping, deep, somewhat poorly drained soil is in irregularly shaped areas on broad uplands. It is also in fan-shaped areas at the head of waterways and in bands along small waterways. Most areas are 4 to 50 acres in size; some areas are more than 100 acres.

Typically, the surface layer is dark grayish brown, friable silt loam about 10 inches thick. The subsoil, which extends to a depth of about 35 inches, is brown and yellowish brown, mottled, firm silty clay, silty clay loam, and clay loam. The substratum to a depth of about 70 inches is glacial till of brown, mottled, firm clay loam.

Included with this soil in mapping are small areas of moderately well drained Glynwood soils on knolls and ridges and very poorly drained Pewamo soils in oval depressions and narrow strips along waterways. These inclusions make up about 15 percent of most areas.

This soil has slow permeability in the subsoil and in the substratum. The available water capacity, organic matter content, and shrink-swell potential are moderate. The potential frost action is high. Runoff is medium. Reaction ranges from strongly acid in the upper part of the subsoil to mildly alkaline in the lower part. This soil has medium natural fertility and crusts easily after heavy rains. A perched seasonal high water table is 12 to 36 inches below the surface in winter, spring, and other extended wet periods. The root zone is mainly moderately deep over compact glacial till.

Most areas of this soil are farmed. Drained areas have high potential for crops, hay, and pasture. This soil has low potential for most building site development and sanitary facilities. It has medium potential for many recreation uses.

This soil is suited to row crops and small grains. The surface layer can be worked through a fairly wide range of moisture content. Erosion control, wetness, and surface crusting are the main management concerns. Surface and subsurface drains are commonly used to remove excess water. Minimizing tillage and planting deep-rooted cover crops improve infiltration. Incorporating crop residue or other organic material into the surface layer improves tilth and fertility, reduces crusting, and increases infiltration.

This soil is suited to pasture or hay. Surface compaction, reduced growth, poor tilth, and decreased infiltration rates result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing, along with weed control, can help keep the pasture and soil in good condition.

This soil is well suited to trees and shrubs that can tolerate some wetness. A few areas are producing native hardwoods. Seedlings of adapted species grow well if competing vegetation is controlled or removed by cutting, spraying, girdling, or mowing.

This soil is severely limited for building site development and sanitary facilities because of slow permeability, low strength, and wetness. These limitations can be partially or fully overcome by specially designed facilities. Runoff and erosion increase during construction; plant cover should be maintained on the site as much as possible. Building sites should be landscaped for good surface drainage away from foundations and septic tank absorption fields. Absorption fields should be located on the higher part of the landscape. Sewage facilities should be connected to central sewers and treatment facilities, wherever possible. Ditches and subsurface drains are used to improve drainage. Local roads can be improved by using artificial drainage and a suitable base material.

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

CaB—Cardington silt loam, 2 to 6 percent slopes. This gently sloping, deep, moderately well drained soil is on uplands. It is on convex ridgetops, on side slopes above steeper areas, and along well-defined waterways. Slopes are dominantly 2 to 4 percent. Most areas are 4 to 50 acres in size; a few areas are more than 100 acres.

Typically, the surface layer is brown, friable silt loam about 6 inches thick. The subsoil is about 28 inches thick. The upper part of the subsoil is yellowish brown and strong brown, friable silty clay loam that is mottled below a depth of about 9 inches; the lower part is yellowish brown and brown, mottled, firm, silty clay loam and silty clay. The substratum to a depth of about 70 inches is glacial till of brown, mottled, very firm clay loam.

Included with this soil in mapping are narrow strips of very poorly drained Pewamo soils along drainageways and small spots of somewhat poorly drained Bennington soils near the base of slopes. These inclusions make up about 15 percent of most areas.

This soil has moderately slow permeability in the subsoil and substratum. The available water capacity and organic matter content are moderate, and the shrink-swell potential in the subsoil is moderate. The potential frost action is high. Runoff from cultivated areas is medium. Reaction in the subsoil ranges from very strongly acid in the upper part to mildly alkaline in the lower part. This soil has medium natural fertility and good tilth. The surface layer can be worked through a fairly wide range of moisture content. Roots are restricted below a depth of 26 to 35 inches by the compact calcareous glacial till. A perched seasonal high water table is between a depth of 24 and 36 inches in winter, spring, and other extended wet periods.

Most areas of this soil are farmed. This soil has high potential for crops, pasture, hay, and trees. It has medium potential for most building site development and medium or low potential for sanitary facilities. This soil has high potential for many recreation uses.

This soil is suited to row crops and small grains. Erosion is the main hazard for row crops. Minimizing tillage, planting cover crops, and using grassed waterways reduce soil loss. Incorporating crop residue or other organic matter into the surface layer improves tilth and fertility and increases water infiltration. These practices also reduce crusting and improve soil-seed contact.

The use of this soil for pasture or hay is effective in controlling erosion. Surface compaction, poor tilth, reduced growth, and increased runoff result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing, along with weed control, can help keep the pasture and soil in good condition.

This soil is well suited to trees and shrubs; a few small areas are in native hardwoods. There are no soil hazards or limitations to growing or harvesting trees and shrubs on this soil. Seedlings grow well if competing vegetation is controlled or removed by cutting, spraying, girdling, or mowing.

Because of seasonal wetness, moderate shrink-swell potential, and moderately slow permeability, this soil is moderately limited for most building site development and sanitary facilities. These limitations can be partially or fully overcome by specially designed facilities. This soil is better suited to houses without basements than to houses with basements. Foundation drains and protective exterior wall coatings can help prevent wet basements. Building sites should be landscaped for good drainage away from foundations and septic tank absorption fields. Local roads can be improved by using artificial drainage and suitable base material. Increased runoff and erosion are problems associated with construction. These can be reduced by maintaining plant cover wherever possible. The moderately slow permeability and wetness that limit the use of septic tanks can be partially overcome by increasing the size of the absorption fields. Sanitary facilities should be connected to central sewers and treatment facilities, wherever possible.

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

CaB2—Cardington silt loam, 2 to 6 percent slopes, eroded. This gently sloping, deep, moderately well drained soil is on uplands. It is on convex ridgetops, on side slopes above steeper areas, and along well-defined waterways. It is also on some long hillsides that are broken up by drainageways. Slopes are dominantly 4 to 6 percent. Areas of this soil are commonly 2 to 20 acres in size; a few areas are up to 50 acres.

Typically, the surface layer is brown, friable silt loam about 7 inches thick. The subsoil is about 26 inches thick. The upper part is yellowish brown, firm silty clay loam; the lower part is yellowish brown and brown, mottled, firm clay loam. The substratum to a depth of about 70 inches is glacial till of dark yellowish brown and yellowish brown, mottled, firm clay loam. Some areas have 6 to 9 percent slopes.

Included with this soil in mapping are very poorly drained Pewamo soils in narrow strips along drainageways and small spots of somewhat poorly drained Bennington soils near the base of slopes. These inclusions make up about 15 percent of most areas.

This soil has moderately slow permeability in the subsoil and substratum. The available water capacity and organic matter content are moderate, although they have been reduced by erosion. The shrink-swell potential is moderate in the subsoil and potential frost action is high. Reaction in the subsoil ranges from very strongly acid in the upper part to mildly alkaline in the lower part. This soil has medium natural fertility and good tilth. Roots are restricted below a depth of 26 to 35 inches by the compact calcareous glacial till. A seasonal high water table is perched between depths of 24 and 36 inches in winter, spring, and other extended wet periods.

Most areas of this soil are farmed. This soil has high potential for crops, hay, pasture, and trees. It has medium potential for most building site development and medium or low potential for sanitary facilities. This soil has high potential for many recreation uses.

This soil is suited to row crops and small grains. Erosion is the main hazard for crops, and it has reduced the range of moisture content suitable for good workability. Minimizing tillage, planting cover crops, and using grassed waterways reduce soil loss. Incorporation of crop residue or other organic matter into the surface layer improves tilth and fertility and increases water infiltration. These practices also reduce crusting and improve soil-seed contact.

The use of this soil for pasture or hay reduces erosion. Surface compaction, poor tilth, reduced growth, and increased runoff can result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing, along with weed control, can help keep the pasture and soil in good condition.

This soil is well suited to trees and shrubs; a few small areas are in native hardwoods. There are no soil hazards or limitations to growing or harvesting trees and shrubs on this soil. Seedlings grow well if competing vegetation is controlled or removed by cutting, spraying, girdling, or mowing.

Because of seasonal wetness, moderate shrink-swell potential, and moderately slow permeability, this soil is moderately limited for most building site development and sanitary facilities. These limitations can be partially or fully overcome by specially designed facilities. This soil is better suited to houses without basements than to houses with basements. Foundation drains and protective exterior wall coatings can help prevent wet basements. Building sites should be landscaped for good drainage away from foundations and septic tank absorption fields. Local roads can be improved by using artificial drainage and suitable base material. Increased runoff and erosion are problems associated with construction. These can be reduced by maintaining plant cover, wherever possible. The moderately slow permeability and wetness that limit the use of septic tanks can be partially overcome by increasing the size of the absorption field. Sanitary facilities should be connected to central sewers and treatment facilities, wherever possible.

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

CaC2—Cardington silt loam, 6 to 12 percent slopes, eroded. This sloping, deep, moderately well drained soil is on uplands. It is on convex ridgetops, on side slopes above steeper areas, and on long, narrow areas along well-defined waterways. In some places this soil is on short hillsides. Erosion has removed part of the original surface layer, and tillage has mixed subsoil material into the present surface layer, resulting in more coarse fragments in the surface layer. Most areas of this soil are 2 to 35 acres in size; some are up to 75 acres.

Typically, the surface layer is brown, friable silt loam about 8 inches thick. The subsoil is about 20 inches thick. The upper part is yellowish brown, firm silty clay loam; the lower part is yellowish brown and brown, mottled, firm silty clay loam and clay loam. The substratum to a depth of about 70 inches is glacial till of brown, mottled, firm clay loam. Some narrow areas along waterways have a slope of 12 to 15 percent.

Included with this soil in mapping are small areas of gently sloping, somewhat poorly drained Bennington soils near the base of slopes and very poorly drained Pewamo soils in narrow strips along drainageways. These inclusions make up about 15 percent of most areas.

This soil has moderately slow permeability in the subsoil and substratum. The available water capacity of this soil is moderate, although it has been reduced by erosion. The organic matter content is moderately low. Potential frost action is high, and shrink-swell potential in the subsoil is moderate. Runoff from cultivated areas is rapid. Reaction ranges from very strongly acid in the upper part of the subsoil to mildly alkaline in the lower part. This soil has medium natural fertility and good tilth. Roots are restricted below depths of 26 to 35 inches by the compact calcareous glacial till. A seasonal high water table is perched between depths of 24 and 36 inches in winter, spring, and other extended wet periods.

Most areas of this soil are farmed. Some are in permanent pasture or woodland. This soil has medium potential for crops and for most building site development and recreation uses. It has low or medium potential for sanitary facilities and high potential for hay and pasture.

This soil is suited to row crops and small grains. Erosion is the main hazard for row crops. It has reduced the range of moisture content in which the soil is suitable for tillage. Minimizing tillage, planting cover crops, and using grassed waterways reduce soil loss. Incorporating crop residue or other organic matter into the surface layer improves tilth and fertility and increases water infiltration. These practices also reduce crusting and improve soil-seed contact.

The use of this soil for pasture or hay reduces erosion. Surface compaction, reduced growth, poor tilth, and increased runoff can result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing, along with weed control, can help keep the pasture and soil in good condition.

This soil is well suited to trees and shrubs; a few areas are in native hardwoods. Seedlings grow well if competing vegetation is controlled or removed by cutting, spraying, girdling, or mowing.

This soil is moderately limited for most building site development, sanitary facilities, and recreation uses because of the seasonal wetness, slope, and moderately slow permeability. These limitations can be partially or fully overcome by specially designed facilities. Artificial drainage and storm sewers can reduce the wetness limitation. Local roads can be improved by using artificial drainage and a suitable base material. Increased runoff and erosion are problems associated with construction. These can be reduced by maintaining plant cover wherever possible. Septic tank systems can be improved by increasing the size of the absorption field and placing the leach lines on the contour. Sanitary facilities should be connected to central sewers and treatment facilities, wherever possible.

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

CbB—Cardington-Urban land complex, 2 to 6 percent slopes. This map unit consists of a deep, moderately well drained Cardington soil on broad upland areas between drainageways and areas of Urban land. The areas commonly have straight line boundaries with distinct corners and range from 40 to several hundred acres in size. The slopes range from 2 to 6 percent; they are commonly more than 3 percent. Most areas are about 45 percent Cardington silt loam soil and 30 percent Urban land. Areas of the Cardington soil and the

Urban land are so intricately mixed, or so small in size, that it was not practical to separate them in mapping.

Typically, the Cardington soil has a brown, friable silt loam surface layer about 6 inches thick. The subsoil is about 35 inches thick. The upper part is dark yellowish brown, friable silt loam and firm silty clay loam; the lower part is yellowish brown and brown, mottled, firm silty clay loam and clay. The substratum to a depth of about 70 inches is glacial till of yellowish brown, mottled, firm clay loam. Narrow strips of 6 to 9 percent slope are in some areas.

The Urban land part of the unit is covered by buildings and pavement that obscure or alter the soils so that identification is not possible. The buildings are mostly residential, but some have industrial and commercial uses.

Included in mapping are areas that have been altered by cutting and filling. Because of attempts to change natural topography there are more excavated areas than filled areas. Also included are narrow strips of very poorly drained Pewamo soils in depressions, many of which have been filled. These inclusions make up about 25 percent of most areas.

Most areas of this map unit have been artificially drained by sewer systems, gutters, and artificial drains. Undrained areas of Cardington soil have a seasonal high water table between depths of 24 and 36 inches in winter, spring, and other extended wet periods. This soil has moderately slow permeability and a moderate organic matter content and available water capacity. The shrink-swell potential in the subsoil is moderate, and the potential frost action is high. The Cardington soil has medium natural fertility and good tilth. Runoff is medium. Reaction in the subsoil ranges from very strongly acid in the upper part to mildly alkaline in the lower part. Roots are restricted below depths of 26 to 35 inches by the compact calcareous glacial till.

The Cardington soil is used for parks, open space, lawns, and gardens. It has high potential for lawns, vegetable and flower gardens, trees, and shrubs. This soil has medium potential for most building site development and medium or low potential for sanitary facilities. This soil has high potential for many recreation uses.

The Cardington soil is well suited to grasses, flowers, vegetables, trees, and shrubs. Soil erosion is generally not a major problem on this unit unless the soil is left in a bare, exposed condition for a considerable period. The included spots of cut and fill land are not well suited to lawns and gardens. Subsoil material which is exposed on the surface has very poor tilth. It is sticky when wet and hard when dry.

This map unit is moderately limited for building site development and sanitary facilities by the seasonal wetness, moderate shrink-swell potential, and moderately slow permeability. This limitation can be partially or fully overcome by specially designed facilities. Building sites should be landscaped for good surface drainage away from foundations and septic tank absorption fields. Local roads and streets can be improved by artificial drainage and suitable base material, which help overcome the risk of damage caused by frost action and low strength. Increased runoff and erosion are problems associated with construction. These can be reduced by maintaining plant cover wherever possible. Septic tank systems can be improved by increasing the size of the absorption field. Sanitary facilities should be connected to central sewage treatment facilities, wherever possible.

The Cardington soil is in capability subclass IIe and woodland suitability subclass 2o; Urban land is not assigned to a capability subclass or woodland suitability subclass.

CbC—Cardington-Urban land complex, 6 to 12 percent slopes. This map unit consists of a deep, moderately well drained Cardington soil and areas of Urban land that are commonly along drainageways. Most areas are irregularly shaped and are 10 to 50 acres in size. Slopes range from 6 to 12 percent; they are dominantly 8 to 12 percent. Most areas are about 45 percent Cardington silt loam and 30 percent Urban land. The pattern of occurrence is too complex to separate in mapping.

Typically, the Cardington soil has a brown, friable silt loam surface layer about 7 inches thick. The subsoil is about 26 inches thick. The upper part of the subsoil is dark yellowish brown, friable silt loam and firm silty clay loam; the lower part is yellowish brown and brown, mottled, firm silty clay loam and clay loam. The substratum to a depth of about 70 inches is glacial till of dark yellowish brown and brown, mottled, firm clay loam.

The Urban land part of the unit is covered by buildings and pavement. The buildings are mostly residential, ranging from single-family houses to apartment complexes; there are some industrial and commercial buildings.

Included in mapping are areas that are altered by cutting and filling. Because of attempts to change natural topography, more areas have been filled than excavated. Also included are narrow strips of 12 to 18 percent slope along well-defined drainageways and narrow areas of somewhat poorly drained Bennington soils on foot slopes and along drainageways. These inclusions make up about 30 percent of most areas.

Most areas of this map unit have been artificially drained by sewer systems, gutters, and artificial drains. Undrained areas of Cardington soil have a seasonal high water table between depths of 24 to 36 inches in winter, spring, and other extended wet periods. This soil has moderately slow permeability and a moderately low organic matter content. The available water capacity and shrink-swell potential in the subsoil are moderate. The potential frost action is high. This soil has medium natural fertility and good tilth. Runoff is rapid. Reaction in the subsoil ranges from very strongly acid in the upper part to mildly alkaline in the lower part. Roots are restricted below depths of 26 to 35 inches by the compact calcareous glacial till.

The Cardington soil is used for parks, open space, lawns, and some gardens. It has high potential for lawns, vegetable and flower gardens, trees, and shrubs. This soil has medium potential for most building site development and recreation uses and low or medium potential for sanitary facilities.

The Cardington soil is well suited to grasses, trees, and shrubs and to flower and vegetable gardens, if erosion is controlled. Erosion can be easily controlled by planting across the slope and by using mulch. Erosion is a very severe hazard during construction. It can be reduced by maintaining plant cover on the site as much as possible during construction. The included spots of cut and fill land are not well suited to lawns and gardens. Subsoil material which is exposed on the surface has very poor tilth. It is sticky when wet and hard when dry.

This map unit is moderately limited for urban use by wetness, slope, and moderately slow permeability. These limitations can be partially or fully overcome by specially designed facilities. Artificial drainage and storm sewers can reduce the wetness limitation. Local roads and streets can also be improved by using a suitable base material, which helps overcome the risk of damage caused by the frost action and low strength. Septic tank systems can be improved by increasing the size of the absorption field and placing the leach lines on the contour. Central sewers and treatment facilities are used in many areas.

The Cardington soil is in capability subclass IIIe and woodland suitability subclass 2o; Urban land is not assigned to a capability subclass or woodland suitability subclass.

Cc—Carlisle muck. This nearly level, deep, very poorly drained soil is in slightly concave depressions on uplands and terraces. It is subject to frequent ponding. Most areas are oval. The surface is uneven in some areas. Areas range from about 2 to 90 acres in size but are dominantly less than 15 acres. Slope is 0 to 2 percent.

Typically, the surface layer is black, friable muck about 7 inches thick. Below this to a depth of about 58 inches are layers of friable and very friable muck that are black, dark reddish brown, dark yellowish brown, and dark brown. From a depth of about 58 to 70 inches is dark grayish brown, very friable sedimentary peat.

Included with this soil in mapping are areas of Montgomery soils formed in lakebed sediment and narrow strips of organic soils that have 20 to 60 inches of muck over mineral material. These inclusions make up about 10 percent of most areas and are along the edges of depressions.

Water is near the surface and ponds for long periods. Permeability is moderately rapid. The available water capacity and organic matter content are very high. The potential frost action is high. The deep root zone is medium acid to mildly alkaline. This soil has good tilth.

Most areas of this soil are in wetland vegetation. Drained areas have high potential for row crops and some specialty crops. This soil has low potential for most building site development, sanitary facilities, and recreation uses. It has high potential as habitat for wetland wildlife.

The ponding and very poor natural drainage are limitations for agricultural uses of this soil. Surface and subsurface drains are effective in removing excess water, but suitable outlets are difficult to establish in many areas. Subsidence, or shrinkage, occurs as the result of the oxidation of the organic material after draining. Controlled drainage can reduce the shrinkage in areas where the water table can be raised or lowered. This soil is soft and highly compressible and commonly will not support narrow-wheeled equipment, especially when wet. During dry periods soil blowing and the risk of fire are major concerns. Planting cover crops, returning crop residues, irrigation, and using windbreaks reduce the risk of soil blowing. Frost damage is an additional concern because the areas are low.

This soil is very poorly suited to trees unless it is drained. Undrained areas support water-tolerant trees and some cattails, reeds, or sedges. The wetness seriously limits the use of logging equipment.

This soil is severely limited for building site development, sanitary facilities, and recreation uses because of ponding, low strength, wetness, and seepage. Local roads can be improved by removing the organic deposit and replacing it with a suitable base material and by providing drainage. This soil is a source of peat. Undrained areas provide good habitat for ducks, muskrats, and other wetland wildlife.

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

CeA—Celina silt loam, 0 to 2 percent slopes. This nearly level, deep, moderately well drained soil is on uplands. It is on slightly convex ridgetops and above steeper areas adjacent to well-defined waterways. Slopes are mainly 1 or 2 percent. Most areas are 2 to 20 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 8 inches thick. The subsoil is about 20 inches thick. The upper part of the subsoil is yellowish brown, firm silty clay loam; the lower part is dark yellowish brown, mottled, firm silty clay loam and clay. The substratum to a depth of about 70 inches is yellowish brown, mottled, firm glacial till.

Included with this soil in mapping are narrow strips of very poorly drained Kokomo soils along waterways and well drained Miamian soils with 2 to 4 percent slopes on slope breaks. Also included are somewhat poorly drained Crosby soils in slight depressions. These inclusions make up about 15 percent of most areas.

This soil has moderately slow permeability in the subsoil and in the substratum. The available water capacity and organic matter content are moderate. The shrink-swell potential in the subsoil is moderate and the potential frost action is high. Runoff from cultivated areas is slow. Reaction in the subsoil is mainly strongly acid to neutral. This soil has medium natural fertility and good tilth. Roots are restricted below depths of 20 to 33 inches by calcareous glacial till. A seasonal high water table is perched between depths of 18 to 36 inches late in winter, in spring, and in other extended wet periods.

Most areas of this soil are farmed. This soil has high potential for crops, hay, pasture, and trees. It has medium potential for most building site development and medium or low potential for sanitary facilities. This soil has high potential for most recreation uses.

This soil is suited to row crops, small grains, and specialty crops. The surface layer can be worked through a fairly wide range of moisture content. Soil compaction occurs when the soil is tilled when soft and sticky as a result of wetness. Minimizing tillage and planting cover crops are good management practices, especially when this soil is used for continuous row cropping. Incorporating crop residue or other organic matter into the surface layer improves fertility and tilth and increases water infiltration. This practice also reduces crusting and improves soil-seed contact.

Surface compaction, poor tilth, and reduced growth result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing, along with weed control, can help keep the pasture and soil in good condition.

This soil is well suited to trees and shrubs. A few small areas are in native hardwoods. There are no soil hazards or limitations to growing or harvesting trees and shrubs. Seedlings grow well if competing vegetation is controlled or removed by cutting, spraying, girdling, or mowing.

Because of seasonal wetness, moderate shrink-swell potential and strength, and moderately slow permeability, this soil is moderately limited for most building site development, sanitary facilities, and recreation uses. These limitations can be partially or fully overcome by specially designed facilities. Artificial drainage and storm sewers can reduce the wetness limitation. Building sites should be landscaped for good surface drainage away from foundations and septic tank absorption fields. This soil is better suited to houses without basements than to houses with basements. Foundation drains and protective exterior wall coatings can help prevent wet basements. Septic tank systems can be improved by increasing the size of the absorption field. Absorption fields should be located on the higher part of the landscape. Sanitary facilities should be connected to central sewers and treatment facilities, wherever possible. Local roads can be improved by artificial drainage and suitable base material, which overcome the risk of damage caused by frost action and low strength.

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

CeB—Celina silt loam, 2 to 6 percent slopes. This gently sloping, deep, moderately well drained soil is on uplands. It is on convex ridgetops, on side slopes above steeper areas, and along well-defined waterways. In some places this soil is on long hillsides that are broken up by small drainageways. Slopes are mainly 2 to 4 percent. Most areas are 2 to 50 acres in size.

Typically, the surface layer is brown, friable silt loam about 7 inches thick. The subsoil is about 18 inches thick. The upper part of the subsoil is yellowish brown, firm silty clay loam that is mottled below a depth of about 11 inches; the lower part is dark yellowish brown, mottled, firm clay and clay loam. The substratum to a depth of about 70 inches is glacial till of brown and yellowish brown, mottled, firm loam.

Included with this soil in mapping are narrow strips of very poorly drained Kokomo soils along drainageways and small areas of somewhat poorly drained Crosby soils at the base of knolls. These inclusions make up about 15 percent of most areas.

This soil has moderately slow permeability in the subsoil and substratum. The available water capacity and organic matter content are moderate. The shrink-swell potential in the subsoil is moderate, and the potential frost action is high. Runoff from cultivated areas is medium. Reaction in the subsoil is mainly strongly acid to neutral. This soil has medium natural fertility and good tilth. The surface layer can be worked through a fairly wide range of moisture content. Roots are restricted below depths of 20 to 33 inches by calcareous glacial till. A seasonal high water table is perched between depths of 18 to 36 inches late in winter, in spring, and in other extended wet periods.

Most areas are farmed. This soil has high potential for crops, hay, pasture, and trees. It has medium potential for most building site development and medium or low potential for sanitary facilities. This soil has high potential for some recreation uses.

This soil is suited to row crops and small grains. Erosion is the main hazard for row crops. Minimizing tillage, planting cover crops, and using grassed waterways help reduce soil loss. Incorporating crop residue or other organic matter into the surface layer improves tilth and fertility and increases the rate of water infiltration. These practices also reduce crusting and improve soil-seed contact.

The use of this soil for pasture or hayland reduces erosion. Surface compaction, reduced growth, poor tilth, and increased runoff result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing, along with weed control, can help keep the pasture and soil in good condition.

This soil is well suited to trees and shrubs and a few small areas are in native hardwoods. There are no soil hazards or limitations to growing or harvesting trees and shrubs. Seedlings grow well if competing vegetation is controlled or removed by cutting, spraying, girdling, or mowing.

Because of seasonal wetness, moderate shrink-swell potential and strength, and moderately slow permeability, this soil is moderately limited for most building site development, sanitary facilities, and recreation uses. These limitations can be partially or fully overcome by specially designed facilities. Artificial drainage and storm sewers can reduce the wetness limitation. This soil is better suited to houses without basements than to houses with basements. Building sites should be landscaped for good surface drainage away from foundations and septic tank absorption fields. Septic tank systems can be improved by increasing the size of the absorption field. Sanitary facilities should be connected to central sewers and treatment facilities, wherever possible. Local roads can be improved by artificial drainage and suitable base material, which overcome the risk of damage caused by frost action and low strength. Increased runoff and erosion are problems associated with construction. These can be reduced by maintaining plant cover, wherever possible.

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

CeB2—Celina silt loam, 2 to 6 percent slopes, eroded. This gently sloping, deep, moderately well drained soil is on uplands. It is on convex ridgetops, on side slopes above steeper areas, and along well-defined waterways. In some places this soil is on long hillsides. Erosion has removed part of the original surface layer. Tillage has mixed subsoil material into the present surface layer resulting in more clay and coarse fragments. Slopes are mainly 4 to 6 percent. Most areas of this soil are 10 to 55 acres in size.

Typically, the surface layer is brown, friable silt loam about 7 inches thick. The subsoil is about 16 inches thick. The upper part of the subsoil is yellowish brown, firm silty clay loam; the lower part is yellowish brown, mottled, firm clay and clay loam. The substratum to a depth of about 70 inches is glacial till of dark yellowish brown and yellowish brown, mottled, firm loam.

Included with this soil in mapping are narrow strips of very poorly drained Kokomo soils along drainageways and small areas of somewhat poorly drained Crosby soils on foot slopes. Narrow strips with slopes of 6 to 9 percent are also included. These inclusions make up about 15 percent of most areas.

This soil has moderately slow permeability in the subsoil and substratum. The available water capacity is moderate and the organic matter content is moderately low. They have been reduced by erosion. Potential frost action is high. Shrink-swell potential in the subsoil is moderate. Runoff from cultivated areas is medium. Reaction in the subsoil is mainly strongly acid to neutral. This soil has medium natural fertility and good tilth. Roots are restricted below depths of 22 to 33 inches by calcareous glacial till. A seasonal high water table is perched between depths of 18 to 36 inches late in winter, in spring, and in other extended wet periods.

Most areas are farmed. This soil has high potential for crops, hay, pasture, and trees. It has medium potential for most building site development and medium or low potential for sanitary facilities. This soil has high potential for most recreation uses.

This soil is suited to row crops and small grains. Erosion is the main hazard for row crops. Minimizing tillage, planting cover crops, and using grassed waterways reduce soil loss. Incorporating crop residue or other organic matter into the surface layer improves tilth and fertility and increases water infiltration. These practices also reduce crusting and improve soil-seed contact.

The use of this soil for pasture or hayland reduces erosion. Surface compaction, poor tilth, reduced growth, and increased runoff result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing, along with weed control, can help keep the pasture and soil in good condition.

This soil is well suited to trees and shrubs and a few small areas are in native hardwoods. There are no soil hazards or limitations to growing or harvesting trees or shrubs. Seedlings grow well if competing vegetation is controlled or removed by cutting, spraying, girdling, or mowing.

Because of seasonal wetness, moderate shrink-swell potential and low strength, and moderately slow permeability, this soil is moderately limited for building site development, sanitary facilities, and recreation uses. These limitations can be partially or fully overcome by specially designed facilities. Artificial drainage and storm sewers can reduce the wetness limitation. Building sites should be landscaped for good surface drainage away from foundations and septic tank absorption fields. Increased runoff and erosion are problems associated with construction. These can be reduced by maintaining plant cover, wherever possible. Septic tank systems can be improved by increasing the size of the absorption field. Sanitary facilities should be connected to central sewers and treatment facilities, wherever possible. Local roads can be improved by using artificial drainage and a suitable base material.

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

CeC2—Celina silt loam, 6 to 12 percent slopes, eroded. This sloping, deep, moderately well drained soil is on uplands. It is on convex ridgetops, on side slopes above steeper areas, and in long narrow areas along well-defined waterways. In some places this soil is on short slope breaks. Erosion has removed part of the original surface layer. Tillage has mixed subsoil material into the present surface layer, resulting in more clay and coarse fragments. Most areas of this soil are 2 to 25 acres in size.

Typically, the surface layer is brown, friable silt loam about 8 inches thick. The subsoil is about 14 inches thick. The upper part of the subsoil is yellowish brown, firm silty clay loam; the lower part is yellowish brown and brown, mottled, firm silty clay loam and clay loam. The substratum to a depth of about 70 inches is glacial till of yellowish brown, mottled, firm loam.

Included with this soil in mapping are small areas of somewhat poorly drained Crosby soils on foot slopes and narrow strips of very poorly drained Kokomo soils along drainageways. Also included are areas of steeper Lewisburg soils that have a shallower root zone. These inclusions make up about 20 percent of most areas.

This soil has moderately slow permeability in the subsoil and substratum. The available water capacity of this soil is moderate, although it has been reduced by erosion. The organic matter content is moderately low. Potential frost action is high and shrink-swell potential in the subsoil is moderate. Runoff from cultivated areas is rapid. Reaction in the subsoil is mainly strongly acid to neutral. This soil has medium natural fertility and good tilth. Roots are restricted below depths of 22 to 33 inches by calcareous glacial till. A seasonal high water table is perched between depths of 18 and 36 inches late in winter, in spring, and in other extended wet periods.

Most areas of this soil are farmed. Some are in permanent pasture or woodland. This soil has medium potential for crops and high potential for hay, pasture, and trees. It has medium potential for most building site development and low or medium potential for sanitary facilities. This soil has medium potential for many recreation uses.

This soil is suited to row crops and small grains. Erosion is the main hazard for row crops. It has reduced the range of moisture content in which the soil is suitable for tillage. Minimizing tillage, planting cover crops, and using grassed waterways reduce soil loss. Incorporating crop residue or other organic matter into the surface layer improves tilth and fertility and increases water infiltration. These practices also reduce crusting and improve soil-seed contact.

The use of this soil for pasture or hayland reduces erosion. Surface compaction, poor tilth, reduced growth, and increased runoff result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing, along with weed control, can help keep the pasture and soil in good condition.

This soil is well suited to trees and shrubs, and a few small areas are in native hardwoods. There are no soil hazards or limitations to growing or harvesting trees or shrubs. Seedlings grow well if competing vegetation is controlled or removed by cutting, spraying, girdling, or mowing.

Seasonal wetness, slope, and moderately slow permeability severely limit the use of this soil for most building site development and sanitary facilities. These limitations can be partially or fully overcome by specially designed facilities. Artificial drainage and storm sewers can reduce the wetness. Increased runoff and erosion occur during construction. These can be reduced by maintaining plant cover, wherever possible. Septic tank systems can be improved by increasing the size of the absorption field. Sanitary facilities should be connected to central sewers and treatment facilities. Local roads can be improved by using artificial drainage and a suitable base material. Sanitary facilities should be connected to central sewers and treatment facilities. Local roads can be improved by using artificial drainage and a suitable base material.

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

CfB—Celina-Urban land complex, 2 to 6 percent slopes. This map unit consists of a deep, moderately well drained, gently sloping Celina soil on broad upland areas between drainageways and areas of Urban land. Areas commonly have straight line boundaries with distinct corners and range from 40 to several hundred acres in size. The slopes range from 2 to 6 percent, but are commonly more than 3 percent. Most areas are about 45 percent Celina silt loam and 30 percent Urban land. Areas of the Celina soil and the Urban land are so intricately mixed, or so small in size, that it was not practical to separate them in mapping.

Typically, the Celina soil has a brown, friable silt loam surface layer about 8 inches thick. The subsoil is about 20 inches thick. The upper part of the subsoil is brown, firm silty clay loam; the lower part is brown, mottled, firm silty clay loam and clay. The substratum to a depth of about 70 inches is glacial till of yellowish brown, mottled, firm clay loam and brown, mottled, firm loam. Some areas contain better drained soils of 6 to 9 percent slope.

The Urban land part of the unit is covered by buildings and pavements that obscure or alter the soils so that identification is not feasible. The buildings are mostly residential, ranging from single-family houses to apartment complexes. In some places there are industrial and commercial uses.

Included in mapping are areas that are altered by cutting and filling. Because of attempts to change the natural topography, more of the areas have been excavated than filled. Also included are narrow strips of very poorly drained Kokomo soils in depressions, many of which have been filled. These inclusions make up about 25 percent of most areas.

Most areas of this map unit have been drained by sewer systems, gutters, and artificial drains. Undrained areas of the Celina soil have a seasonal high water table between depths of 18 to 36 inches late in winter, in spring, and in other extended wet periods. This soil has moderately slow permeability and a moderate organic matter content, available water capacity, and shrink-swell potential in the subsoil. The potential frost action is high. Celina soil has medium natural fertility and good tilth. Reaction in the subsoil is mainly strongly acid to neutral. Roots are restricted below depths of 20 to 33 inches by calcareous glacial till.

The Celina soil is used for parks, open space, lawns, and gardens. It has high potential for lawns, vegetable and flower gardens, trees, and shrubs. This soil has medium potential for most building site development, low or medium potential for sanitary facilities, and high potential for most recreation uses.

The Celina soil is well suited to grasses, flowers, trees, and shrubs. The high lime content in the substratum causes nutrient deficiencies in some deep-rooted plants. This can be partially overcome by special onsite diagnosis and treatment. Soil erosion generally is not a major problem on this unit unless the soil is disturbed and left in a bare, exposed condition for a considerable period. The included spots of cut and fill land are not well suited to lawns and gardens. Subsoil material which is exposed on the surface has very poor tilth. It is sticky when wet and hard when dry.

The seasonal wetness, moderate shrink-swell potential and strength, and moderately slow permeability of the Celina soil are somewhat limiting for building site development and sanitary facilities. These limitations can be partially or fully overcome by specially designed facilities. Building sites should be landscaped for good surface drainage away from foundations and septic tank absorption fields. Septic tank systems can be improved by increasing the size of the absorption field. Sanitary facilities should be connected to central sewers and treatment facilities, wherever possible. Local roads and streets can be improved by artificial drainage and suitable base material, which overcome the risk of damage by frost action and low strength.

The Celina soil is in capability subclass IIe and woodland suitability subclass 1o; Urban land is not assigned to a capability subclass or woodland suitability subclass.

Cn—Condit silt loam. This nearly level, deep, poorly drained soil is on uplands. It commonly is in slight depressions surrounded by Bennington soils. It also occurs at the heads of waterways and as narrow bands along small waterways. In some places this soil occurs as small islands in large areas of Pewamo soils. Most areas are 4 to 20 acres in size.

Typically, the surface layer is dark gray and gray, friable silt loam about 11 inches thick. The subsoil is about 42 inches thick. The upper and middle parts of the subsoil are gray, mottled, friable and firm silty clay loam and silty clay; the lower part is yellowish brown, mottled, firm silty clay loam. The substratum to a depth of about 70 inches is glacial till of olive gray and olive brown, mottled, firm clay loam and loam.

Included with this soil in mapping are very poorly drained Pewamo soils in small depressions and in narrow strips along waterways. Also included are areas of somewhat poorly drained Bennington soils on slightly higher landscape positions. These inclusions make up about 10 percent of most areas.

Permeability is slow. The available water capacity, organic matter content, and shrink-swell potential are moderate. The potential frost action is high. Runoff is very slow. Reaction ranges from very strongly acid in the upper part of the subsoil to mildly alkaline in the lower part. This soil has medium natural fertility and good tilth. The surface layer can be worked through a fairly wide range of moisture content. A seasonal high water table is near the surface in winter, spring, and other extended wet periods. The root zone is deep.

Most areas of this soil are used for permanent pasture or are wooded. This soil has medium potential for crops. It has low potential for most building site development, sanitary facilities, and recreation uses.

Wetness is the main limitation for farming. Drained areas are suited to row crops. Stands of wheat and oats in inadequately drained areas are poor in most years. Surface drains are commonly used to remove excess surface water. Minimizing tillage and planting deep-rooted crops increase infiltration and percolation. Incorporating crop residue or other organic matter into the surface layer improves tilth and fertility and increases water infiltration. These practices also reduce crusting and improve soil-seed contact.

This soil is suited to water-tolerant grasses and legumes for pasture and hay. Surface compaction, reduced growth, poor tilth, and decreased water infiltration result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing, along with weed control, can help keep the pasture and soil in good condition.

This soil is suited to trees and shrubs that are adapted to wet sites, and many areas are producing native wetland hardwoods. Seedlings of adapted species grow well if competing vegetation is controlled or removed by cutting, spraying, girdling, or mowing. Wetness limits the use of tree planting and harvesting equipment.

This soil is severely limited for building site development, sanitary facilities, and recreation uses because of slow permeability, wetness, and low strength. In some places artificial drains are effective in reducing the wetness. Local roads can be improved by using artificial drainage and a suitable base material. Building sites should be landscaped for good surface drainage away from the foundations and septic tank absorption fields. Sanitary facilities should be connected to central sewers and treatment facilities, wherever possible.

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

CpA—Crane silt loam, 0 to 2 percent slopes. This nearly level, deep, somewhat poorly drained soil is on stream terraces and outwash plains. A few areas are along drainageways in the uplands. Most areas range from 10 to 90 acres in size.

Typically, the surface layer is black, friable silt loam about 9 inches thick. The subsurface layer is black, friable silty clay loam about 7 inches thick. The subsoil is about 27 inches thick. The upper part of the subsoil is dark grayish brown, mottled, firm silty clay loam and clay loam. The substratum to a depth of about 70 inches is pale brown, friable gravelly loam in the upper part and light brownish gray, loose gravelly sand in the lower part. Some areas have a lighter colored surface layer.

Included with this soil in mapping are small areas of moderately well drained soils on flood plains. These inclusions make up about 10 percent of most areas.

Permeability is moderately slow in the subsoil and very rapid in the substratum. The available water capacity, organic matter content, and potential frost action are high. The shrink-swell potential in the subsoil is moderate. Runoff is slow. Reaction ranges from slightly acid or neutral in the upper part of the subsoil to mildly alkaline in the lower part. This soil has high natural fertility and good tilth. It has a seasonal high water table between depths of 12 and 36 inches in winter, spring, and other extended wet periods. The root zone is deep.

Most areas of this soil are farmed. This soil has high potential for crops, hay, pasture, and trees. It has low potential for most building site development and sanitary facilities. This soil has medium potential for most recreation uses.

This soil is suited to row crops grown year after year and to small grains. Wetness is the main limitation for farming. This soil warms slowly and dries later in the spring in undrained areas. Most cropland has been drained. Subsurface drainage systems are the common method of drainage. Good drainage outlets are not available in some areas. Minimizing tillage and planting cover crops are good management practices. Incorporating crop residue or other organic matter into the surface layer increases water infiltration and improves tilth and fertility. These practices also reduce crusting and improve soil-seed contact.

This soil is suited to pasture or hay. Grazing is sometimes delayed in spring because of wetness. Surface compaction, poor tilth, reduced growth, and decreased infiltration rates result from overgrazing or grazing when the soil is soft and sticky because of wetness. Varieties tolerant of some wetness should be used in new seedings.

This soil is well suited to trees and shrubs that tolerate some wetness. A few small areas are in native hardwoods. Seedlings grow well if competing vegetation is controlled or removed by cutting, spraying, girdling, or mowing.

The seasonal wetness severely limits the use of this soil as a site for buildings and sanitary facilities and is moderately limited for most recreation uses. This soil is also limited for sanitary facilities by the possible pollution of underground water supplies. These limitations can be partially or fully overcome by specially designed facilities. Artificial drains are effective in reducing the wetness in most areas. Landscaping building sites keeps surface water away from foundations and septic tank absorption fields. Sanitary facilities should be connected to central sewers and treatment facilities, wherever possible. Excavations are limited during winter and spring by the high water table and sloughing banks.

This soil is in capability subclass IIw; it is not assigned to a woodland suitability subclass.

CrA—Crosby silt loam, 0 to 2 percent slopes. This nearly level, deep, somewhat poorly drained soil is on narrow to broad upland areas between Celina soils on low knolls and ridges and Kokomo soils in depressions. It also occurs as fan-shaped areas at the heads of waterways and as bands along small waterways. Most areas are 4 to 45 acres in size, and some areas are more than 100 acres.

Typically, the surface layer is dark grayish brown, friable silt loam about 9 inches thick. A transitional layer of brown, mottled, firm silty clay loam is about 4 inches thick. The subsoil, which extends to a depth of about 28 inches, is brown and yellowish brown, mottled, firm and very firm clay loam and silty clay loam. The substratum to a depth of about 70 inches is glacial till of yellowish brown and brown, mottled, firm clay loam and loam. Some areas have slopes of 2 to 4 percent.

Included with this soil in mapping are small areas of very poorly drained Kokomo soils in depressions and moderately well drained Celina soils on low knolls. These inclusions make up about 15 percent of most areas.

Permeability is slow. The available water capacity, organic matter content, and shrink-swell potential in the subsoil are moderate. The potential frost action is high. Runoff is slow. Reaction ranges from medium acid in the upper part of the subsoil to mildly alkaline in the lower part. This soil has medium natural fertility and good tilth. The surface layer can be worked through a fairly wide range of moisture content. A seasonal high water table is between depths of 12 and 36 inches late in winter, in spring, and in other extended wet periods. The root zone is mainly moderately deep over compact glacial till.

Most areas of this soil are farmed. When drained, this soil has high potential for crops, hay, and pasture. It has low potential for most building site development and sanitary facilities. It has medium potential for most recreation uses.

This soil is suited to row crops and small grains. Wetness is the main limitation for farming. Surface drains and land smoothing are commonly used to remove surface water. Subsurface drains are used to lower the seasonal high water table. Tillage at proper moisture levels is important to maintain good soil structure (fig. 3). Minimizing tillage and incorporating crop residue or other organic matter into the surface layer improve tilth and fertility and increase water infiltration. These practices will also reduce crusting and improve soil-seed contact.

This soil is suited to pasture or hay. Surface compaction, reduced growth, poor tilth, and decreased water infiltration can result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and de-

Figure 3.—Tillage on Crosby silt loam, 0 to 2 percent slopes, should be done at proper moisture levels to maintain good soil structure.

ferment of grazing, along with weed control, can help keep the pasture and soil in good condition.

This soil is well suited to trees and shrubs that tolerate some wetness, and a few areas are producing native hardwoods. Seedlings of adapted species grow well if competing vegetation is controlled or removed by cutting, spraying, girdling, or mowing.

This soil is severely limited for building site development and sanitary facilities and moderately limited for most recreation uses because of slow permeability, seasonal wetness, and low strength. These limitations can be partially or fully overcome by specially designed facilities. Local roads can be improved by using artificial drainage and a suitable base material. Surface and subsurface drains are effective in reducing the wetness. Building sites should be landscaped for good surface drainage away from the foundations and septic tank absorption fields. Absorption fields should be located on the higher part of the landscape. Sanitary facilities should be connected to central sewers and treatment facilities, wherever possible.

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

CrB—Crosby silt loam, 2 to 6 percent slopes. This gently sloping, deep, somewhat poorly drained soil is in narrow to broad upland areas between Celina soils on knolls and ridges and Kokomo soils in depressions and along waterways. It also occurs in fan-shaped areas at the heads of waterways and as bands along small waterways. In some places this soil is on low knolls. Most areas 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 16 inches thick. The upper part of the subsoil is brown and dark yellowish brown, mottled, firm silty clay loam and silty clay; the lower part is yellowish brown, mottled, firm clay loam. The substratum to a depth of about 70 inches is glacial till of yellowish brown, mottled, firm clay loam and loam.

Included with this soil in mapping are small areas of very poorly drained Kokomo soils along waterways and in depressions and moderately well drained Celina soils on low knolls. These inclusions make up about 15 percent of most areas.

Permeability is slow. The available water capacity, organic matter content, and shrink-swell potential in the subsoil are moderate. The potential frost action is high. Runoff is medium. Reaction ranges from medium acid in the upper part of the subsoil to mildly alkaline in the lower part. This soil has medium natural fertility and good tilth. The surface layer can be worked through a fairly wide range of moisture content. A seasonal high water table is between depths of 12 to 36 inches late in winter, in spring, and in other extended wet periods. The root zone is mainly moderately deep over compact glacial till.

Most areas of this soil are farmed. When drained, this soil has high potential for crops, hay, and pasture. It has low potential for most building site development and sanitary facilities. This soil has medium potential for most recreation uses.

This soil is well suited to row crops (fig. 4) and small grains. Wetness and the erosion hazard are the main limitations for farming. Surface drains are commonly used to remove excess surface water. Subsurface drains are used to lower the seasonal high water table. Minimizing tillage and incorporating crop residue or other organic matter into the surface layer reduce erosion, increase water infiltration, and improve tilth and fertility. These practices also reduce crusting and improve soil-seed contact.

This soil is suited to pasture or hay. Surface compaction, reduced growth, poor tilth, and decreased infiltration can result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing, along with weed control, can help keep the pasture and soil in good condition.

This soil is well suited to trees and shrubs that tolerate some wetness, and a few areas are producing native hardwoods. Seedlings of adapted species grow well if competing vegetation is controlled or removed by cutting, spraying, girdling, or mowing.

This soil is severely limited for building site development and sanitary facilities and moderately limited for most recreation uses because of slow permeability, seasonal wetness, and low strength. These limitations can be partially or fully overcome by special facilities whose designs are based on specific onsite investigations. Artificial drains are effective in reducing the wetness. Building sites should be landscaped for good surface drainage away from the foundations. Increased runoff and erosion occur during construction. Plant cover should be maintained on the site as much as possible to reduce soil loss. Sanitary facilities should be connected to commercial sewers and treatment facilities, wherever possible.

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

CsA—Crosby-Urban land complex, 0 to 2 percent slopes. This map unit consists of a deep, nearly level, somewhat poorly drained Crosby soil and areas of Urban land on broad upland areas between drainageways. The areas commonly have straight line boundaries with distinct corners and range from 40 to several hundred acres in size. The slope is dominantly less than one percent. Most areas are about 45 percent Crosby silt loam soil and 30 percent Urban land. The pattern of occurrence is too complex to separate the Crosby soil from the Urban land in mapping.

Typically, the Crosby soil has a surface layer of dark

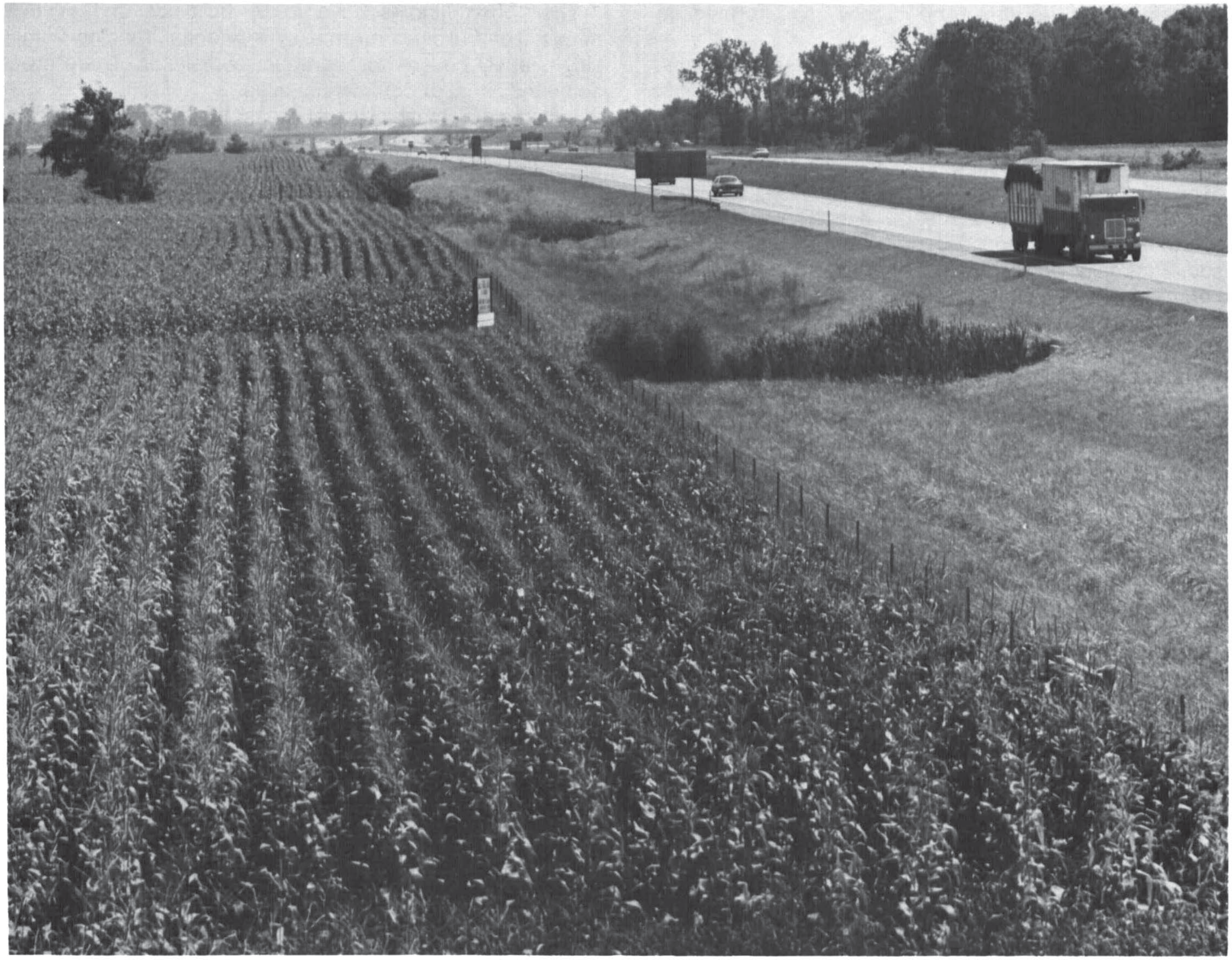


Figure 4.—Crosby silt loam, 2 to 6 percent slopes, is well suited to crops. Land use is shifting to other uses, such as highways.

grayish brown, friable silt loam about 9 inches thick. The subsoil is about 20 inches thick. It is brown and yellowish brown, mottled, firm silty clay loam and clay loam. The substratum to a depth of about 70 inches is glacial till of yellowish brown and brown, mottled, firm clay loam and loam.

The Urban land is mainly covered by buildings and pavement. The buildings are mostly residential, ranging from single-family houses to apartment complexes, and there are some industrial and commercial uses.

Included in mapping are areas that are altered by cutting and filling. Because of attempts to change natural drainage more filling than excavating has occurred in most areas. Also included are narrow strips of very poorly drained Kokomo soils along waterways and small areas of moderately well drained Celina soils on low knolls and ridges. These inclusions make up about 25 percent of most areas.

Most areas of this map unit have been artificially drained by sewer systems, gutters, and subsurface drains. Crosby areas that are not drained have a seasonal high water table between depths of 12 and 36 inches late in winter, in spring, and in other extended wet periods. This soil has slow permeability and high potential frost action. The organic matter content, available water capacity, and shrink-swell potential in the subsoil are moderate. Runoff is slow. The Crosby soil has medium natural fertility and good tilth.

The Crosby soil is used for parks, open space, lawns, and gardens. It has high potential for lawns, gardens, trees, and shrubs. This soil has low potential for most building site development and sanitary facilities and medium potential for most recreation uses.

The Crosby soil is well suited to grasses, flowers, vegetables, trees, and shrubs if excess water is removed. Several methods of artificial drainage can be used. Perennial plants selected for planting should be tolerant of some wetness. Soil erosion is generally not a major problem on this unit unless the soil is disturbed and left in a bare, exposed condition for a considerable period of time. The included spots of cut and fill land are not well suited to lawns and gardens. Subsoil material which is exposed on the surface has very poor tilth. It is sticky when wet and hard when dry.

The Crosby soil is severely limited for building site development and sanitary facilities because of slow permeability, seasonal wetness, and low strength. These limitations can be partially or fully overcome by specially designed facilities. Building sites should be landscaped for good surface drainage away from foundations and septic tank absorption fields. Absorption fields should be located on the higher part of the landscape. Local roads and streets can be improved by covering or replacing the upper layer of the Crosby soil with a suitable base material. Most sanitary facilities are connected to central sewers and treatment facilities. Where possible, the small included areas of Celina soils should be selected for building sites.

The Crosby soil is in capability subclass IIw and woodland suitability subclass 3o; Urban land is not assigned to a capability subclass or a woodland suitability subclass.

CsB—Crosby-Urban land complex, 2 to 6 percent slopes. This map unit consists of a deep, gently sloping, somewhat poorly drained Crosby soil and areas of Urban land on broad upland areas between drainageways. The areas commonly have straight line boundaries with distinct corners and range from 40 to several hundred acres in size. Slope ranges from 2 to 6 percent but is dominantly 2 to 4 percent. Most areas are about 45 percent Crosby silt loam and 30 percent Urban land. The pattern of occurrence is complex, and it is not practical to separate the Crosby soil from the Urban land in mapping.

Typically, the Crosby soil has a dark grayish brown, friable silt loam surface layer about 9 inches thick. The subsoil, which extends to a depth of about 26 inches, is brown, mottled, friable silty clay loam and yellowish brown, mottled, firm clay loam. The substratum to a depth of about 70 inches is glacial till of yellowish brown, mottled, firm clay loam and loam.

The Urban land is covered by buildings and pavements. The buildings are mostly residential, ranging from single-family houses to apartment complexes. There are some industrial or commercial uses.

Included in mapping are areas that are altered by cutting and filling. Because of attempts to change natural drainage more filling than excavating has occurred in most areas. Also included are narrow strips of very poorly drained Kokomo soils along waterways and small areas of moderately well drained Celina soils on low knolls and ridges. These inclusions make up about 25 percent of most areas.

Most areas of this map unit have been artificially drained by sewer systems, gutters, and subsurface drains. Crosby areas that are not drained have a seasonal high water table between depths of 12 and 36 inches late in winter, in spring, and in other extended wet periods. This soil has slow permeability and high potential frost action. The organic matter content, available water capacity, and shrink-swell potential in the subsoil are moderate. Runoff is medium. This soil has medium natural fertility and good tilth.

The Crosby soil is used for parks, open space, lawns, and gardens. It has high potential for lawns, gardens, trees, and shrubs. This soil has low potential for most building site development and sanitary facilities and medium potential for many recreation uses.

The Crosby soil is well suited to grasses, flowers, vegetables, trees, and shrubs if excess water is removed. Several methods of artificial drainage can be used. Perennial plants selected for planting should be tolerant of some wetness. Increased runoff and erosion occur during construction. Plant cover should be maintained on the site as much as possible to reduce the erosion hazard. The included spots of cut and fill land are not well suited to lawns and gardens. Subsoil material which is exposed on the surface has very poor tilth. It is sticky when wet and hard when dry.

The Crosby soil is severely limited for building site development and sanitary facilities because of slow permeability, seasonal wetness, and low strength. These limitations can be partially or fully overcome by specially designed facilities. Building sites should be landscaped for good surface drainage away from foundations and septic tank absorption fields. Absorption fields should be located on the higher part of the landscape. Local roads and streets can be improved by covering or replacing the upper layers of the Crosby soil with a suitable base material. Most sanitary facilities are connected to central sewers and treatment facilities. Where possible, the small included areas of Celina soil should be selected for building sites.

The Crosby soil is in capability subclass IIe and woodland suitability subclass 3o; Urban land is not assigned to a capability subclass or woodland suitability subclass.

Ee—Eel silt loam, occasionally flooded. This nearly level, deep, moderately well drained soil is dominantly in narrow to broad areas on wide flood plains with some areas in small stream valleys. Flooding may occur at any time of the year, but commonly occurs for brief periods in fall, winter, and spring. Slope is 0 to 2 percent. Most areas range from 10 to 50 acres in size; some are more than 100 acres.

Typically, the surface layer is brown, friable silt loam about 8 inches thick. The substratum to a depth of about 70 inches is brown, friable silt loam in the upper part and brown and light brownish gray, mottled, friable clay loam in the lower part.

Included with this soil in mapping are small areas of very poorly drained Sloan soils that are commonly in old high water channels near slope breaks to uplands or terraces. Also included are small areas of well drained Genesee soils on slightly elevated positions and somewhat poorly drained Shoals soils in slightly lower positions. These inclusions make up about 15 percent of most areas.

Permeability is moderate, and the available water capacity is high. Organic matter content is moderate. Natural fertility is medium. The shrink-swell potential is low and potential frost action is high. This soil is neutral to moderately alkaline. Runoff is slow. The soil has good tilth and a deep root zone. A seasonal high water table occurs between depths of 36 and 72 inches.

Most areas of this soil are farmed. This soil has high potential for row crops. This soil has low potential for most building site development and sanitary facilities. It has medium potential for most recreation uses and high potential as a source of topsoil.

This soil is suited to growing continuous row crops and to pasture and hay. Winter grain crops are limited by the flooding hazard. The surface layer is easily worked through a wide range of moisture content. Dikes can be used to help prevent flooding in some areas. Minimizing tillage, incorporating crop residue, and planting cover crops can help maintain tilth, reduce crusting, and protect the surface in areas that are subject to scouring during floods. Randomly spaced subsurface drains are needed in some areas of the included wetter soils.

This soil is well suited to trees and shrubs. Some areas are used for nurseries. Spraying, mowing, or disking reduce plant competition.

This soil is severely limited for building site development and sanitary facilities by the flooding hazard and wetness. In some places, extensive filling has occurred to prepare sites for building. It is suited to such recreation uses as picnic areas and paths and trails.

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

ElA—Eldean silt loam, 0 to 2 percent slopes. This nearly level, deep, well drained soil is on broad and long and narrow stream terraces and on broad outwash plains. Slopes are dominantly 1 or 2 percent. Most areas are 4 to 40 acres in size.

Typically, the surface layer is brown, friable silt loam about 9 inches thick. The subsoil, which extends to a depth of about 28 inches, is brown and reddish brown, firm clay loam, clay, and gravelly clay loam. The substratum to a depth of about 70 inches is brown, loose gravelly sand.

Included with this soil in mapping are small areas of Ockley soils with a thicker subsoil on broad flats and somewhat poorly drained Sleeth soils in slight depressions. Also included are a few small areas of very poorly drained Westland soils along drainageways and in depressions. These inclusions make up about 20 percent of most areas.

Permeability is moderate or moderately slow in the subsoil and rapid or very rapid in the substratum. The available water capacity is low or moderate and potential frost action is moderate. The organic matter content and shrink-swell potential in the subsoil are moderate. Runoff from cultivated areas is slow. Reaction ranges from medium acid in the upper part of the subsoil to mildly alkaline in the lower part. This soil has medium natural fertility and good tilth. The root zone is mainly moderately deep over calcareous sand and gravel.

Most areas of this soil are farmed, and a few are being mined for sand and gravel. This soil has high potential for crops, hay, pasture, and trees. It has high potential for most building site development and recreation uses and as a source of sand and gravel. It has low potential for water impoundment because of the rapidly or very rapidly permeable substratum.

This soil is suited to row crops and small grains. Droughtiness is the main limitation. Row crops can be grown continuously under a high level of management. The surface layer can be worked through a fairly wide range of moisture content. This soil is well suited to irrigation. Minimizing tillage and planting cover crops are good management practices, especially when the soil is planted to row crops year after year. Incorporating crop residue or other organic matter into the surface layer increases water infiltration and improves tilth and fertility. These practices also reduce crusting and improve soil-seed contact.

This soil is well suited to grazing early in spring. Surface compaction, reduced growth, and poor tilth result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing, along with weed control, can help keep the pasture and soil in good condition.

This soil is well suited to trees and shrubs, and a few small areas are in native hardwoods. Seedlings grow well if competing vegetation is controlled or removed by cutting, spraying, girdling, or mowing.

Although soil strength and shrink-swell potential are moderate limitations, this soil is well suited as a site for buildings. The strength limitation can be overcome by extending the building foundation to the substratum. Local roads can be improved by replacing the subsoil with a suitable base material. If used for certain types of sanitary facilities, ground water pollution can result because of the rapid or very rapid permeability in the substratum. Sanitary facilities should be connected to central sewers and treatment facilities, wherever possible. This soil is droughty for lawns during dry periods. It is a good source of sand and gravel.

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

ElB—Eldean silt loam, 2 to 6 percent slopes. This gently sloping, deep, well drained soil is on undulating areas on long narrow stream terraces and broad outwash plains. Some areas are on low knolls. Slopes are dominantly 3 to 5 percent. Most areas are 4 to 75 acres in size.

Typically, the surface layer is brown, friable silt loam about 7 inches thick. The subsoil is about 28 inches thick. The upper part is brown and reddish brown, friable and firm clay loam; the lower part is brown, firm gravelly clay and dark brown, friable gravelly sandy clay loam. The substratum to a depth of about 70 inches is brown, loose gravelly sand.

Included with this soil in mapping are small areas of Ockley soils with a thicker subsoil on broad flats, somewhat poorly drained Sleeth soils in slight depressions, and very poorly drained Westland soils along drainageways. These inclusions make up about 15 percent of most areas.

Permeability is moderate or moderately slow in the subsoil and rapid or very rapid in the substratum. The available water capacity is low or moderate, and potential frost action is moderate. The organic matter content and shrink-swell potential in the subsoil are moderate. Runoff from cultivated areas is medium, and erosion is a hazard. Reaction ranges from medium acid in the upper part of the subsoil to mildly alkaline in the lower part. This soil has medium natural fertility and good tilth. The root zone is mainly moderately deep over calcareous sand and gravel.

Most areas of this soil are farmed. This soil has high potential for crops, hay, pasture, trees, building site development and recreation uses and as a source of sand and gravel. It has low potential for water impoundment because of the rapidly or very rapidly permeable substratum.

This soil is well suited to row crops and small grains. The surface layer can be worked through a fairly wide range of moisture content. Because of the limited available water capacity it is better suited to early maturing crops than to crops that mature late in summer.

Droughtiness and controlling erosion are the main management concerns. This soil is well suited to irrigation. Minimizing tillage, planting cover crops, and using grassed waterways can reduce runoff and soil loss. Incorporating crop residue or other organic matter into the surface layer increases water infiltration and improves tilth and fertility. These practices also reduce crusting and improve soil-seed contact.

This soil is well suited to grazing early in spring. Surface compaction, reduced growth, and poor tilth result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing, along with weed control, can help keep the pasture and soil in good condition.

This soil is well suited to trees and shrubs, and a few small areas are in native hardwoods. Seedlings grow well if competing vegetation is controlled or removed by cutting, spraying, girdling, or mowing.

Although soil strength and shrink-swell potential are moderate limitations, this soil is well suited as a site for buildings. The low strength can be overcome by extending building foundations to the substratum. Local roads can be improved by replacing the subsoil with suitable base material. Increased runoff and erosion occur during construction. These can be reduced by maintaining plant cover, wherever possible. If used for certain types of sanitary facilities, ground water pollution can result because of the rapid or very rapid permeability in the substratum. This soil is droughty for lawns during dry periods. It is a good source of sand and gravel.

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

ElC2—Eldean silt loam, 6 to 12 percent slopes, eroded. This sloping, deep, well drained soil is on slope breaks on stream terraces and outwash plains. It is also on kames and side slopes of valleys. Slopes range from 6 to 12 percent but are dominantly more than 8 percent. Erosion has removed part of the original surface layer. Tillage has mixed subsoil material into the surface layer, resulting in more clay and coarse fragments. Most areas are 4 to 75 acres in size.

Typically, the surface layer is brown, friable silt loam about 6 inches thick. The subsoil, which extends to a depth of about 26 inches, is dark yellowish brown, firm clay loam; reddish brown, firm clay; and dark reddish brown, firm gravelly clay loam. The substratum to a depth of about 70 inches is brown, loose gravelly sand.

Included with this soil in mapping are small areas of Kendallville soils that are underlain with glacial till where the terraces grade to the uplands and narrow strips of Ockley soils that have a thicker subsoil on the lower parts of slopes. Also included are scattered droughty spots with sand and gravel at a depth less than 20 inches. These inclusions make up about 15 percent of most areas.

Permeability is moderate or moderately slow in the subsoil and rapid or very rapid in the substratum. The available water capacity is low and potential frost action is moderate. The organic matter content is moderately low, and shrink-swell potential in the subsoil is moderate. Runoff from cultivated areas is rapid, and erosion is a hazard. Reaction ranges from medium acid in the upper part of the subsoil to mildly alkaline in the lower part. This soil has low natural fertility and good tilth. The root zone is mainly moderately deep over calcareous sand and gravel.

Most areas of this soil are farmed. This soil has medium potential for crops, most building site development, and recreation uses. This soil has low potential for water impoundment because of the rapidly or very rapidly permeable substratum. It has high potential as a source of sand and gravel and for hay and pasture.

Erosion is the main hazard for crops. During extended dry periods this soil is droughty. Because of the limited available water capacity, it is better suited to early maturing crops than to crops that mature late in summer. The surface layer can be worked through a fairly wide range of moisture content. Minimizing tillage, planting cover crops, and using grassed waterways can reduce runoff and soil loss. Incorporating crop residue or other organic matter into the surface layer increases water infiltration and improves tilth and fertility. These practices also reduce crusting and improve soil-seed contact.

Including long-term hay or pasture in the cropping system reduces the erosion hazard. This soil is well suited to grazing early in spring. Surface compaction, reduced growth, and poor tilth result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing, along with weed control, can help keep the pasture and soil in good condition.

This soil is well suited to trees and shrubs, and a few small areas are in native hardwoods. Nutrient deficiencies in some plants occur in the included spots that are shallow over calcareous sand and gravel. Plant competition can be reduced by cutting, spraying, girdling, or mowing. Logging roads and skid trails should be protected against erosion.

The slope, soil strength, shrink-swell potential, and possible pollution of underground water supplies limit this soil as a site for buildings, sanitary facilities, and recreation uses. Increased runoff and erosion occur during construction. These can be reduced by maintaining plant cover, wherever possible. The low strength can be overcome by extending building foundations to the substratum. Local roads can be improved by replacing the subsoil with a suitable base material. This soil is droughty for lawns during dry periods. Trails in recreation areas should be protected against erosion and established across the slope, wherever possible. This soil is a good source of sand and gravel.

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

EID2—Eldean silt loam, 12 to 18 percent slopes, eroded. This moderately steep, deep, well drained soil is on short slope breaks on stream terraces and outwash plains. It is also on kames and side slopes of valleys. Slopes range from 12 to 18 percent, but are dominantly 12 to 15 percent.

Typically, the surface layer is brown, friable silt loam about 6 inches thick. The subsoil, which extends to a depth of about 24 inches, is reddish brown and dark reddish brown, firm clay loam, clay, and gravelly clay loam. The substratum to a depth of about 70 inches is brown, loose gravelly sand.

Included with this soil in mapping are long narrow areas of Eldean soils on steep slopes, small areas of Kendallville soils that are underlain with glacial till on breaks to uplands, and narrow strips of Ockley soils that have a thicker subsoil on the lower part of slopes. Some areas on shoulder slopes have sand and gravel at a depth of less than 20 inches and are very droughty. These inclusions make up about 15 percent of most areas.

Permeability is moderate or moderately slow in the subsoil and rapid or very rapid in the substratum. The available water capacity is low, and the organic matter content is moderately low. The potential frost action and shrink-swell potential in the subsoil are moderate. Runoff from cultivated areas is very rapid, and erosion is a hazard. Reaction ranges from medium acid in the upper part of the subsoil to mildly alkaline in the lower part. This soil has low natural fertility and good tilth. The root zone is mainly moderately deep over calcareous sand and gravel.

Most areas of this soil are in vegetation. Some areas adjacent to less sloping areas are being farmed. This soil has low potential for crops and medium potential for pasture and hay. It has low potential for most building site development, sanitary facilities, recreation uses, and water impoundments because of the rapidly or very rapidly permeable substratum. It has high potential as a source of sand and gravel.

This soil is limited for crops because of slope and erosion hazards. Row crops can be grown occasionally if erosion is controlled under a good management program. This soil is droughty. It is better suited to early maturing crops than to crops that mature late in summer. The surface layer can be worked through a fairly wide range of moisture content. Minimizing tillage, planting cover crops, and using grassed waterways can help reduce runoff and soil loss. Incorporating crop residue or other organic matter into the surface layer increases water infiltration and improves tilth and fertility. These practices reduce crusting and improve soil-seed contact.

This soil is well suited to grazing early in spring. Surface compaction, reduced growth, and poor tilth result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing, along with weed control, can help keep the pasture and soil in good condition.

This soil is suited to trees and shrubs, and some areas are in native hardwoods. Nutrient deficiencies in some plants may occur in the included spots that are shallow over calcareous sand and gravel. Seedlings grow well if competing vegetation is controlled or removed by cutting, spraying, girdling, or mowing. Logging roads and skid trails should be protected against erosion and established across the slope, wherever possible.

This soil is severely limited for most building site development, sanitary facilities, and recreation uses because of slope and possible pollution of underground water supplies. Increased runoff and erosion occur during construction. Plant cover should be maintained on the site as much as possible to reduce the erosion hazard. This soil is droughty for lawns. Trails in recreation areas should be protected against erosion and established across the slope, wherever possible. This soil is a good source of sand and gravel.

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

EmA—Eldean-Urban land complex, 0 to 2 percent slopes. This map unit consists of a deep, nearly level, well drained Eldean soil and areas of Urban land on stream terraces. The areas occur as long narrow bands and range from about 8 to 70 acres in size. Slope is dominantly less than one percent. Most areas are about 45 percent Eldean silt loam and 30 percent Urban land. The pattern of occurrence is complex, and it is not practical to separate the Eldean soil and Urban land in mapping.

Typically, the Eldean soil has a surface layer of brown, friable silt loam about 7 inches thick. The subsoil is about 28 inches thick. The upper part of the subsoil is brown and dark reddish brown, firm silty clay loam and clay loam; the lower part is dark yellowish brown and brown, firm clay loam and clay. The substratum to a depth of about 70 inches is yellowish brown, loose stratified gravelly sand.

The Urban land is covered by buildings and pavement. The buildings are mostly used for industrial and commercial purposes. Some are single-family houses and apartments.

Included in mapping are areas that are radically altered by cutting and filling. Also included are narrow strips along drainageways and in depressions of very poorly drained Westland and somewhat poorly drained Sleeth soils. These inclusions make up about 25 percent of most areas of this unit.

Permeability is moderate or moderately slow in the subsoil and rapid or very rapid in the substratum of the Eldean soil. It has a moderate organic matter content, low or moderate available water capacity, moderate shrink-swell potential in the subsoil, and moderate potential frost action. Runoff is slow. The Eldean soil has medium natural fertility and good tilth. The root zone is mainly moderately deep over calcareous sand and gravel.

The Eldean soil is used for parks, open space, lawns, and gardens. It has good potential for lawns, vegetable and flower gardens, trees, and shrubs. It has high potential for building site development and recreation uses. This soil has low potential for water impoundment because of the rapidly or very rapidly permeable substratum.

The Eldean soil is well suited to grasses, flowers, vegetables, trees, and shrubs. It is droughty during dry periods, and watering is necessary for good growth. Soil erosion is generally not a problem unless the soil is disturbed and left unprotected. The included spots of cut and fill land are not well suited to lawns and gardens. Subsoil material which is exposed on the surface has very poor tilth. It is sticky when wet and hard when dry.

Although soil strength and shrink-swell potential are moderate limitations, the Eldean soil is well suited as a site for buildings. The strength limitation can be overcome by extending the building foundation to the substratum. Local roads can be improved by replacing the subsoil with a suitable base material. Small stones in the surface layer interfere with such intensive recreation uses as baseball diamonds. If the Eldean soil is used for sanitary facilities, there is a hazard of polluting underground water supplies. Sanitary facilities should be connected to central sewers and treatment facilities.

The Eldean soil is in capability subclass IIs and woodland suitability subclass 2o; Urban land is not assigned to either a capability subclass or woodland suitability subclass.

EmB—Eldean-Urban land complex, 2 to 6 percent slopes. This map unit consists of a deep, gently sloping, well drained Eldean soil and areas of Urban land on stream terraces. The areas occur as long narrow bands and range from about 30 to 150 acres in size. The slope ranges from 2 to 6 percent, but is dominantly less than 4 percent. Most areas are about 45 percent Eldean silt loam and 30 percent Urban land. The pattern of occurrence is complex, and it is not practical to separate the Eldean soil and the Urban land in mapping.

Typically, the Eldean soil has a surface layer of brown, friable silt loam about 9 inches thick. The subsoil is about 19 inches thick. The upper part of the subsoil is brown and reddish brown, firm and very firm clay loam; the lower part is reddish brown, very firm clay and friable gravelly clay loam. The substratum to a depth of about 70 inches is brown, loose stratified gravelly sand.

The Urban land is covered by buildings and pavements. The buildings are mostly used for industrial and commercial purposes. Some are single-family houses and apartments.

Included in mapping are scattered areas that are radically altered by cutting and filling. The excavated areas commonly have sand and gravel on the surface, whereas the filled areas are commonly deep over sand and gravel. Also included are small strips along drainageways and in depressions of very poorly drained Westland and somewhat poorly drained Sleeth soils. These inclusions make up about 25 percent of most areas of this unit.

Permeability is moderate or moderately slow in the subsoil and rapid or very rapid in the substratum of the Eldean soil. It has a moderate organic matter content, low or moderate available water capacity, moderate shrink-swell potential in the subsoil, and low potential frost action. Runoff is medium. The Eldean soil has medium natural fertility and good tilth. The root zone is mainly moderately deep over calcareous sand and gravel.

The Eldean soil is used for parks, open space, lawns, and gardens. It has good potential for lawns, vegetable and flower gardens, trees, and shrubs. It has high potential for building site development and recreation uses. This soil has low potential for water impoundment because of the rapidly or very rapidly permeable substratum.

The Eldean soil is well suited to growing grasses, flowers, vegetables, trees, and shrubs. It is droughty during dry periods, and watering is necessary for good growth. Soil erosion is not a major problem, except in unvegetated water courses or where the soil is disturbed and left unprotected. The included spots of cut and fill land are not well suited to lawns and gardens. Subsoil material which is exposed has very poor tilth. It is sticky when wet and hard when dry.

Although soil strength and shrink-swell potential are moderate limitations, the Eldean soil is well suited as a site for buildings. The strength limitation can be overcome by extending the building foundation to the substratum. Local roads and streets can be improved by replacing the subsoil with a suitable base material. Small stones in the surface layer interfere with such intensive recreation uses as baseball diamonds. If the Eldean soil is used for sanitary facilities, there is a hazard of polluting underground water supplies. Sanitary facilities should be connected to central sewers and treatment facilities.

The Eldean soil is in capability subclass IIe and woodland suitability subclass 2o; Urban land is not assigned to a capability subclass or woodland suitability subclass.

Gn—Genesee silt loam, occasionally flooded. This nearly level, deep, well drained soil is on narrow to broad flood plains. Flooding may occur at any time of the year, but commonly occurs for brief periods in fall, winter, and spring. This soil covers almost the entire flood plain in some areas. In other areas it is on natural levels along streams or on slight rises along high water channels. Slope is 0 to 2 percent. Most areas range from 10 to 70 acres in size; some areas are more than 100 acres.

Typically, the surface layer is brown, friable silt loam about 9 inches thick. The subsoil is brown and dark yellowish brown, friable silt loam about 14 inches thick. The substratum to a depth of about 70 inches is yellowish brown and brown, friable loam, silt loam, and clay loam and very friable gravelly sandy loam. Some narrow strips have slopes of 2 to 4 percent and other areas have a darker surface layer.

Included with this soil in mapping are narrow strips of somewhat poorly drained Shoals soils in slight depressions and high water channels. Also included are narrow strips of moderately well drained Eel and Medway soils. These inclusions make up about 15 percent of most areas.

Permeability is moderate, and the available water capacity is high. Organic matter content is moderate and natural fertility is medium. The shrink-swell potential is low. Runoff is slow. The subsoil is slightly acid to moderately alkaline. This soil has fair tilth and a deep root zone.

Most areas of this soil are farmed. This soil has high potential for row crops. This soil has low potential for most building site development and sanitary facilities. It has medium to low potential for most recreation uses and high potential as a source of topsoil.

This soil is suited to continuous row cropping and to hay and pasture. Row crops can be planted and harvested during the nonflooding period in most years. Winter grain crops are limited by the flooding hazard. Dikes can be used to help prevent flooding in some areas. The surface layer can be worked through a wide range of moisture content. Minimizing tillage, incorporating crop residue, and planting cover crops can help maintain tilth, reduce crusting, and protect the surface in areas that are subject to scouring during floods.

This soil is well suited to trees and other vegetation grown as habitat for wildlife. Some areas are used for nurseries.

This soil is severely limited for most building site development and sanitary facilities by the flooding hazard. In some places extensive filling has occurred to prepare sites for buildings. This soil is suited to such recreation uses as picnic areas and paths and trails.

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

GwB—Glynwood silt loam, 2 to 6 percent slopes. This gently sloping, deep, moderately well drained soil is on convex ridgetops, side slopes above steeper areas, and along well-defined waterways in the uplands. Some long slopes are broken by drainageways. Slopes are dominantly 3 to 5 percent. Most areas 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 19 inches thick. The upper part of the subsoil is dark yellowish brown, friable silty clay loam and firm clay; the lower part is dark yellowish brown, mottled, firm clay. The substratum to a depth of about 70 inches is glacial till of brown and yellowish brown, mottled, firm clay loam. Narrow strips along dissected waterways have slopes of 6 to 12 percent, and small eroded spots occur in some areas.

Included with this soil in mapping are narrow areas of somewhat poorly drained Blount and very poorly drained Pewamo soils along drainageways and in small oval depressions. These inclusions make up about 10 percent of most areas.

This soil has slow permeability in the subsoil and substratum. The available water capacity, organic matter content, and shrink-swell potential are moderate. The potential frost action is high. Runoff is medium. The subsoil is strongly acid to neutral in the upper part and slightly acid to mildly alkaline in the lower part. This soil has medium natural fertility and good tilth. The surface layer can be worked through a fairly wide range of moisture content. Roots are restricted below depths of 24 to 39 inches by calcareous glacial till. A seasonal high water table is perched between depths of 18 and 36 inches in winter, spring, and other extended wet periods.

Most areas of this soil are farmed. This soil has high potential for crops, hay, pasture, and trees. It has medium potential for most building site development, sanitary facilities, and recreation uses.

This soil is suited to row crops and small grains. Erosion is the main hazard for row crops. Minimum tillage, planting cover crops, and using grassed waterways can reduce soil loss. Incorporating crop residue or other organic matter into the surface layer improves tilth and fertility and increases water infiltration. These practices also reduce crusting and improve soil-seed contact.

The use of this soil for pasture or hay reduces erosion. Surface compaction, reduced plant growth, poor tilth, and increased runoff result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing, along with weed control, can help keep the pasture and soil in good condition.

This soil is well suited to trees and shrubs, and a few small areas are in native hardwoods. There are no soil hazards or limitations to growing or harvesting trees and shrubs on this soil; however, the calcareous glacial till substratum may cause nutrient deficiency in some deep-rooted plants. Seedlings grow well if competing vegetation is controlled or removed by cutting, spraying, girdling, or mowing.

Because of seasonal wetness, shrink-swell potential, and slow permeability, this soil is moderately limited for most building site development, sanitary facilities, and recreation uses. These limitations can be partially or fully overcome by specially designed facilities. In some places artificial drainage can reduce the wetness and shrink-swell potential if proper design and installation procedures are used. This soil is better suited to houses without basements than to houses with basements. Building sites should be landscaped for good surface drainage away from foundations and septic tank absorption fields. Increased run-off and erosion occur during construction, but can be minimized by maintaining plant cover, wherever possible. Septic tank systems can be improved by increasing the size of the absorption field. Sanitary facilities should be connected to central sewers and treatment facilities, wherever possible.

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

GwC2—Glynwood silt loam, 6 to 12 percent slopes, eroded. This sloping, deep, moderately well drained soil is on convex ridgetops, on side slopes above steeper areas, and in long narrow areas along well-defined waterways in the uplands. A few areas are on short slope breaks. Erosion has removed part of the original surface layer, and the present surface layer contains subsoil material that has more coarse fragments and a higher clay content. Most areas are 4 to 25 acres in size.

Typically, the surface layer is brown, friable silt loam about 9 inches thick. The subsoil is about 30 inches thick. The upper part of the subsoil is yellowish brown and brown, firm silty clay loam; the lower part is brown, mottled, firm clay loam. The substratum to a depth of about 70 inches is glacial till of brown, mottled, firm clay loam.

Included with this soil in mapping are small areas of gently sloping somewhat poorly drained Blount soils and nearly level very poorly drained Pewamo soils in oval depressions and in narrow strips along drainageways. Also included are a few narrow strips along well-defined waterways with slopes of 12 to 30 percent. These inclusions make up about 15 percent of most areas.

This soil has slow permeability in the subsoil and substratum. The available water capacity is moderate, although it has been reduced by erosion. The organic matter content is moderately low. Potential frost action is high and the shrink-swell potential is moderate. Runoff from cultivated areas is rapid. The subsoil is strongly acid to neutral in the upper part and slightly acid to mildly alkaline in the lower part. This soil has medium natural fertility and good tilth. Roots are restricted below depths of 17 to 32 inches by calcareous glacial till. A seasonal high water table is perched between depths of 18 and 36 inches in winter, spring, and other extended wet periods.

Most areas of this soil are farmed. Some are in permanent pasture or woodland. This soil has medium potential for crops, building site development, sanitary facilities, and many recreation uses. It has high potential for hay, pasture, and trees.

This soil is suited to row crops and small grains. Erosion is the main hazard for row crops. The surface layer crusts after hard rains. If plowed when wet and sticky, the soil is cloddy. Minimizing tillage, planting cover crops, and using grassed waterways can reduce soil loss. Incorporating crop residue or other organic matter into the surface layer improves tilth and fertility and increases the rate of water infiltration. These practices also reduce crusting and improve soil-seed contact.

The use of this soil for pasture or hay reduces erosion. Surface compaction, reduced growth, poor tilth, and increased runoff result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing, along with weed control, can help keep the pasture and soil in good condition.

This soil is well suited to trees and shrubs, and a few areas are in native hardwoods. Seedlings grow well if competing vegetation is controlled or removed by cutting, spraying, girdling, or mowing. Logging roads should be protected against erosion.

This soil is moderately to severely limited for most building site development, sanitary facilities, and recreation uses because of seasonal wetness, slope, shrink-swell potential, and slow permeability. These limitations can be partially or fully overcome by specially designed facilities. In some places artificial drainage can reduce the wetness limitation if proper design and installation procedures are used. Local roads may also be improved by using a suitable base material. Sanitary facilities should be connected to central sewers and treatment facilities, wherever possible. Increased runoff and erosion occur during construction, but can be minimized by maintaining plant cover, wherever possible.

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

HeE2—Hennepin and Miamian loams, 18 to 25 percent slopes, eroded. These steep, deep, well drained soils are on side slopes along deep, well-defined, dissected drainageways in the uplands. In some places they are on hillsides. Areas of this map unit contain either or both of these soils. Erosion has removed part of the original surface layer on more than one-half of this unit. Most areas are 5 to 35 acres in size.

Typically, the Hennepin soil has a dark grayish brown, friable loam surface layer about 6 inches thick. The subsoil, which extends to a depth of about 16 inches, is brown and yellowish brown, firm clay loam. The substratum to a depth of about 70 inches is glacial till of yellowish brown, firm gravelly loam.

Typically, the Miamian soil has a surface layer of brown, friable loam about 6 inches thick. The subsoil, which extends to a depth of about 24 inches, is dark yellowish brown, firm silty clay loam and clay loam. The substratum to a depth of about 70 inches is glacial till of yellowish brown, firm loam.

Included with these soils in mapping are narrow bands of less sloping, moderately well drained Celina soils on hill crests and ridgetops. Also included are narrow strips of Eldean soils formed in glacial outwash near the base of slopes and some short, nearly vertical escarpments along streams. These inclusions make up about 15 percent of most areas.

Permeability is slow or moderately slow in the Hennepin soil and moderately slow in the Miamian soil. The available water capacity is moderate in both soils. The organic matter content is low, and the potential frost action is moderate. Runoff is very rapid. The subsoil of the Hennepin soil is neutral or mildly alkaline. Reaction ranges from slightly acid in the upper part of the Miamian soil to mildly alkaline in the lower part. Natural fertility is low in the Hennepin soil and medium in the Miamian soil. Both soils have good tilth. The root zone is mainly shallow over compact calcareous glacial till in the Hennepin soil and moderately deep in the Miamian soil.

Most areas of these soils are wooded, and a few areas are in permanent pasture. These soils have low potential for cultivated crops, building site development, and sanitary facilities. They have medium potential for pasture and high potential for woodland and habitat for woodland wildlife.

Slope severely limits the use of these soils for cropland, but they are suited to adapted grasses and legumes for hay and pasture. Erosion is a severe hazard when adequate plant cover is not maintained. Surface compaction, poor tilth, reduced growth, and increased runoff results from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing, along with weed control, are good management practices. Reseeding pastures with the trash mulch or no-till seeding methods can help control erosion.

This soil is well suited to trees and shrubs. Some deep-rooted plants may have nutrient deficiencies if their roots encounter the calcareous glacial till in the substratum. Seedlings grow well if competing vegetation is controlled or removed by cutting, spraying, or girdling. Logging roads and skid trails should be protected against erosion and constructed on the contour, wherever possible.

This soil is severely limited for building site development, sanitary facilities, and most recreation uses because of slope and slow or moderately slow permeability. Cover should be maintained on the site as much as possible during construction to reduce the erosion hazard. Trails in recreation areas should be protected against erosion and established across the slope, wherever possible.

Both of these soils are in capability subclass VIe and woodland suitability subclass 1r.

HeF2—Hennepin and Miamian loams, 25 to 50 percent slopes, eroded. These very steep, deep, well drained soils are on hillsides and on side slopes along deep, well-defined, dissected drainageways in the uplands. Areas of this map unit contain either or both of these soils. Erosion has removed part of the original surface layer on more than one-half of this map unit. Most areas of these soils are 3 to 35 acres in size.

Typically, the Hennepin soil has a brown, friable loam surface layer about 6 inches thick. The subsoil, which extends to a depth of about 18 inches, is dark yellowish brown and yellowish brown, firm gravelly clay loam. The substratum to a depth of about 70 inches is glacial till of brown, firm gravelly loam.

Typically, the Miamian soil has a brown, friable loam surface layer about 5 inches thick. The subsoil, which extends to a depth of about 22 inches, is dark yellowish brown, firm clay loam. The substratum to a depth of about 70 inches is glacial till of yellowish brown, firm loam.

Included with these soils in mapping are narrow bands of less sloping, moderately well drained Celina soils on hill crests and ridgetops. Also included are narrow strips of Eldean soils formed in glacial outwash near the base of slopes and a few short nearly vertical escarpments along streams. These inclusions make up about 15 percent of most areas.

Permeability is slow or moderately slow in the Hennepin soil and moderately slow in the Miamian soil. The available water capacity is moderate in both soils. The organic matter content is low and the potential frost action is moderate. Runoff is very rapid. The subsoil of the Hennepin soil is neutral or mildly alkaline. Reaction ranges from slightly acid in the upper part of the Miamian soil to mildly alkaline in the lower part. Natural fertility is low in the Hennepin soil and medium in the Miamian soil. Both soils have good tilth. The root zone is mainly shallow over compact calcareous glacial till in the Hennepin soil and moderately deep in the Miamian soil.

Most areas of these soils are wooded. A few areas are in permanent pasture. These soils have low potential for cropland, pasture, building site development, sanitary facilities, and recreation uses. They have high potential for woodland and as habitat for woodland wildlife.

Slopes are too steep for safe operation of modern farm machinery. Erosion is a severe hazard when adequate plant cover is not maintained. Surface compaction, poor tilth, reduced growth, and increased runoff result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing can help keep the pasture and soil in good condition.

These soils are well suited to trees and shrubs. Some deep-rooted plants may have nutrient deficiencies if their roots encounter the calcareous glacial till in the substratum. Seedlings grow well if competing vegetation is controlled or removed by cutting, spraying, or girdling. The very steep slope severely limits the use of logging equipment. Logging roads should be protected against erosion and laid out on the contour, where possible.

Construction for recreation and urban uses is very difficult and the hazard of erosion is very severe when vegetation is removed. Trails in recreation areas should be protected against erosion and established across the slope, wherever possible.

These soils are in capability subclass VIIe and woodland suitability subclass 1r.

KeA—Kendallville silt loam, 0 to 2 percent slopes. This nearly level, deep, well drained soil is in broad areas on uplands. In some places it occurs in a transition zone between uplands and terraces. Most areas are 5 to 30 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsoil is about 30 inches thick. The upper part of the subsoil is brown, firm silt loam and dark yellowish brown, firm silty clay loam; the lower part is dark brown, firm clay loam and clay. The substratum to a depth of about 70 inches is glacial till of yellowish brown, very firm loam. Some areas have a thicker layer of glacial outwash over the glacial till.

Included with this soil in mapping are areas of somewhat poorly drained Crosby soils in slight depressions and along drainageways and moderately well drained Celina soils in the transition zone between this soil and soils formed in glacial till. These inclusions make up about 15 percent of most areas.

Permeability is moderately slow and the available water capacity is moderate. The organic matter content, potential frost action, and shrink-swell potential in the subsoil are moderate. Runoff from cultivated areas is slow. Reaction ranges from medium acid in the upper part of the subsoil to mildly alkaline in the lower part. This soil has medium natural fertility and good tilth. The surface layer can be worked through a fairly wide range of moisture content. Roots are restricted below depths of 33 to 40 inches by compact calcareous glacial till.

Most areas of this soil are farmed. This soil has high potential for crops, hay, pasture, trees, and most building site development and recreation uses. This soil has medium potential for most sanitary facilities.

This soil is suited to all the crops commonly grown in the county. Minimizing tillage and planting cover crops are good management practices. Incorporating crop residue or other organic matter into the surface layer increases water infiltration and improves tilth and fertility. These practices also reduce crusting and improve soil-seed contact.

This soil is well suited to hay and pasture. Surface compaction, reduced growth, and poor tilth can result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing, along with weed control, can help keep the pasture and soil in good condition.

This soil is well suited to trees and shrubs and a few small areas are in native hardwoods. Seedlings grow well if competing vegetation is controlled or removed by cutting, spraying, girdling, or mowing.

Even though the shrink-swell potential and low strength are moderately limiting, this soil is well suited as a site for buildings. Local roads can be improved by providing a suitable base material. The moderately slow permeability severely limits the use of septic tank absorption but can be partially overcome by increasing the size of the absorption field. Sanitary facilities should be connected to central sewers and treatment facilities, wherever possible. This soil is well suited to recreation uses.

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

KeB—Kendallville silt loam, 2 to 6 percent slopes. This gently sloping, deep, well drained soil is on broad areas on convex ridgetops and low kames. A few areas are on long hillsides. Most areas are 2 to 50 acres in size.

Typically, the surface layer is brown, friable silt loam about 9 inches thick. The subsoil is about 27 inches thick. The upper part of the subsoil is dark yellowish brown, friable silt loam and dark brown, firm clay loam and gravelly clay loam; the lower part is dark yellowish brown and brown, firm clay loam. The substratum to a depth of about 70 inches is glacial till of brown and yellowish brown, mottled, very firm clay loam and loam. Some areas have a thicker layer of glacial outwash over the glacial till.

Included with this soil in mapping are areas of somewhat poorly drained Crosby soils in slight depressions and along drainageways and moderately well drained Celina soils in the transition zone between this soil and soils formed in glacial till. These inclusions make up about 15 percent of most areas.

Permeability is moderately slow, and the available water capacity is moderate. The organic matter content, potential frost action, and shrink-swell potential in the subsoil are moderate. Runoff from cultivated areas is medium. Reaction ranges from medium acid in the upper part of the subsoil to mildly alkaline in the lower part. This soil has medium natural fertility and good tilth. The surface layer can be worked through a fairly wide range of moisture content. Roots are restricted below depths of 33 to 40 inches by compact calcareous glacial till.

Most areas of this soil are farmed. This soil has high potential for cultivated crops, hay, pasture, trees and for building site development and recreation uses. The potential for sanitary facilities is medium.

This soil is well suited to row crops and small grains. Row crops can be grown year after year if erosion is controlled. Minimizing tillage, planting cover crops, and using grassed waterways reduce soil loss. Incorporating crop residue or other organic matter into the surface layer increases water infiltration and improves tilth and fertility. These practices can also reduce crusting and improve soil-seed contact.

The use of this soil for pasture or hay is effective in controlling erosion. This soil is suited to early spring grazing. Surface compaction, reduced growth, poor tilth, and increased runoff can result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing, along with weed control, can help keep the pasture and soil in good condition.

This soil is well suited to trees and shrubs, and a few small areas are in native hardwoods. Seedlings grow well if competing vegetation is controlled or removed by cutting, spraying, girdling, or mowing.

Even though the shrink-swell potential is moderately limiting, this soil is well suited as a site for buildings. Local roads can be improved by using suitable base material. Increased runoff and erosion occur during construction. Plant cover should be maintained on the site as much as possible to reduce soil loss. The moderately slow permeability that severely limits septic tank absorption can be partially overcome by increasing the size of the absorption field. Sanitary facilities should be connected to central sewers and treatment facilities, wherever possible. This soil is suited to most recreation uses.

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

KeC2—Kendallville silt loam, 6 to 12 percent slopes, eroded. This sloping, deep, well drained soil is on convex ridgetops and side slopes in the uplands. In a few areas it is on short slope breaks between uplands and terraces. Erosion has removed part of the original surface layer. Subsoil material that has a higher clay content and more coarse fragments has been mixed into the present surface layer. Most areas are 5 to 35 acres in size.

Typically, the surface layer is brown, friable silt loam about 8 inches thick. The subsoil is about 28 inches thick. The upper part of the subsoil is dark brown, firm gravelly clay loam; the lower part is brown and dark yellowish brown, firm clay loam. The substratum to a depth of about 70 inches is glacial till of brown, very firm clay loam and loam. Some areas have a thicker layer of glacial outwash over the glacial till, and other areas have soils formed entirely in glacial till.

Included with this soil in mapping and making up about 10 percent of most areas are narrow bands of somewhat poorly drained Crosby or Bennington soils along drainageways.

Permeability is moderately slow, and the available water capacity is moderate. The organic matter content is moderately low. Potential frost action and shrink-swell in the subsoil are moderate. Runoff from cultivated areas is rapid. Reaction ranges from medium acid in the upper part of the subsoil to mildly alkaline in the lower part. This soil has medium natural fertility and good tilth. Erosion has resulted in a narrower range of moisture content in which the soil is suitable for good workability.

Roots are restricted below depths of 33 to 40 inches by compact calcareous glacial till.

Many areas of this soil are used for farming; some are in woodland. This soil has medium potential for crops and high potential for pasture and trees. It has medium potential for most building site development, sanitary facilities, and recreation uses.

This soil is suited to row crops and small grains. Erosion is the main hazard for row crops. The surface layer crusts after hard rains. If plowed when wet and sticky, the soil is cloddy. Minimizing tillage, planting cover crops, and using grassed waterways reduce runoff and soil loss. Incorporating crop residue or other organic matter into the surface layer improves tilth and fertility and increases water infiltration. These practices also reduce crusting and improve soil-seed contact.

The use of this soil for pasture or hay reduces erosion. Surface compaction, poor tilth, reduced growth, and increased runoff result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing, along with weed control, can help keep the pasture and soil in good condition.

This soil is well suited to trees and shrubs, and some areas are in native hardwoods. Seedlings grow well if competing vegetation is controlled or removed by cutting, spraying, girdling, or mowing. Logging roads and skid trails should be protected against erosion.

This soil is suited as a site for buildings if proper design and installation procedures are used, based on specific onsite investigations. Slope, moderately slow permeability, and moderate shrink-swell potential are the main limitations. Increased runoff and erosion occur during construction. Plant cover should be maintained on the site as much as possible to reduce soil loss. Local roads can be improved by using a suitable base material. The moderately slow permeability severely limits the use of septic tanks. This limitation can be partially overcome by increasing the size of the absorption field and installing leach lines on the contour. Sanitary facilities should be connected to central sewers and treatment facilities, wherever possible.

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

Ko—Kokomo silty clay loam. This nearly level, deep, very poorly drained soil is in depressions and at the heads of drainageways on uplands. Some areas are along drainageways. This soil receives runoff from adjacent higher soils and is subject to ponding. Most areas are 4 to 75 acres in size; some are more than 100 acres. Slope is 0 to 2 percent.

Typically, the surface layer is very dark gray, friable silty clay loam about 9 inches thick. The subsurface layer which extends to a depth of about 16 inches, is very dark gray, firm silty clay loam. The subsoil is about 27 inches thick. The upper part of the subsoil is dark gray, mottled, firm silty clay; the lower part is dark gray, mottled, firm silty clay loam and clay loam. The substratum to a depth of about 70 inches is glacial till of brown and yellowish brown, mottled, firm clay loam and loam.

Included with this soil in mapping are oval areas of somewhat poorly drained Crosby soils on slight convex rises and small areas of moderately well drained Celina soils on low knolls. These inclusions make up about 15 percent of most areas.

This moderately slowly permeable soil has a high available water capacity, organic matter content, and potential frost action. The shrink-swell potential is moderate in the subsoil. Runoff is very slow or ponded. The subsoil is dominantly neutral throughout. The soil has high natural fertility and fair tilth. The root zone is deep. Unless drained, a seasonal high water table is near the surface in winter, spring, and other extended wet periods.

Most areas of this soil are farmed. The soil has high potential for cultivated crops, hay, pasture, and trees. It has low potential for building site development, sanitary facilities, and recreation uses.

Wetness is the main limitation for farming. Drained areas are suited to row crops and small grains. Stands of wheat and oats in inadequately drained areas are poor in most years. Surface and subsurface drains are commonly used to remove excess water. Tillage within a limited range of moisture content is important because this soil becomes compacted and cloddy if worked when wet and sticky. Minimizing tillage and planting cover crops are good management practices. Incorporating crop residue or other organic matter into the surface layer improves tilth and fertility and increases water infiltration. This practice also reduces crusting and improves soil-seed contact.

This soil is suited to pasture or hay (fig. 5). Surface compaction, poor tilth, reduced growth, and decreased infiltration rates can result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing, along with weed control, are used to keep the pasture and soil in good condition.

Wetness is the main soil limitation to growing or harvesting trees or shrubs on this soil. It limits planting and harvesting during winter and spring. This soil is suited to trees and shrubs that are adapted to wet sites. A few small areas are in native hardwoods. Seedlings grow well if competing vegetation is controlled or removed by cutting, spraying, girdling, or mowing.

This soil is severely limited for building site development, sanitary facilities, and recreation uses because of moderately slow permeability, seasonal wetness, ponding, and low strength. Surface drains and storm sewers are used to remove surface water. Building sites should be landscaped for good surface drainage away from foundations and septic tank absorption fields. Absorption fields should be located on the higher part of the land-

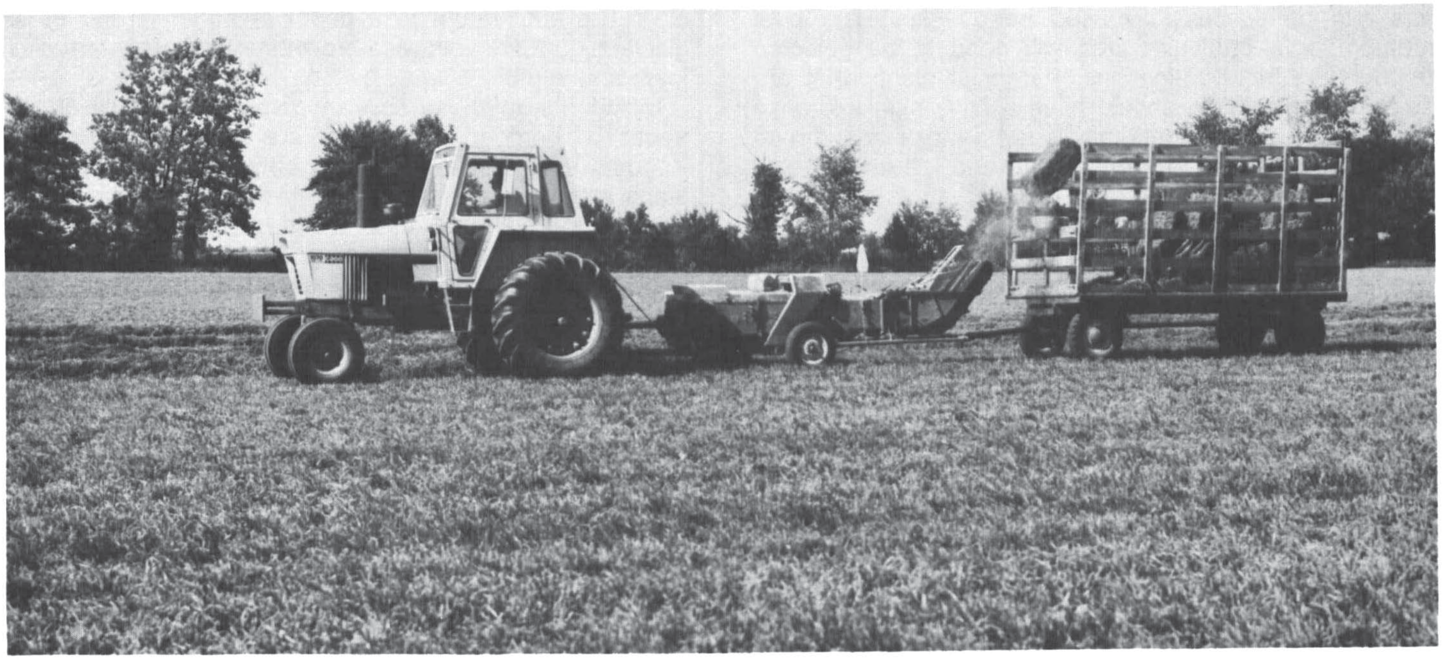


Figure 5.—Kokomo silty clay loam is suited to hay.

scape. Local roads can be improved by using artificial drainage and a suitable base material. Sanitary facilities should be connected to central sewers and treatment facilities, wherever possible.

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

Ku—Kokomo-Urban land complex. This map unit consists of a nearly level, very poorly drained Kokomo soil and areas of Urban land on smooth upland flats and in shallow depressions and drainageways. Undrained areas of the Kokomo soil receive runoff from adjacent higher soils and are subject to ponding. Areas are commonly long and narrow, but some are large and irregularly shaped. Slope is 0 to 1 percent. This map unit is about 50 percent Kokomo silty clay loam and 30 percent Urban land. Areas of the Kokomo soil and the Urban land are so intricately mixed, or so small in size, that is was not practical to separate them in mapping.

Typically, the Kokomo soil has a surface layer of very dark gray, friable silty clay loam about 9 inches thick. The subsurface layer, which extends to a depth of about 16 inches, is very dark gray, firm silty clay loam. The subsoil is about 20 inches thick. The upper part of the subsoil is dark gray, mottled, firm silty clay loam and silty clay; the lower part is olive gray, mottled, firm silty clay loam. The substratum to a depth of about 70 inches is glacial till of dark grayish brown, mottled, firm loam glacial till.

The Urban land part of the unit is covered by buildings and pavement. The buildings are mostly residential, ranging from single-family houses to apartment complexes. Some areas are industrial or commercial in nature.

Included with this complex in mapping are small areas of somewhat poorly drained Crosby soils on very slight convex rises and moderately well drained Celina soils on low knolls and ridges. Also included are spots in open areas where the original soil has been covered by various fill materials. These inclusions make up about 20 percent of most areas.

Most of the Urban land part of this unit has been artificially drained by sewer systems, gutters, and surface and subsurface drains. Kokomo soil areas that are not drained have a seasonal high water table near the surface in winter, spring, and other extended wet periods. The Kokomo soil has moderately slow permeability and high organic matter content, available water capacity, and potential frost action. The shrink-swell potential is moderate in the subsoil. Runoff is very slow or ponded. This soil has high natural fertility and fair tilth. The subsoil is dominantly neutral throughout.

The Kokomo soil is used mainly for open space and lawns and gardens. It has medium potential for lawns, vegetable and flower gardens, and shrubs. It has high potential for trees and low potential for building site development, sanitary facilities, and recreation uses.

If excess water is removed, the Kokomo soil is suited to grasses, flowers, vegetables, trees, and shrubs common to the area. Several methods of artificial drainage can be successfully used on this soil. The best method for a particular area will need to be selected through onsite investigations. Perennial plants that are selected for planting should have a fairly high tolerance for wetness. Erosion generally is not a major problem on the unit unless the soil is disturbed and left unprotected for a considerable period. The included spots of cut and fill land are not well suited to lawns and gardens. Subsoil and substratum material which is exposed on the surface has very poor tilth. It is sticky when wet and hard when dry.

The Kokomo soil is severely limited as a site for buildings, sanitary facilities, and recreation uses because of the seasonal wetness, ponding, moderately slow permeability, and low strength. Soil areas used for these purposes must be artificially drained. Building sites should be landscaped for good surface drainage away from foundations and septic tank absorption fields. Absorption fields should be located on the higher part of the landscape. Local roads can be improved by using artificial drainage and a suitable base material. All sanitary facilities should be connected to central sewers and treatment facilities. Where possible, the small included areas of Celina and Crosby soils should be selected for developing new parks and playgrounds. Play areas and walkways may require special surfacing. Onsite investigation is essential to properly evaluate and plan the development of specific sites.

The Kokomo soil is in capability subclass IIw and woodland suitability subclass 2w; Urban land is not assigned to a capability subclass or woodland suitability subclass.

LeB—Lewisburg-Crosby complex, 2 to 6 percent slopes. This unit consists of a deep, moderately well drained Lewisburg soil and a deep, somewhat poorly drained Crosby soil on low knolls and ridges in the uplands. Some areas occur as islands surrounded by Kokomo soils. Most areas of these gently sloping soils are 4 to 20 acres in size and are about 45 percent Lewisburg silt loam and 40 percent Crosby silt loam. The Lewisburg soil is commonly on convex slopes on the tops and sides of knolls and ridges, and the Crosby soil is on concave foot slopes. These soils occur in such an intricate pattern that it is not practical to separate them in mapping. Slopes are dominantly 2 to 4 percent.

Typically, the Lewisburg soil has a surface layer of dark grayish brown, friable silt loam about 6 inches thick. The subsoil, which extends to a depth of about 16 inches, is brown and dark yellowish brown, firm silty clay loam. The substratum to a depth of about 70 inches is glacial till of yellowish brown and brown, firm loam, which is mottled below a depth of about 26 inches.

Typically, the Crosby soil has a dark grayish brown, friable silt loam surface layer about 9 inches thick. The subsoil, which extends to a depth of about 31 inches, is yellowish brown, mottled, firm silty clay loam and silty clay. The substratum to a depth of about 70 inches is glacial till of dark yellowish brown, mottled, very firm clay loam and loam.

Included with these soils in mapping and making up about 15 percent of this unit are very poorly drained Kokomo soils in narrow bands between low knolls and strips along drainageways. Also included near the top of ridges and knolls are small areas of an eroded soil that has a clay loam surface layer. Because of the higher clay content the soil in these areas have good workability over a reduced range in moisture content.

Permeability is moderate or moderately slow in the subsoil of the Lewisburg soil and slow in the substratum. The Crosby soil is slowly permeable. The available water capacity and shrink-swell potential in the subsoil are moderate in both soils. The potential frost action is moderate for the Lewisburg soil and high for the Crosby soil. The organic matter content is moderate in both soils. Reaction ranges from slightly acid to mildly alkaline in the subsoil of the Lewisburg soil and ranges from medium acid in the upper part of the subsoil to mildly alkaline in the lower part of the subsoil of the Crosby soil. Runoff from cultivated areas is medium. This unit has medium natural fertility and good tilth. The surface layer can be worked through a fairly wide range of moisture content except for the included eroded areas of the Lewisburg soil that tend to become cloddy if worked when wet. Roots are mainly restricted by the compact calcareous glacial till, which causes nutrient deficiencies in some deep-rooted plants. The root zone is shallow in the Lewisburg soil and moderately deep in the Crosby soil. The seasonal high water table is between depths of 24 to 36 inches in the Lewisburg soil and is near the surface of the Crosby soil.

Most areas of these soils are farmed. They have high potential for cultivated crops, hay, pasture, and trees. The Lewisburg soil has medium potential for most building site development and sanitary facilities, and the Crosby soil has low potential for these uses. These soils have medium potential for most recreation uses.

These soils are suited to row crops and small grains. Erosion is the main hazard for row crops. Minimizing tillage, planting cover crops, and using grassed waterways reduce soil loss. Incorporating crop residue or other organic matter into the surface layer increases water infiltration and improves tilth and fertility. These practices will also reduce crusting and improve soil-seed contact. Wetness also limits the use of the Crosby soil. Subsurface and surface drains are commonly used to improve drainage.

Using these soils for pasture or hay reduces erosion. Surface compaction, poor tilth, reduced growth, and increased runoff can result from overgrazing or grazing when the soils are soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing, along with weed control, can help keep the pasture and soil in good condition.

These soils are suited to trees and shrubs, and a few small areas are in native hardwoods. Seedlings grow well if competing vegetation is controlled or removed by cutting, spraying, girdling, or mowing. The shallow depth of the Lewisburg soil over calcareous glacial till may cause nutrient deficiencies in some plants. Species tolerant of some wetness should be selected for planting on the Crosby soil.

The seasonal wetness, slow permeability, and low strength limit the use of these soils for most building site development, sanitary facilities, and recreation uses. These limitations can be partially or fully overcome by specially designed facilities. Artificial drains are effective in reducing the wetness in most areas. Increased runoff and erosion occur during construction. Plant cover should be maintained on the site as much as possible to reduce soil loss. The Lewisburg soil is better suited as a site for buildings than the Crosby soil. Local roads and streets can be improved by using artificial drainage and a suitable base material.

Both soils are in capability subclass IIe. The Lewisburg soil is in woodland suitability subclass 2o; the Crosby soil is in woodland suitability subclass 3o.

Mh—Medway silt loam, occasionally flooded. This nearly level, deep, moderately well drained soil is dominantly in narrow to broad areas on flood plains. It commonly occurs near slope breaks to terraces or uplands in large valleys and adjacent to streams in small valleys. Flooding may occur at any time of the year, but it commonly occurs during winter and spring. Slope is 0 to 2 percent. Most areas range from 5 to 50 acres in size; some areas are more than 100 acres.

Typically, the surface layer is very dark grayish brown, friable silt loam about 7 inches thick. The subsurface layer is very dark grayish brown, friable silt loam about 8 inches thick. The subsoil to a depth of about 39 inches is very dark gray, brown, and dark grayish brown, firm silt loam, loam, and sandy loam that is mottled below a depth of about 21 inches. The substratum to a depth of about 70 inches is grayish brown, mottled, very friable gravelly sandy loam. Some areas have a lighter colored surface layer.

Included with this soil in mapping are areas of very poorly drained Sloan soils near slope breaks to uplands or terraces. Also included are Wea and Warsaw soils on low stream terraces. These inclusions make up about 15 percent of most areas.

Permeability is moderate. The available water capacity, organic matter content, and natural fertility are high. The shrink-swell potential is low. Runoff is slow. Reaction ranges from slightly acid to mildly alkaline in the upper part of the subsoil and slightly acid to moderately alkaline in the lower part. This soil has good tilth and can be worked through a wide range of moisture content. A seasonal high water table is between depths of 18 and 36 inches. The root zone is deep.

Most areas of this soil are farmed. This soil has high potential for row crops and low potential for most building site development and sanitary facilities. It has medium potential for most recreation uses and high potential as a source of topsoil.

This soil is suited to growing row crops year after year and to hay and pasture. Flooding in winter and spring can severely damage winter grain crops if not protected. Dikes can be used to help prevent flooding in some areas. Minimizing tillage, incorporating crop residue, and planting cover crops can help maintain tilth, reduce crusting, and protect the surface in areas that are subject to scouring during floods. Randomly spaced subsurface drains are needed in some of the included areas of wetter soils.

This soil is well suited to trees and shrubs. Many areas are used for nurseries. Spraying, mowing, or disking reduce plant competition.

This soil is severely limited as a site for buildings and sanitary facilities by the flooding hazard and wetness. Some places have been extensively filled to prepare sites for buildings. This soil is suited to such recreation uses as picnic areas and paths and trails.

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

MkB—Miamian silt loam, 2 to 6 percent slopes. This gently sloping, deep, well drained soil is on convex ridgetops, on side slopes above steeper areas, and along well-defined waterways in the uplands. Most areas are 4 to 40 acres in size; a few areas are up to 100 acres.

Typically, the surface layer is brown, friable silt loam about 9 inches thick. The subsoil, which extends to a depth of about 36 inches, is yellowish brown and dark yellowish brown, very firm silty clay loam. The substratum to a depth of about 70 inches is glacial till of yellowish brown, very firm loam.

Included with this soil in mapping are small areas of somewhat poorly drained Crosby soils on foot slopes and in slight depressions and very poorly drained Kokomo soils in strips along waterways. These inclusions make up about 10 percent of most areas.

This soil has moderately slow permeability. The available water capacity, organic matter content, potential frost action, and shrink-swell potential in the subsoil are moderate. Runoff from cultivated areas is medium. Reaction ranges from slightly acid in the upper part of the subsoil to mildly alkaline in the lower part. This soil has medium natural fertility and good tilth. The root zone is mainly moderately deep over compact calcareous glacial till.

Most areas of this soil are farmed. This soil has high potential for row crops, hay, pasture, trees, and most building site development and recreation uses. This soil has medium to high potential for most sanitary facilities.

This soil is suited to row crops and small grains. Erosion is the main hazard for row crops. The surface layer can be worked through a fairly wide range of moisture content. It crusts after hard rains. Minimizing tillage, planting cover crops, and using grassed waterways can help reduce soil loss. Incorporating crop residue or other organic matter into the surface layer increases water infiltration and improves tilth and fertility. These practices also reduce crusting and improve soil-seed contact.

The use of this soil for pasture or hay reduces erosion. Surface compaction, reduced growth, poor tilth, and increased runoff result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing, along with weed control can help keep the pasture and soil in good condition.

This soil is well suited to trees and shrubs and a few small areas are in native hardwoods. There are no soil hazards or limitations to growing or harvesting trees or shrubs. Seedlings grow well if competing vegetation is controlled or removed by cutting, spraying, girdling, or mowing.

This soil is suited as a site for buildings and sanitary facilities if proper design and installation procedures are used. Increased runoff and erosion occur during construction. Plant cover should be maintained on the site as much as possible to reduce soil loss. Local roads can be improved by using a suitable base material. The moderately slow permeability that limits the use of septic tanks can be partially overcome by increasing the size of the absorption field. Sanitary facilities should be connected to central sewers and treatment facilities, wherever possible.

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

MlB2—Miamian silty clay loam, 2 to 6 percent slopes, eroded. This gently sloping, deep, well drained soil is on convex ridgetops, on side slopes above steeper areas, and along well-defined waterways in the uplands. Erosion has removed part of the original surface layer. Subsoil material with a higher clay content and more coarse fragments has been tilled into the present surface layer. Slopes are dominantly 4 to 6 percent. Most areas are 4 to 25 acres in size.

Typically, the surface layer is brown, friable silty clay about 8 inches thick. The subsoil, which extends to a depth of about 33 inches, is yellowish brown and dark yellowish brown, very firm silty clay loam. The substratum to a depth of about 70 inches is glacial till of yellowish brown, very firm clay loam and loam. A few areas have 6 to 9 percent slopes.

Included with this soil in mapping are narrow strips of very poorly drained Kokomo soils along drainageways and somewhat poorly drained Crosby soils in slight depressions and on foot slopes. These inclusions make up about 15 percent of most areas.

Permeability is moderately slow. The organic matter content is moderately low. The available water capacity, potential frost action, and shrink-swell potential in the subsoil are moderate. Runoff from cultivated areas is medium. Reaction ranges from slightly acid in the upper part of the subsoil to mildly alkaline in the lower part. This soil has medium natural fertility and fair tilth. The root zone is moderately deep over compact calcareous glacial till.

Most areas of this soil are farmed. This soil has high potential for row crops, hay, pasture, and trees. This soil has high potential for most building site development and medium to high potential for sanitary facilities. It has medium potential for most recreation uses.

This soil is suited to row crops and small grains. If the soil is cultivated there is an erosion hazard. Erosion has resulted in a reduced range of moisture content in which the soil is suitable for good workability. Timely tillage is important because the soil clods if worked when soft and sticky as a result of wetness. Good tilth is difficult to maintain. Minimizing tillage, planting cover crops, and using grassed waterways reduce soil loss. Incorporating crop residue or other organic matter into the surface layer increases water infiltration and improves tilth and fertility. These practices also reduce crusting and improve soil-seed contact.

The use of this soil for pasture or hay reduces erosion. Surface compaction, poor tilth, reduced growth, and increased runoff result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rate, plant selection, pasture rotation, and deferment of grazing, along with weed control, can help keep the pasture and soil in good condition.

This soil is well suited to trees and shrubs, and a few small areas are in native hardwoods. Seedlings are difficult to establish during extended dry periods.

This soil is suited as a site for buildings and sanitary facilities if proper design and installation procedures are used, based on specific onsite investigations. Increased runoff and erosion occur during construction. Plant cover should be maintained on the site as much as possible to reduce soil loss.

Local roads can be improved by using suitable base material. The moderately slow permeability that limits the use of septic tanks can be partially overcome by increasing the size of the absorption field. Sanitary facilities should be connected to central sewers and treatment facilities, wherever possible. The silty clay loam surface layer is sticky when wet.

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

MlC2—Miamian silty clay loam, 6 to 12 percent slopes, eroded. This sloping, deep, well drained soil is on convex ridgetops, on side slopes above steeper areas, and along well-defined drainageways on uplands. In some places it is in long narrow areas on hillsides. Erosion has removed part of the original surface layer. Subsoil material with a higher clay content and more coarse fragments has been mixed into the present surface layer. Most areas of this soil are 4 to 60 acres in size.

Typically, the surface layer is brown, friable silty clay loam about 9 inches thick. The subsoil, which extends to a depth of about 25 inches, is dark yellowish brown and yellowish brown firm and very firm clay loam. The substratum to a depth of about 70 inches is glacial till of yellowish brown, mottled, very firm clay loam and firm loam.

Included with this soil in mapping and making up about 10 percent of most areas are narrow bands of very poorly drained Kokomo soils along drainageways and small areas of somewhat poorly drained Crosby soils on foot slopes.

Permeability is moderately slow. The available water capacity is moderate, although it has been reduced by the effects of erosion. The organic matter content is moderately low. Potential frost action and shrink-swell potential are moderate. Runoff from cultivated areas is rapid. Reaction ranges from slightly acid in the upper part of the subsoil to mildly alkaline in the lower part. This soil has medium natural fertility and fair tilth. The root zone is mainly moderately deep over compact calcareous glacial till.

Most areas of this soil are used for farming; some areas are in woodland. This soil has medium potential for row crops and high potential for pasture and trees. It has medium potential for most building site development, sanitary facilities, and recreation uses.

This soil is moderately well suited to row crops and small grains. Erosion is severe in cultivated areas. Erosion has resulted in a narrower range of moisture content in which the soil is suitable for good workability. Timely tillage is important because the soil clods if worked when soft and sticky as a result of wetness. Good tilth is difficult to maintain. The surface layer crusts after hard rains. Minimizing tillage, planting cover crops, and using grassed waterways reduce runoff and soil loss. Incorporating crop residue or other organic matter into the surface layer increases infiltration and improves tilth and fertility. These practices also reduce crusting and improve soil-seed contact.

The use of this soil for pasture or hay reduces erosion. Surface compaction, poor tilth, reduced growth, and increased runoff result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing, along with weed control, can help keep the pasture and soil in good condition.

This soil is well suited to trees and shrubs, and some areas are in native hardwoods. Seedlings are difficult to establish during extended dry periods. Survival and growth can be improved by good site preparation. Logging roads should be protected against erosion.

This soil is suited as a site for buildings if proper design and installation procedures are used. Slope, moderate shrink-swell potential, and strength are the main limitations. Increased runoff and erosion occur during construction. These can be reduced by maintaining plant cover, wherever possible. The moderately slow permeability that limits the use of septic tanks can be partially overcome by increasing the size of the absorption field and constructing leach lines on the contour. Sanitary facilities should be connected to central sewers and treatment facilities. Local roads can be improved by using a suitable base material. This soil is suitable for ponds (fig. 6).

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

MID2—Miamian silty clay loam, 12 to 18 percent slopes, eroded. This moderately steep, deep, well drained soil is on hillsides. Erosion has removed part of the original surface layer. Subsoil material with a higher clay content and more coarse fragments has been tilled into the present surface layer. Most areas are 4 to 15 acres in size.

Typically, the surface layer is brown, friable silty clay loam about 7 inches thick. The subsoil, which extends to a depth of about 23 inches, is dark yellowish brown and yellowish brown, firm and very firm clay loam. The substratum to a depth of about 70 inches is glacial till of yellowish brown, firm loam.

Permeability is moderately slow. The available water capacity of this soil is moderate although it has been significantly reduced by the effects of erosion. The organic matter content is moderately low. Potential frost action and shrink-swell potential in the subsoil are moderate. Runoff from cultivated areas is very rapid. Reaction ranges from slightly acid in the upper part of the subsoil to mildly alkaline in the lower part. This soil has medium natural fertility and fair tilth. The root zone is mainly moderately deep over compact calcareous glacial till.

Most areas of this soil are used for permanent pasture or woodland. Some are being cropped. This soil has low potential for cultivated crops, building site development, sanitary facilities, and many recreation uses. It has high potential for woodland and medium potential for pasture.

This soil is limited for use as cropland because of slope and the erosion hazard. Row crops can be grown occasionally under good management if erosion is controlled. The slopes cause some problems in the operation of machinery and in the installation of erosion-control practices. Erosion has resulted in a narrower range of moisture content in which the soil has good workability.

If plowed when sticky and wet, the soil is cloddy. It puddles and crusts easily. Minimizing tillage, planting cover crops, and using grassed waterways reduce runoff and soil loss. Incorporating crop residue or other organic matter into the surface layer increases water infiltration and improves tilth and fertility. These practices also reduce crusting and improve soil-seed contact.

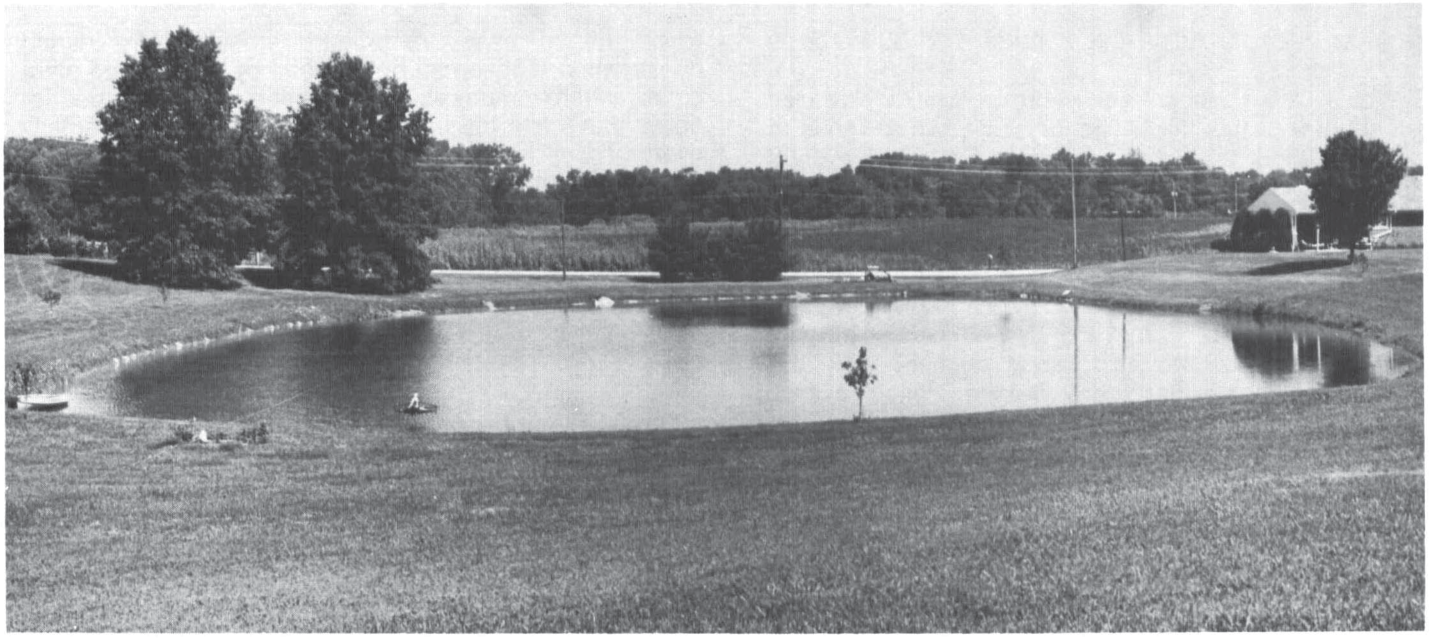


Figure 6.—Miamian silty clay loam, 6 to 12 percent slopes, eroded, is suited to ponds for recreation and fire protection.

The use of this soil for pasture or hay reduces erosion. Surface compaction, poor tilth, reduced growth, and increased runoff result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing, along with weed control, can help keep the pasture and soil in good condition. Reseeding should be done with cover crops or companion crops, or by the trash mulch or no-till seeding methods.

This soil is well suited to trees and shrubs, and many areas are in native hardwoods. The slope moderately limits the use of equipment. Seedlings are difficult to establish during extended dry periods. Logging roads and skid trails should be established across the slope wherever possible and protected against erosion.

This soil is severely limited for building site development, sanitary facilities, and recreation uses because of slope and moderately slow permeability. Plant cover should be maintained on the site as much as possible during construction to reduce the erosion hazard. Sanitary facilities should be connected to central sewers and treatment facilities, wherever possible. Trails in recreation areas should be laid out on the contour wherever possible and protected against erosion.

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

MmC3—Miamian clay loam, 6 to 12 percent slopes, severely eroded. This sloping, deep, well drained soil is on hillsides and along well-defined waterways in the uplands. Erosion has removed most of the original surface layer. Subsoil material with a higher clay content and more coarse fragments has been mixed into the present surface layer. Most areas are 4 to 20 acres in size.

Typically, the surface layer is brown, firm clay loam about 9 inches thick. The subsoil, which extends to a depth of about 19 inches, is dark yellowish brown, firm clay. The substratum to a depth of 70 inches is glacial till of yellowish brown, firm gravelly clay loam and gravelly loam. Some areas have slopes of 12 to 15 percent.

Included with this soil in mapping are narrow bands of very poorly drained Kokomo soils along drainageways and small areas where calcareous glacial till is at or near the surface on the upper part of slopes where erosion has been very severe. These inclusions make up about 15 percent of most areas.

Permeability is moderately slow, and the available water capacity is moderate to low. The organic matter content is low. Potential frost action and shrink-swell in the subsoil are moderate. Runoff from cultivated areas is very rapid. Reaction in the subsoil ranges from slightly acid to mildly alkaline. This soil has low natural fertility and fair tilth. The root zone is mainly moderately deep over the compact calcareous glacial till. The high lime content of the substratum causes nutrient deficiency in some deep-rooted plants.

Most areas of this soil are used for row crops and hay. Some are in permanent pasture or woodland. This soil has low potential for cultivated crops. It has medium potential for hay, pasture, most building site development, sanitary facilities, and many recreation uses.

This soil is poorly suited to crops, but can be used for permanent pasture and hay. The erosion hazard is severe in cultivated areas. The subsoil material in the plow layer makes maintenance of good tilth very difficult. This soil can be worked within a narrow range of moisture content. It crusts and puddles after hard rains. If plowed when wet and sticky, the soil is very cloddy. Minimizing tillage, planting cover crops, and using grassed waterways can reduce runoff and soil loss.

Incorporating crop residue or other organic matter into the surface layer improves tilth and increases water infiltration. These practices also reduce crusting and improve soil-seed contact.

Drought-resistant grasses and legumes can be grown for pasture and hay. Pastures do not do well during the dry summer months. Surface compaction, reduced growth, and increased runoff result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing, along with weed control, are good management practices.

This soil is well suited to trees and other vegetation grown for wildlife developments. The limited depth to calcareous glacial till may result in nutrient deficiencies in some plants. Seedlings are difficult to establish during dry summers, but survival and growth can be improved by good site preparation. Plant competition can be reduced by cutting, spraying, girdling, or mowing.

This soil is suited as a site for buildings if proper design and installation precedures are used. Slope and moderate shrink-swell potential and strength are the main limitations. Increased runoff and erosion occur during construction. These can be reduced by maintaining plant cover wherever possible. Lawns are difficult to establish and maintain in the severely eroded clay loam surface layer. Seedlings should be mulched. Recreation uses are limited by the stickiness of the surface layer. The moderately slow permeability that limits the use of septic tanks can be partially overcome by increasing the size of the absorption field and constructing leach lines on the contour. Sanitary facilities should be connected to central sewers and treatment facilities, wherever possible. Local roads and streets can be improved by using a suitable base material. This soil is suitable for pond embankments.

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

MnC—Miamian-Urban land complex, 6 to 12 percent slopes. This map unit consists of a deep, well drained Miamian soil on knolls and side slopes along drainageways on the uplands and Urban land. Areas range from 10 to more than 100 acres in size. Slope ranges from 6 to 12 percent but is dominantly 8 to 12 percent. Areas are about 45 percent Miamian silt loam and 30 percent Urban land. Areas of the Miamian soil and the Urban land occur in such an intricate pattern that it was not practical to separate them in mapping.

Typically, the Miamian soil has a brown, friable silt loam surface layer about 9 inches thick. The subsoil, which extends to a depth of about 36 inches, is dark yellowish brown and yellowish brown, very firm and firm clay loam. The substratum to a depth of about 70 inches is glacial till of yellowish brown, very firm clay loam and brown, firm loam.

The Urban land is covered by buildings and pavements. The buildings are mostly residential, ranging from single-family houses to apartment complexes. In some places there are industrial and commercial uses.

Included in mapping and making up about 25 percent of the unit are areas that have been altered by cutting and filling. Because of attempts to change the natural slope more of the area has been excavated than filled. Also included, in some places, are narrow bands of somewhat poorly drained Crosby soils.

The Miamian soil has moderately slow permeability and a moderate available water capacity, shrink-swell potential in the subsoil, and potential frost action. The organic matter content is moderately low. This soil has medium natural fertility and good tilth. Runoff is rapid. The root zone is mainly moderately deep over compact glacial till.

The Miamian soil is used for parks, open space, lawns, and gardens. It has high potential for lawns, vegetable and flower gardens, trees, and shrubs. It has medium potential for most building site development, sanitary facilities, and recreation uses.

The Miamian soil is well suited to grasses, flowers, vegetables, trees, and shrubs. Erosion is a hazard when the soil is disturbed or left in a bare, exposed condition. The surface layer crusts after hard rains. The high lime content in the substratum causes nutrient deficiencies in some deep-rooted plants. Special onsite diagnosis and treatment is generally necessary. The included spots of cut and fill land are not well suited to lawns and gardens. Subsoil material that is exposed on the surface has poor tilth. It is sticky when wet and hard when dry.

The Miamian soil is suited as a site for buildings if proper design and installation procedures are used. Foundations and footings of dwellings and small buildings should be designed to prevent structural damage caused by the moderate strength and the shrinking and swelling of the soil. Local roads can be improved by using a suitable base material. The moderately slow permeability that severely limits the use of septic tanks can be partially overcome by increasing the size of the absorption field. Sanitary facilities should be connected to central sewers and treatment facilities, wherever possible. Plant cover should be maintained on the site as much as possible during construction to reduce the risk of erosion.

The Miamian soil is in capability subclass IIIe and woodland suitability subclass 1o; Urban land is not assigned to a capability subclass or woodland suitability subclass.

MoB—Milton silt loam, 2 to 6 percent slopes. This gently sloping, moderately deep, well drained soil is on broad, bedrock-controlled uplands. Most areas are 4 to 75 acres in size; a few are up to 100 acres.

Typically, the surface layer is dark grayish brown, friable silt loam about 9 inches thick. The subsoil is about 22 inches thick. The upper part of the subsoil is brown and dark brown, friable and firm silty clay loam; the lower part is dark reddish brown and reddish brown, firm clay and channery clay. Limestone bedrock is at a depth of about 31 inches. In some areas along drainageways, slope is 6 to 9 percent.

Included with this soil in mapping are small areas of moderately well drained Celina soils that are deeper over bedrock. Also included are narrow strips of the shallow Ritchey soils and rock outcroppings along drainageways. These inclusions make up about 15 percent of most areas.

Permeability is moderate or moderately slow. The available water capacity is low. The organic matter content, potential frost action, and shrink-swell potential are moderate. Runoff from cultivated areas is medium. Reaction in the subsoil ranges from medium acid to neutral. This soil has medium natural fertility and good tilth. The root zone is moderately deep over limestone bedrock.

Most areas of this soil are farmed. This soil has high potential for cultivated crops, hay, pasture, and trees. It has medium to low potential for most building site development and low potential for sanitary facilities. This soil has high potential for most recreation uses.

This soil is suited to row crops and small grains. The erosion hazard and low available water capacity are the main limitations for crops. The surface layer can be worked through a fairly wide range of moisture content. It crusts and puddles after hard rains. Minimizing tillage, planting cover crops, and using grassed waterways reduce soil loss. Incorporating crop residue or other organic matter into the surface layer increases the water-holding capacity and water infiltration. These practices also reduce crusting and improve soil-seed contact.

The use of this soil for pasture or hay reduces erosion. Surface compaction, reduced growth, poor tilth, and increased runoff result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing, along with weed control, can help keep the pasture and soil in good condition.

This soil is well suited to trees and shrubs, and a few small areas are in native hardwoods. Seedlings grow well if competing vegetation is controlled or removed by cutting, spraying, girdling, or mowing.

This soil is severely limited for most building site development and sanitary facilities because of the moderately deep depth to bedrock, moderate shrink-swell potential, and moderate or moderately slow permeability. Sanitary facilities are also limited by the possibility of polluting ground water through fissures in the limestone bedrock. These limitations can be partially overcome by specially designed buildings. Central sewage systems are commonly used in this soil, although the bedrock makes installation difficult. This soil is better suited to houses without basements than to houses with basements because blasting of bedrock is generally necessary for basement excavations. Local roads can be improved by replacing the surface layer and subsoil with a suitable base material.

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

MoC2—Milton silt loam, 6 to 12 percent slopes, eroded. This sloping, moderately deep, well drained soil is on dissected, bedrock-controlled uplands. Most areas are 10 to 60 acres in size; a few are 100 acres.

Typically, the surface layer is brown, friable silt loam about 7 inches thick. The subsoil is about 21 inches thick. The upper part of the subsoil is reddish brown, firm clay; the lower part is reddish brown and brown, firm channery clay loam. Limestone bedrock is at a depth of about 28 inches.

Included with this soil in mapping are narrow strips of Ritchey soils that are shallow over bedrock along drainageways and small areas of the moderately well drained, deeper Celina soils on hill crests. These inclusions make up about 15 percent of most areas.

Permeability is moderate or moderately slow. The available water capacity is low. The organic matter content is moderately low. The frost action potential and shrink-swell potential are moderate. Runoff from cultivated areas is rapid. Reaction in the subsoil ranges from medium acid to neutral. This soil has medium natural fertility and good tilth. The root zone is moderately deep over limestone bedrock.

Most areas of this soil are in permanent pasture. This soil has medium potential for row crops and high potential for pasture and woodland. It has medium to low potential for most building site development and low potential for sanitary facilities. This soil has medium potential for some recreation uses.

This soil is not well suited to row crops because of the low available water capacity and the erosion hazard. If erosion is controlled row crops can be grown. The surface layer crusts after hard rains. If plowed when wet and sticky, the soil is cloddy. Minimizing tillage, planting cover crops, and using grassed waterways reduce soil loss. Incorporating crop residue or other organic matter into the surface layer can increase the water-holding capacity and water infiltration. These practices also reduce crusting and improve tilth and soil-seed contact.

The use of this soil for pasture or hay reduces erosion. It is well suited to early spring grazing. Surface compaction, poor tilth, reduced growth, and increased runoff result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing, along with weed control, help keep the pasture and soil in good condition.

This soil is well suited to trees and shrubs, and many areas are in native hardwoods. Seedlings grow well if competing vegetation is controlled or removed by cutting, spraying, girdling, or mowing. Logging roads and skid trails should be protected against erosion.

This soil is severely limited for building site development and sanitary facilities because of the slope, moderately deep depth to bedrock, and moderate or moderately slow permeability. Sanitary facilities are also limited by the possibility of polluting ground water through fissures in the limestone bedrock. These limitations can be partially or fully overcome by specially designed facilities. Central sewage systems are commonly used in this soil although the bedrock makes installation difficult. Increased runoff and erosion occur during construction, but can be minimized by maintaining plant cover wherever possible. Blasting of bedrock is generally necessary for basement excavations. Local roads can be improved by replacing the surface layer and subsoil with a suitable base material.

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

MpB—Milton-Urban land complex, 2 to 6 percent slopes. This map unit consists of a moderately deep, gently sloping, well drained Milton soil and areas of Urban land on bedrock-controlled uplands. Areas commonly have distinct corners and straight line boundaries on at least one side. They range from about 30 to 150 acres in size. Most areas are about 45 percent Milton silt loam and 30 percent Urban land. The pattern of occurrence of the Milton soil and Urban land is complex, and it is not practical to separate them in mapping.

Typically, the Milton soil has a surface layer of dark brown, friable silt loam about 9 inches thick. The subsoil is about 20 inches thick. The upper part of the subsoil is brown and dark brown, firm silty clay loam; the lower part is dark reddish brown, very firm clay and channery clay. Limestone bedrock is at a depth of about 29 inches.

The Urban land is covered by buildings and pavement. The buildings are mostly residential, consisting of single-family houses and apartments. There are some industrial and commercial uses.

Included with this complex in mapping and making up about 25 percent of the unit are areas that have been altered by cutting and filling. Also included are narrow strips of the shallow Ritchey soils on slope breaks and small areas of the deeper moderately well drained Celina soils on hill crests.

Permeability is moderate or moderately slow in the Milton soil. It has a moderate organic matter content, low available water capacity, moderate shrink-swell potential, and moderate potential frost action. Natural fertility is medium and tilth is good. Runoff is medium. The subsoil is medium acid to neutral. The root zone of the Milton soil is moderately deep over limestone bedrock.

The Milton soil is used for parks, open space, lawns, and gardens. It has high potential for lawns, vegetable and flower gardens, trees, and shrubs. It has high potential for most recreation uses. This soil has medium to low potential for most building site development and low potential for sanitary facilities.

The Milton soil is suited to most vegetables, flowers, trees, and shrubs common to the area. Because of the low capacity of this soil to hold water available for plants, watering is needed during dry periods. Erosion is generally not a major problem on this unit unless the soil is disturbed and left in a bare, exposed condition for a considerable period. The included spots of cut and fill land are not well suited to lawns and gardens. Subsoil material which is exposed on the surface has very poor tilth. It is sticky when wet and hard when dry.

The Milton soil is severely limited for building site development and sanitary facilities because of the moderately deep depth to bedrock, moderate shrink-swell potential, and moderate or moderately slow permeability. Sanitary facilities are also limited by the possibility of polluting ground water through fissures in the limestone bedrock. These limitations can be partially overcome by specially designed facilities. Central sewage systems are commonly used, although the bedrock makes installation difficult. This soil is better suited to houses without basements than to houses with basements because blasting of bedrock is generally necessary for basement excavations. Local roads can be improved by replacing the surface layer and subsoil with a suitable base material.

The Milton soil is in capability subclass IIe and woodland suitability subclass 2o; Urban land is not assigned to either a capability subclass or woodland suitability subclass.

MpC—Milton-Urban land complex, 6 to 12 percent slopes. This map unit consists of a moderately deep, sloping, well drained Milton soil and areas of Urban land on broad, bedrock-controlled uplands. The areas commonly have distinct corners and straight line boundaries on at least one side. They range about 30 to 150 acres in size. Most areas are about 45 percent Milton silt loam and 30 percent Urban land. The pattern of occurrence of the Milton soil and the Urban land is complex, and it is not practical to separate them in mapping.

Typically, the Milton soil has a surface layer of dark brown, friable silt loam about 7 inches thick. The subsoil is about 24 inches thick. The upper part of the subsoil is brown and dark brown, firm clay loam; the lower part is dark reddish brown, very firm clay and channery clay. Limestone bedrock is at a depth of about 31 inches.

The Urban land is covered by buildings and pavement. The buildings are mostly residential, consisting of single-family houses and apartments. There are some industrial or commercial uses.

Included with this complex in mapping and making up about 25 percent of the unit are areas that have been altered by cutting and filling. Also included are long narrow strips of the shallow Ritchey soils along streams and small areas of the deeper, moderately well drained Celina soils on hill crests.

Permeability is moderate or moderately slow in the Milton soil. The organic matter content is moderately low. The shrink-swell potential and potential frost action are moderate. Runoff is rapid. The subsoil is medium acid to neutral. Natural fertility is medium, and tilth is good. The root zone of the Milton soil is moderately deep over limestone bedrock.

The Milton soil is used for parks, open space, lawns, and vegetable and flower gardens. It has high potential for trees, shrubs, and lawns. This soil has medium potential for vegetable and flower gardens and most recreation uses. It has medium to low potential for most building site development and low potential for sanitary facilities.

The Milton soil is suited to trees and shrubs and moderately well suited to vegetable and flower gardens. The soil is droughty and the erosion hazard is severe where long slopes are cultivated. Watering is needed during dry periods. The included spots of cut and fill land are not well suited to lawns and gardens. Subsoil material which is exposed on the surface has very poor tilth. It is sticky when wet and hard when dry.

The Milton soil is severely limited for building site development and sanitary facilities because of the slope, moderately deep depth to bedrock, moderate shrink-swell potential, and moderate or moderately slow permeability. Sanitary facilities are also limited by the possibility of polluting ground water through fissures in the limestone bedrock. These limitations can be partially or fully overcome by specially designed facilities. Central sewage systems are commonly used, although the bedrock makes installation difficult. Increased runoff and erosion occur during construction, but these can be minimized by maintaining plant cover wherever possible. Blasting of bedrock is generally necessary for basements. Local roads can be improved by replacing the surface layer and subsoil with a suitable base material.

The Milton soil is in capability subclass IIIe and woodland suitability subclass 2o; Urban land is not assigned to either a capability subclass or a woodland suitability subclass.

MrB—Mitiwanga silt loam, 2 to 6 percent slopes. This gently sloping, moderately deep, somewhat poorly drained soil is on convex knolls and long concave side slopes of bedrock-controlled uplands. Most areas are 5 to 30 acres in size; a few are more than 100 acres.

Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The subsoil is about 24 inches thick. The upper part of the subsoil is yellowish brown, mottled, firm and very firm silty clay loam and clay loam; the lower part is brown, mottled, firm and very firm clay loam and channery clay loam. A substratum of dark yellowish brown, firm, soft-bedded silty shale occurs over the light brownish gray, fine-grained sandstone bedrock that is at a depth of about 35 inches. A few areas on knolls are eroded.

Included with this soil in mapping are small areas of the deeper, poorly drained Condit soils in depressions and the deeper, moderately well drained Cardington soils on knolls. These inclusions make up about 15 percent of most areas.

Permeability is moderate, and the available water capacity is low. The organic matter content and shrink-swell potential in the subsoil are moderate. The potential frost action is high. Runoff from cultivated areas is medium. Reaction ranges from very strongly acid in the upper part of the subsoil to slightly acid in the lower part. This soil has medium natural fertility and good tilth. The surface layer can be worked through a fairly wide range of moisture content. The root zone is moderately deep over bedrock. A seasonal high water table is near the surface in winter, spring, and other extended wet periods.

Most areas of this soil are farmed. This soil has medium potential for row crops and high potential for hay, pasture, and trees. It has low potential for most building site development, sanitary facilities, and recreation uses.

This soil is suited to row crops and small grains. Wetness and the erosion hazard on long slopes are the main limitations. The underlying sandstone and shale bedrock hinders the installation of subsurface drains. Minimizing tillage, planting cover crops, and using grassed waterways reduce soil loss. Incorporating crop residue or other organic matter into the surface layer can improve tilth and fertility and increase water infiltration. These practices also reduce crusting and improve soil-seed contact.

The use of this soil for pasture or hay reduces erosion. This soil is not suited to grazing early in spring. Surface compaction, reduced growth, poor tilth, and increased runoff result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing, along with weed control, can help keep the pasture and soil in good condition.

This soil is well suited to trees and shrubs that tolerate some wetness. A few small areas are in native hardwoods. Seedlings grow well if competing vegetation is controlled or removed by cutting, spraying, girdling, or mowing.

This soil is severely limited for building site development, sanitary facilities, and most recreation uses by the moderately deep depth over bedrock and seasonal wetness. These limitations can be partially or fully overcome by specially designed facilities. Building sites should be landscaped for good surface drainage away from foundations and septic tank absorption fields. Increased runoff and erosion occur during construction. Plant cover should be maintained on the site as much as possible. Sanitary facilities should be connected to central sewers and treatment facilities, wherever possible. Local roads can be improved by using artificial drainage and a suitable base material.

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

Ms—Montgomery silty clay loam. This nearly level, deep, very poorly drained soil is on flat and depressional areas in slack water basins. Some areas are in kettle holes on the uplands. This soil is subject to frequent ponding from runoff from higher adjacent soils. Slope is 0 to 2 percent. Most areas are 5 to 35 acres in size; some are more than 100 acres.

Typically, the surface layer is very dark gray, friable silty clay loam about 8 inches thick. The subsoil is about 35 inches thick. The upper part of the subsoil is very dark gray, friable silty clay loam and very dark gray and dark gray, mottled, firm silty clay; the lower part is gray, mottled, firm silty clay and silty clay loam. The substratum to a depth of about 70 inches is gray, mottled, firm silty clay loam.

Included with this soil in mapping near the edge of depressions are narrow strips of the more loamy Algiers and Westland soils. Also included in the lower parts of depressions are small areas of Carlisle soils formed in organic deposits. These inclusions make up about 10 percent of most areas.

Permeability is slow or very slow. The available water capacity, organic matter content, and shrink-swell potential in the subsoil are high. The potential frost action is moderate. Runoff is very slow or ponded. Reaction ranges from neutral or mildly alkaline in the upper part of the subsoil to mildly alkaline in the lower part. This soil has high natural fertility and fair tilth. It puddles and clods easily. A seasonal high water table is near the surface in winter, spring, and other extended wet periods. The root zone is deep.

Most areas of this soil are farmed. This soil has high potential for row crops, hay, pasture, and trees. It has low potential for building site development, sanitary facilities, and recreation uses.

This soil is suited to growing continuous row crops and small grains, if artificially drained. The very poor natural drainage is the main limitation for farming. Stands of wheat and oats in inadequately drained areas are poor in most years. A combination of surface and subsurface drains is commonly used, but suitable subsurface drainage outlets are difficult to establish in some areas. It is important to restrict tillage within a limited range of moisture content because this soil becomes compacted and cloddy if worked when wet and sticky. Minimizing tillage and planting cover crops are good management practices. Incorporating crop residue or other organic matter into the surface layer increases water infiltration and improves tilth and fertility. These practices also reduce crusting and improve soil-seed contact.

This soil is suited to pasture or hay, but is poorly suited to grazing early in spring. Surface compaction, poor tilth, reduced growth, and decreased infiltration result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing, along with weed control, can help keep the pasture and soil in good condition.

This soil is well suited to trees and shrubs that are adapted to wet sites. Seedlings grow well if competing vegetation is controlled or removed by cutting, spraying, girdling, or mowing. Logging can be done during the drier part of the year.

This soil is severely limited for building site development, sanitary facilities, and recreation uses because of the slow or very slow permeability, wetness, and high shrink-swell potential. Surface drains and storm sewers should be used to remove surface water. Building sites should be landscaped for good surface drainage away from foundations and septic tank absorption fields. Sanitary facilities should be connected to central sewers and treatment facilities, wherever possible. Local roads can be improved by using artificial drainage and a suitable base material.

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

OcA—Ockley silt loam, 0 to 2 percent slopes. This nearly level, deep, well drained soil is in broad areas on stream terraces and outwash plains. In some places it occurs on the crests of wide, flat low knolls and long ridges. Most areas are 5 to 50 acres in size.

Typically, the surface layer is brown, friable silt loam about 8 inches thick. The subsurface layer is brown, friable silt loam about 5 inches thick. The subsoil is about 34 inches thick. The upper part of the subsoil is reddish brown, firm clay loam; the lower part is brown, firm clay loam and brown, friable sandy clay loam. The substratum to a depth of about 70 inches is brown, loose gravelly sand.

Included with this soil in mapping are small areas of very poorly drained Westland and somewhat poorly drained Sleeth soils in depressions and along small drainageways. Also included are small areas of Eldean soils that have a thinner subsoil near slope breaks and Kendallville soils that are underlain by glacial till on breaks to uplands. These inclusions make up about 15 percent of most areas.

This soil has moderate permeability in the subsoil and very rapid permeability in the substratum. The available water capacity is moderate or high. The organic matter content, shrink-swell potential in the subsoil, and potential frost action are moderate. Runoff is slow. Reaction ranges from strongly acid or medium acid in the upper part of the subsoil to neutral in the lower part. This soil has medium natural fertility and fair tilth. The root zone is deep.

Most areas of this soil are farmed. It has high potential for cultivated crops, hay, pasture, and trees. This soil has high potential for most building site development and recreation uses. It has low potential for water impoundment because of the very rapid permeability in the substratum. It has high potential as a source of sand and gravel.

This soil is well suited to row crops grown year after year and to specialty crops. It is also suited to small grains. The surface layer can be worked through a fairly wide range of moisture content. Minimizing tillage and planting deep-rooted cover crops are good management practices, especially for continuous cropping. Incorporating crop residue or other organic matter into the surface layer increases water infiltration and improves tilth and fertility. These practices also reduce crusting and improve soil-seed contact.

This soil is suited to pasture or hay. Surface compaction, poor tilth, reduced growth, and decreased infiltration result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing, along with weed control, can help keep the pasture and soil in good condition.

This soil is well suited to trees and shrubs, and a few areas along streams are in native hardwoods. Seedlings are easy to establish if competing vegetation is controlled or removed by cutting, spraying, girdling, or mowing.

Even though the shrink-swell potential and soil strength are moderate limitations, this soil is well suited as a site for buildings. The limitations can be partly overcome by extending foundations to the underlying sand and gravel and by backfilling with a suitable material. Local roads can be improved by using a suitable base material. If used for sanitary facilities, ground water could be polluted because of the very rapid permeability in the substratum. This soil is well suited to recreation uses. It is a good source of sand and gravel.

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

OcB—Ockley silt loam, 2 to 6 percent slopes. This gently sloping, deep, well drained soil is in irregularly shaped areas on low knolls and in long narrow strips on stream terraces and broad outwash plains. Most areas are 4 to 50 acres in size.

Typically, the surface layer is brown, friable silt loam about 8 inches thick. The subsurface layer is brown, friable silt loam about 6 inches thick. The subsoil is about 38 inches thick. The upper and middle parts of the subsoil are brown and reddish brown, mottled, friable gravelly sandy clay loam. The substratum to a depth of about 70 inches is brown, loose gravelly loamy sand. A few areas on 6 to 10 percent slopes are eroded.

Included with this soil in mapping are small areas of the more droughty Eldean soils and Kendallville soils that are underlain by glacial till near slope breaks. Small areas of moderately well drained Thackery soils are in small slight depressions. These inclusions make up about 15 percent of most areas.

This soil has moderate permeability in the subsoil and very rapid permeability in the substratum. The available water capacity is moderate or high. The organic matter content, shrink-swell potential in the subsoil, and potential frost action are moderate. Runoff is medium. Reaction ranges from strongly acid or medium acid in the upper part of the subsoil to neutral in the lower part. This soil has medium natural fertility and good tilth. The root zone is deep.

Most areas of this soil are farmed. This soil has high potential for crops, hay, pasture, and trees. It has high potential for most building site development and recreation uses and as a source of sand and gravel. It has low potential for water impoundment because of the very rapid permeability in the substratum.

This soil is suited to row crops and small grains. Erosion is the main hazard for row crops. Row crops can be grown year after year if erosion is controlled. The surface layer can be worked through a fairly wide range of moisture content. This soil is suited to irrigation. Minimizing tillage, planting cover crops, and using grassed waterways can reduce soil loss. Incorporating crop residue or other organic matter into the surface layer increases water infiltration and improves tilth and fertility. These practices also reduce crusting and improve soil-seed contact.

This soil is suited to pasture or hay. It is well suited to grazing early in spring. Surface compaction, poor tilth, reduced growth, and decreased infiltration result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing, along with weed control, can help keep the pasture and soil in good condition.

This soil is well suited to trees and shrubs and a few areas along streams are in native hardwoods. There are no soil hazards or limitations to growing or harvesting trees and shrubs on this soil. Seedlings grow well if competing vegetation is controlled or removed by cutting, spraying, girdling, or mowing.

Even though the shrink-swell potential and soil strength are moderate limitations, this soil is a good site for buildings. The limitations can be partly overcome by extending foundations to the underlying sand and gravel and by backfilling with a suitable material. Local roads can be improved by using a suitable base material. The possibility of contaminating ground water limits some sanitary facilities. Increased runoff and erosion occur during construction, but can be minimized by maintaining plant cover, wherever possible. This soil is well suited to most recreation uses. It is a good source of sand and gravel.

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

OcC2—Ockley silt loam, 6 to 12 percent slopes, eroded. This sloping, deep, well drained soil is in long and narrow areas on short slopes between terraces and flood plains or between different terrace levels. Some areas are on kames. Most areas are 3 to 25 acres in size.

Typically, the surface layer is brown, friable silt loam about 8 inches thick. The subsoil is about 46 inches thick. The upper and middle parts of the subsoil are brown, firm clay loam; the lower part is brown, friable gravelly clay loam. The substratum to a depth of about 70 inches is brown, loose gravelly sand.

Included with this soil in mapping are small areas of the more droughty Eldean soils on the upper parts of slopes and Kendallville soils that are underlain by glacial till in narrow strips at the base of kames. These inclusions make up about 10 percent of most areas.

This soil has moderate permeability in the subsoil and very rapid permeability in the substratum. The available water capacity is moderate or high. The organic matter content is moderately low. The shrink-swell potential in the subsoil and potential frost action are moderate. Runoff is rapid. Reaction ranges from strongly acid or medium acid in the upper part of the subsoil to neutral in the lower part. This soil has medium natural fertility and good tilth. The root zone is deep.

Many areas of this soil are farmed. A few areas are mined for sand and gravel or are in permanent pasture or woodland. This soil has medium potential for row crops and high potential for hay, pasture, and trees. It has medium potential for building site development and recreation uses, but low potential for water impoundment because of the very rapidly permeable substratum. It has high potential as a source of sand and gravel.

This soil is suited to row crops and small grains. Erosion is the main hazard for row crops. The surface layer can be worked through a fairly wide range of moisture content. Minimizing tillage, planting cover crops, and using grassed waterways reduce soil loss. Incorporating crop residue or other organic matter into the surface layer increases water infiltration and improves tilth and fertility. These practices also reduce crusting and improve soil-seed contact.

Including long-term hay or pasture in the cropping system reduces the erosion hazard. This soil is well suited to grazing early in spring. Surface compaction, reduced growth, poor tilth, and decreased infiltration result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing along with weed control can help keep the pasture and soil in good condition.

This soil is well suited to trees and shrubs, and a few areas along streams are in native hardwoods. Seedlings grow well if competing vegetation is controlled or removed by cutting, spraying, girdling, or mowing. Logging roads and skid trails should be protected against erosion.

The slope, soil strength, shrink-swell potential, and possibility of polluting ground water limit this soil as a site for buildings, sanitary facilities, and recreation uses. Increased runoff and erosion occur during construction, but can be minimized by maintaining plant cover wherever possible. The low strength can be overcome by extending building foundations to the underlying sand and gravel and by backfilling with a suitable material. Local roads can be improved by using a suitable base material. Trails in recreation areas should be protected against erosion and established across the slope, wherever possible. This soil is a good source of sand and gravel.

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

Pm—Pewamo silty clay loam. This nearly level, deep, very poorly drained soil is in depressions and along drainageways on uplands. It receives runoff from higher adjacent soils and is subject to ponding. Slope is 0 to 2 percent. Most areas are irregularly shaped and 2 to 65 acres in size; some are more than 100 acres.

Typically, the surface layer is very dark gray, friable silty clay loam about 8 inches thick. The subsurface layer, which extends to about 13 inches, is very dark gray, friable silty clay loam. The subsoil is about 37 inches thick. The upper part of the subsoil is dark gray, mottled, firm silty clay and very firm clay; the lower part is gray, mottled, very firm clay and clay loam. The substratum to a depth of about 70 inches is glacial till of mottled, very firm clay loam and firm loam. Some areas have a lighter colored surface layer.

Included with this soil in mapping are narrow bands and islands of somewhat poorly drained Bennington soils that make up about 15 percent of most areas.

The soil has moderately slow permeability in the subsoil and in the substratum. The available water capacity, organic matter content, and potential frost action are high. The shrink-swell potential is moderate. Runoff is very slow or ponded. Reaction ranges from slightly acid in the upper part of the subsoil to mildly alkaline in the lower part. This soil has high natural fertility, fair tilth, and a deep root zone. The seasonal high water table is near the surface in winter, spring, and other extended wet periods.

Most areas of this soil are farmed The soil has high potential for cultivated crops, hay, pasture, and trees. It has low potential for building site development, sanitary facilities, and recreation uses.

Wetness is the main limitation to farming. Drained areas are well suited to row crops and small grains. Surface and subsurface drains are commonly used to remove excess water. It is important to restrict tillage within a limited range of moisture content because this soil becomes compacted and cloddy if worked when wet and sticky. Minimizing tillage, using cover crops, incorporating crop residue or other organic matter into the surface layer help maintain tilth, increase water infiltration, and improve fertility. These practices also reduce crusting and improve soil-seed contact.

The soil is suited to pasture or hay. Surface compaction, poor tilth, decreased infiltration, and reduced plant growth result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing, along with weed control, help keep the pasture and soil in good condition.

The soil is well suited to trees and shrubs adapted to wet sites, and a few small areas are in native hardwoods. Wetness is the main limitation to growing and harvesting trees or shrubs. Seedlings grow well if competing vegetation is controlled or removed by spraying, girdling, or mowing.

This soil is severely limited for building site development, sanitary facilities, and recreation uses by the moderately slow permeability, wetness, ponding, and low strength. Areas used for these purposes must be artificially drained. Local roads can also be improved by using a suitable base material. Building sites should be landscaped for good surface drainage away from foundations and septic tank absorption fields. Absorption fields should be located on the higher part of the landscape. Sanitary facilities should be connected to central sewers and treatment facilities, wherever possible.

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

Pn—Pewamo-Urban land complex. This complex of deep, nearly level, very poorly drained Pewamo soil and Urban land is in depressions and along drainageways. It occupies the lowest part of the immediate landscape. The Pewamo soil receives runoff from higher adjacent soils and is subject to ponding. Most areas are long and narrow or irregularly shaped and about 50 percent Pewamo silty clay loam soil and 30 percent Urban land. The Pewamo soil and Urban land are so intricately mixed or so small in size that it was not practical to separate them in mapping. Slope is 0 to 2 percent.

Typically, the Pewamo soil has a surface layer of very dark gray, friable silty clay loam about 13 inches thick. The subsoil is about 37 inches thick. The upper part of the subsoil is dark gray, mottled, firm silty clay and very firm clay; the lower part is gray, mottled, very firm clay and clay loam. The substratum to a depth of about 70 inches is glacial till of brown, mottled, very firm clay loam.

The Urban land is covered by buildings and pavements. The buildings are mostly residential, ranging from single-family houses to apartment complexes, with some industrial and commercial uses.

Included with this complex in mapping are small areas of somewhat poorly drained Bennington soils on flats and moderately well drained Cardington soils on low knolls and ridges. Also included are areas where the original soil has been covered by fill material with highly variable properties. These inclusions make up about 20 percent of most areas.

Most areas of this map unit have been artificially drained by sewer systems, gutters, and storm drains. The Pewamo soil in areas that are not drained has a water table near the surface in wet seasons, and some low areas are ponded by runoff from higher adjacent areas. Runoff is very slow. This soil has moderately slow permeability, high organic matter content, high available water capacity, moderate shrink-swell potential, and high potential frost action. The Pewamo soil has high natural fertility and is sticky when wet. Reaction ranges from slightly acid in the upper part of the subsoil to mildly alkaline in the lower part.

The Pewamo soil is used for parks, open space, lawns, and gardens. When drained, it is suited to most vegetables, flowers, trees, and shrubs common to the area. Water-tolerant plants grow in undrained areas, which have low potential for most building site development, sanitary facilities, and recreation uses.

This map unit is severely limited for most building site development and sanitary facilities because of the moderately slow permeability, low strength, ponding, and wetness. Areas used for these purposes should be artificially drained. Because of low strength, a suitable base material should be used under local roads and streets. Dwellings and small buildings should be constructed without basements, and foundations and footers should be designed to prevent structural damage caused by the high potential frost action and the shrinking and swelling of the soil. Building sites should be landscaped for good surface drainage away from foundations and septic tank absorption fields. Absorption fields should be located on the higher part of the landscape. Sanitary facilities should be connected to central sewage systems and treatment facilities, wherever possible.

The Pewamo soil is in capability subclass IIw and woodland suitability subclass 2w; Urban land is not assigned to a capability subclass or a woodland suitability subclass.

Pt—Pits, Quarry. These are areas where limestone or shale bedrock have been surface-mined for construction, industrial, or agricultural purposes. Quarries are commonly on the upland and are typically associated with Ritchey and Milton soils. Most quarries range from about 2 to 25 acres in size. One is about 900 acres. Actively mined quarries are continually being enlarged. Most quarries have a high wall on one or more sides.

Included with this unit in mapping around the edges of quarries are small areas that are similar to adjacent soils. These inclusions make up about 5 percent of most areas.

Prior to quarrying, the overburden, including the original soils, is usually scalped and piled to the side. The material associated with limestone bedrock is commonly calcareous; that with shale bedrock is acid. This material is very low in organic matter and has a variable available water capacity. It is highly susceptible to erosion.

Areas that are no longer being mined could be reclaimed to reduce the risk of erosion. Resurfacing with topsoil can aid in the establishment and maintenance of plant cover. Plants that are tolerant of a fairly low available water capacity and unfavorable soil properties should be selected for planting.

Some quarries can be developed for wildlife habitat and recreation.

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

RhB—Ritchey silt loam, 2 to 6 percent slopes. This gently sloping, shallow, well drained soil is on bedrock-controlled uplands. Most areas are 10 to 50 acres in size; a few are 100 acres.

Typically, the surface layer is brown, friable silt loam about 7 inches thick. The subsoil is about 10 inches thick. The upper part of the subsoil is brown, friable silt loam; the lower part is reddish brown, firm clay loam. Limestone bedrock is at a depth of about 17 inches. Some areas along streams have slopes of 6 to 9 percent, and a few areas are eroded.

Included with this soil in mapping are small areas of deeper Milton soils on the upper part of slopes and long narrow areas of rock outcroppings on slope breaks. These inclusions make up about 15 percent of most areas.

Permeability is moderate, and available water capacity is very low. The organic matter content and shrink-swell potential are moderate. Potential frost action is moderate. Runoff from cultivated areas is medium. Reaction ranges from slightly acid in the upper part of the subsoil to mildly alkaline in the lower part. This soil has low natural fertility and good tilth. The root zone is shallow over limestone bedrock.

Most areas of this soil are farmed. This soil has low potential for row crops and medium potential for hay and pasture. It has low potential for most building site development and sanitary facilities. This soil has medium to low potential for many recreation uses.

This soil is not well suited to row crops. It is droughty. If cultivated, the cropping system should include close-growing crops and grasses and legumes. The surface layer can be worked through a fairly wide range of moisture content. Minimizing tillage, planting cover crops, and using grassed waterways reduce soil loss. Incorporating crop residue or other organic matter into the surface layer can increase the capacity of the soil to hold water and improve tilth. These practices also reduce crusting and improve soil-seed contact.

Drought-resistant grasses and legumes can be grown for pasture or hay. This soil is well suited to early spring grazing, but pastures dry up during the dry summer months. Surface compaction, poor tilth, and increased runoff result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, pasture rotation, and deferment of grazing, along with weed control, can help keep the pasture and soil in good condition.

This soil is suited to drought-tolerant trees and shrubs, and a few small areas are in native hardwoods. Tree seedlings are difficult to establish in most years. Growth can improve if competing vegetation is controlled or removed by cutting, spraying, girdling, or mowing.

This soil is severely limited for most building site development and sanitary facilities by its shallow depth over bedrock. Blasting is usually required for basement excavations and installation of underground utilities. Sanitary facilities are also limited by the possibility of polluting ground water through fissures in the limestone bedrock. This soil is better suited to houses without basements than to houses with basements. It is suited to such recreation uses as paths and trails.

This soil is in capability subclass IIIe and woodland suitability subclass 5d.

RhD2—Ritchey silt loam, 12 to 18 percent slopes, eroded. This moderately steep, shallow, well drained soil is along streams on bedrock-controlled uplands. Most areas are 10 to 30 acres in size.

Typically, the surface layer is brown, friable silt loam about 6 inches thick. The subsoil which extends to a depth of about 15 inches, is brown and reddish brown, firm clay loam. Limestone bedrock is at a depth of about 15 inches.

Included with this soil in mapping are small areas of the deeper Milton soils on the upper part of slopes and narrow strips of rock outcroppings on slope breaks. Also included are areas with 9 to 12 percent slopes and 18 to 25 percent slopes. These inclusions make up about 15 percent of most areas.

Permeability is moderate, and the available water capacity is very low. The organic matter content is moderately low. Shrink swell potential and potential frost action are moderate. Runoff from cultivated areas is very rapid.

Reaction ranges from slightly acid in the upper part of the subsoil to mildly alkaline in the lower part. This soil has low natural fertility and good tilth. The root zone is shallow over limestone bedrock.

Most areas of this soil are in woodland. Some areas adjacent to less sloping soils are farmed. This soil has low potential for cultivated crops and hay. It has low potential for most building site development, sanitary facilities, and recreation uses.

This soil is generally not used for crops because of the moderately steep slopes, shallow depth to bedrock, and very low available water capacity. It is suited to drought-resistant grasses and legumes for hay or pasture. Erosion is a serious hazard when pasture is reseeded or when adequate plant cover is not maintained. Grazing should be regulated to maintain enough vegetation to control erosion. This soil is suited to early spring grazing, but pastures dry up during dry summer months.

This soil is suited to drought-tolerant trees and shrubs, and a few small areas are in native hardwoods. Tree seedlings are difficult to establish in most years. Growth can be improved if competing vegetation is controlled or removed by cutting, spraying, girdling, or mowing. The slope limits the use of logging equipment. Logging roads and skid trails should be protected against erosion.

This soil is severely limited for most building site development, sanitary facilities, and recreation uses by the moderately steep slope and shallow depth to bedrock. Blasting is usually required for basement excavations and installation of underground utilities. Sanitary facilities are also limited by the possibility of polluting ground water through fissures in the limestone bedrock. Plant cover should be maintained on the site as much as possible during construction. This soil is suited to such recreation uses as paths and trails.

This soil is in capability subclass VIe and woodland suitability subclass 5d.

Rs—Ross silt loam, occasionally flooded. This nearly level, deep, well drained soil is on narrow to broad flood plains. It commonly occurs on the highest part of the flood plain and is subject to occasional flooding. Slope is 0 to 2 percent. Most areas range from 10 to 90 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 11 inches thick. The subsurface is very dark grayish brown, friable silt loam about 5 inches thick. The subsoil is about 24 inches thick. The upper part of the subsoil is very dark gray and very dark grayish brown, friable silty clay loam; the lower part is brown and dark yellowish brown, friable silt loam and silty clay loam. The substratum to a depth of about 70 inches is dark yellowish brown and yellowish brown, friable silt loam that is mottled in the lower part.

Included with this soil in mapping are areas of moderately well drained Eel soils in slightly lower positions and somewhat poorly drained Shoals soils in narrow high water channels near breaks to uplands. Also included are Wea and Warsaw soils on low stream terraces. These inclusions make up about 15 percent of most areas.

Permeability is moderate. The available water capacity, organic matter content, and natural fertility are high. The shrink-swell potential is low. Runoff is slow. The subsoil is slightly acid to mildly alkaline. This soil has good tilth and can be worked through a wide range of moisture content. It has a deep root zone.

Most areas of this soil are farmed. This soil has high potential for row crops and low potential for most building site development and sanitary facilities. It has medium potential for most recreation uses and high potential as a source of topsoil.

This soil is suited to continuous row cropping and to hay and pasture. Row crops can be planted and harvested during the nonflooding period in most years. Winter grain crops are limited by the flooding hazard. Dikes can be used to help prevent flooding. Minimizing tillage, incorporating crop residue, and planting cover crops can maintain tilth, reduce crusting, and protect the surface in areas that are subject to scouring during floods.

This soil is suited to trees and other vegetation grown as habitat for wildlife. Some areas are used for nurseries. Spraying, mowing, and disking can reduce plant competition.

This soil is severely limited for building site development and sanitary facilities by the flooding hazard. In some places extensive filling has occurred to prepare sites for buildings. This soil is suited to such recreation uses as picnic areas and paths and trails.

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

Sh—Shoals silt loam, occasionally flooded. This nearly level, deep, somewhat poorly drained soil is on flood plains. It is in narrow strips near slope breaks to uplands and terraces and in high water channels on wide flood plains. It is flooded for brief periods in fall, winter, and spring. Slope is 0 to 2 percent. Most areas range from 4 to 50 acres in size; some are about 100 acres.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is brown, mottled, friable silt loam about 5 inches thick. The substratum to a depth of about 70 inches is brown, grayish brown, and dark yellowish brown, mottled, friable silt loam and loam.

Included with this soil in mapping are areas of moderately well drained Eel soils on slightly higher positions and somewhat poorly drained Sloan soils in high water channels and depressions. These inclusions make up about 15 percent of most areas.

Permeability is moderate. The potential frost action and available water capacity are high. Organic matter content is moderate. Natural fertility is medium, and shrink-swell potential is low. Runoff is very slow. The substratum is slightly acid to mildly alkaline in the upper part and neutral to moderately alkaline in the lower part. This soil has good tilth and can be worked through a wide range of moisture content. A seasonal high water table is between depths of 12 and 36 inches in winter, spring, and other extended wet periods. The root zone is deep.

Most areas of this soil are farmed. This soil has high potential for crops and low potential for most building site development and sanitary facilities. It has low to medium potential for most recreation uses and high potential as a source of topsoil.

The flooding hazard and wetness limit the use of this soil for crops. They delay planting in most years and limit the choice of crops. This soil is suited to row crops that can be planted after the major threat of flooding. Flooding severely damages winter grain crops. Subsurface drains are commonly used in areas that have suitable outlets. Outlets are difficult to establish in some areas. Minimizing tillage, incorporating crop residue, and planting cover crops can maintain tilth, reduce crusting, and protect the surface in areas that are subject to scouring during floods.

This soil is suited to pasture, but maintaining soil tilth and desirable forage stands is difficult unless the soil is drained and grazing is controlled. Overgrazing or grazing this soil when soft and sticky because of wetness causes compaction and poor tilth. Pasture rotation and deferment of grazing during wet periods can keep the pasture and soil in good condition.

This soil is suited to trees and other vegetation grown as habitat for wildlife. Species that are tolerant of some wetness should be selected for reforestation.

The flood hazard and seasonal wetness seriously limit this soil as a site for buildings and sanitary facilities. This soil has potential for such recreation uses as hiking during the drier part of the year. In some places extensive filling has occurred to prepare sites for buildings.

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

SlA—Sleeth silt loam, 0 to 2 percent slopes. This nearly level, deep, somewhat poorly drained soil is in irregularly shaped areas and long and narrow strips on stream terraces and outwash plains. It occurs primarily in transitional areas between Thackery soils on flats and slight rises and Westland soils in depressions. It also occurs on slight rises in Westland soils. Most areas 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 47 inches thick. The upper part of the subsoil is yellowish brown, mottled, firm and very firm silt loam and silty clay loam; the lower part is dark yellowish brown, mottled, firm clay loam and friable loam and brown, mottled, very friable sandy clay loam. The substratum to a depth of about 70 inches is grayish brown, mottled, loose gravelly sand. Some areas on low knolls and on slope breaks have slopes of 2 to 4 percent.

Included with this soil in mapping are small areas of very poorly drained Westland soils in depressions and moderately well drained Eel soils on flood plains. These inclusions make up about 10 percent of most areas.

Permeability is moderate in the subsoil and very rapid in the substratum. The available water capacity is moderate or high. The organic matter content and shrink-swell potential in the subsoil are moderate. The potential frost action is high. Runoff is slow. Reaction ranges from strongly acid to slightly acid in the upper part of the subsoil to mildly alkaline in the lower part. This soil has medium natural fertility and good tilth. A seasonal high water table is between depths of 12 and 36 inches in winter, spring, and other extended wet periods.

Most areas of this soil are farmed. Drained areas have high potential for row crops, hay, pasture, and trees. This soil has low potential for most building site development and sanitary facilities. It has medium potential for many recreation uses and high potential as a source of sand and gravel.

This soil is suited to row crops and small grains. Wetness is the main limitation for farming. Surface and subsurface drains are commonly used to remove excess water, but suitable outlets are difficult to establish in some areas. Minimizing tillage and planting deep-rooted cover crops improve natural drainage. Incorporating crop residue or other organic matter into the surface layer increases water infiltration and improves tilth and fertility. These practices also reduce crusting and improve soil-seed contact.

This soil is suited to pasture or hay. Surface compaction, poor tilth, reduced growth, and decreased infiltration rates result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, deferment of grazing, and weed control can help keep the pasture and soil in good condition.

This soil is well suited to trees and shrubs that tolerate some wetness, and a few areas along streams are producing native hardwoods. Seedlings of adapted species grow well if competing vegetation is controlled or removed by cutting, spraying, girdling, or mowing.

The seasonal wetness and hazard of ground water pollution severely limits the use of this soil for most building site development and sanitary facilities. Artificial drains are effective in reducing the wetness in most areas. Building sites should be landscaped for good surface drainage away from foundations and septic tank absorption fields. Absorption fields should be located on the higher part of the landscape. If used for sanitary facilities, ground water pollution can result because of the very rapid permeability in the substratum. Sanitary facilities should be connected to central sewers and treatment facilities, wherever possible. Local roads and streets can be improved by using artificial drainage and a suitable base material. Wetness also limits recreation uses.

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

SmA—Sleeth-Urban land complex, 0 to 2 percent slopes. This map unit consists of a deep, nearly level, somewhat poorly drained Sleeth soil and Urban land on terraces. Most areas are long narrow strips and range from about 10 to 100 acres in size. Slope is dominantly less than 1 percent. Sleeth silt loam makes up about 45 percent of the unit, and Urban land about 25 percent. Areas of the Sleeth soil and Urban land are so intricately mixed or so small in size that it was not practical to separate them in mapping.

Typically, the Sleeth soil has a surface layer of dark grayish brown, friable silt loam about 9 inches thick. The subsoil is about 46 inches thick. The upper part of the subsoil is brown, mottled, friable silt loam and firm silty clay loam; the lower part is yellowish brown, mottled, firm clay loam and gravelly clay loam. The substratum to a depth of about 70 inches is grayish brown, mottled, loose gravelly sand. Some areas on low knolls and slope breaks have slopes of 2 to 4 percent.

The Urban land is covered by buildings and pavement. The buildings are mostly used for industrial and commercial purposes. There are some single-family houses and apartments.

Included in mapping are areas that are altered by cutting and filling. In some cases, areas have been filled to change natural drainage. Also included are areas of very poorly drained Westland soils in depressions. These inclusions make up about 25 percent of most areas.

Most areas of this map unit have been artificially drained by sewer systems, gutters, subsurface drains, and, to a lesser extent, surface ditches. Areas of Sleeth soils that are not drained have a seasonal high water table between depths of 12 and 36 inches in winter, spring, and other extended wet periods. Permeability is moderate in the subsoil and very rapid in the substratum. The organic matter content is moderate and the available water capacity is moderate or high. The potential frost action is high. The Sleeth soil has medium natural fertility and a deep root zone.

The Sleeth soil is used for parks, open space, lawns, and gardens. It has high potential for lawns, vegetable and flower gardens, trees, and shrubs. It has low potential for most building site development and sanitary facilities. This soil has medium potential for many recreation uses.

The Sleeth soil is well suited to growing grasses, flowers, vegetables, trees, and shrubs if excess water is removed. Several methods of artificial drainage can be successfully used on this soil. Onsite investigation is needed to determine the best method for a particular area. Perennial plants selected for planting should be tolerant of some wetness. Erosion is generally not a major problem on this unit unless the soils are disturbed and left unprotected for a considerable period. The included spots that have been filled are not well suited to lawns and gardens. Subsoil material which is exposed on the surface has very poor tilth. It is sticky when wet and hard when dry.

Seasonal wetness severely limits the use of the Sleeth soil as a site for buildings. Dwellings and small buildings should be landscaped for good surface drainage away from foundations and septic tank absorption fields. Absorption fields should be located on the higher part of the landscape. Local roads and streets can be improved by using artificial drainage and a suitable base material. If the Sleeth soil is used for sanitary facilities, there is a hazard of ground water pollution. Sanitary facilities should be connected to central sewers and treatment facilities, wherever possible.

The Sleeth soil is in capability subclass IIw and woodland suitability subclass 3o; Urban land is not assigned to a capability subclass or woodland suitability subclass.

So—Sloan silt loam, frequently flooded. This nearly level, deep, very poorly drained soil is on narrow to wide flood plains. It commonly occurs in depressions near slope breaks to terraces and uplands and in narrow swales of high water channels on the wide flood plains. It is frequently flooded for brief periods in winter and spring. Most areas range from 10 to 35 acres in size; some are about 100 acres.

Typically, the surface layer is very dark brown, friable silt loam about 11 inches thick. The subsoil is about 23 inches thick. The upper part of the subsoil is very dark grayish brown, firm silty clay loam; the middle part is dark grayish brown and gray, mottled, firm silty clay loam; and the lower part is gray, mottled, firm clay loam. The substratum to a depth of about 70 inches is light gray, yellowish brown and very dark grayish brown, mottled, friable loam and gravelly loam.

Included with this soil in mapping on slightly higher positions are fan-shaped areas of somewhat poorly drained Algiers soils at the base of slopes and narrow strips and oval areas of somewhat poorly drained Shoals soils. These inclusions make up about 15 percent of most areas.

Permeability is moderate or moderately slow. The available water capacity, potential frost action, organic matter content, and natural fertility are high. The shrink-swell potential in the subsoil is moderate. Runoff is very slow or ponded. Reaction ranges from slightly acid to moderately alkaline in the subsoil. This soil has good tilth. A seasonal high water table is near the surface in winter, spring, and other extended wet periods. The root zone is deep.

Most areas of this soil are farmed. This soil has high potential for crops and low potential for most building site development, sanitary facilities, and recreation uses.

Flooding and seasonal wetness limit the use of this soil for farming. They delay planting in most years and limit the choice of crops. Drained areas are suited to row crops. Flooding severely damages winter grain crops. Surface drains are commonly used to remove ponded water. Subsurface drains are used to remove excess water from the subsoil in areas that have suitable drainage outlets. Outlets are difficult to establish in some areas. The surface layer can be worked through a fairly wide range of moisture content. Minimizing tillage, incorporating crop residue, and planting cover crops can help maintain tilth and increase water infiltration. These practices also reduce crusting, improve soil-seed contact, and protect the surface in areas that are subject to scouring.

This soil is poorly suited to grazing early in spring. Overgrazing or grazing when soft and sticky as a result of wetness causes compaction and poor tilth. Pasture rotation and deferment of grazing during wet periods help keep the pasture and soil in good condition.

This soil is suited to trees that are adapted to wet sites. Seedlings of adapted species survive and grow well if competing vegetation is controlled or removed by spraying, mowing, or disking. Wetness and flooding limit the planting and harvesting of trees.

This soil is severely limited for most building site development, sanitary facilities, and recreation uses by the frequent flooding, wetness, and moderate or moderately slow permeability. In some places extensive filling has occurred to prepare sites for buildings. Diking to control flooding is difficult.

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

ThA—Thackery silt loam, 0 to 2 percent slopes. This nearly level, deep, moderately well drained soil is near the breaks to the uplands on stream terraces and outwash plains. Most areas are long and narrow or irregularly shaped and are 5 to 30 acres in size.

Typically, the surface layer is brown, friable silt loam about 10 inches thick. The subsoil is about 44 inches thick. The upper part of the subsoil is brown, friable silt loam and loam that is mottled below a depth of about 15 inches. The middle part is brown and yellowish brown, mottled, friable and firm clay loam. The lower part is brown, mottled, friable gravelly sandy loam. The substratum to a depth of about 70 inches is dark gray gravelly sand.

Included with this soil in mapping are small areas of very poorly drained Westland and somewhat poorly drained Sleeth soils in depressions and along small waterways. These inclusions make up about 10 percent of most areas.

Permeability is moderate in the subsoil and rapid or very rapid in the substratum. The available water capacity is moderate or high. The organic matter content, shrink-swell potential in part of the subsoil, and potential frost action are moderate. Runoff is slow. Reaction ranges from strongly acid in the upper part of the subsoil to mildly alkaline in the lower part. This soil has medium natural fertility and good tilth. A seasonal high water table is between depths of 18 and 36 inches in winter, spring, and other extended wet periods. The root zone is deep.

Most areas of this soil are farmed. This soil has high potential for cultivated crops, hay, pasture, and trees. It has medium potential for most building site development and medium to high potential for recreation uses. This soil has low potential for water impoundment.

This soil is suited to row crops and small grains. The surface layer can be worked through a fairly wide range of moisture content. Minimizing tillage and planting deep-rooted cover crops are good management practices, especially if used for continuous row cropping. Incorporating crop residue or other organic matter into the surface layer increases water infiltration and improves tilth and fertility. These practices also reduce crusting and improve soil-seed contact.

This soil is suited to pasture or hay. Surface compaction, poor tilth, reduced growth, and decreased infiltration rates result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing, along with weed control, can help keep the pasture and soil in good condition.

This soil is well suited to trees and shrubs, and a few areas along streams are producing native hardwoods. Plant competition can be reduced by cutting, spraying, girdling, or mowing.

The seasonal wetness, shrink-swell potential, and soil strength limit the use of this soil as a site for buildings, sanitary facilities, and recreation uses. These limitations can be partially or fully overcome by using specially designed facilities. This soil is better suited to houses without basements than to houses with basements. Building sites should be landscaped so that surface water drains away from building foundations and septic tank absoprtion fields. Local roads and streets can be improved by using artificial drainage and a suitable base material. The possibility of polluting ground water also limits most sanitary facilities. Sanitary facilities should be connected to central sewers and treatment facilities, wherever possible.

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

ThB—Thackery silt loam, 2 to 6 percent slopes. This gently sloping, deep, moderately well drained soil is on irregularly shaped low rises and in long and narrow strips on stream terraces and outwash plains. Most areas are 5 to 20 acres in size.

Typically, the surface layer is brown, friable silt loam about 10 inches thick. The subsoil is about 36 inches thick. The upper part of the subsoil is brown and yellowish brown, friable silt loam; the middle and lower parts are dark yellowish brown and brown, mottled, firm clay loam and sandy clay loam. The substratum to a depth of about 70 inches is dark grayish brown, mottled, friable loamy sand and brown, loose, gravelly sand.

Included with this soil in mapping are small areas of somewhat poorly drained Sleeth soils in depressions and narrow strips of very poorly drained Westland soils along waterways. These inclusions make up about 10 percent of most areas.

Permeability is moderate in the subsoil and rapid or very rapid in the substratum. The available water capacity is moderate or high. The organic matter content, shrink-swell potential in part of the subsoil, and potential frost action are moderate. Runoff is medium. Reaction ranges from strongly acid in the upper part of the subsoil to mildly alkaline in the lower part. This soil has medium natural fertility and good tilth. A seasonal high water table is between depths of 18 and 36 inches in winter, spring, and other extended wet periods. The root zone is deep.

Most areas of this soil are farmed. Some areas are mined for sand and gravel. This soil has high potential for cultivated crops, hay, pasture, and trees. It has medium potential for most building site development and medium to high potential for recreation uses. This soil has low potential for water impoundment because of the rapidly or very rapidly permeable substratum.

This soil is suited to row crops and small grains. Erosion can be controlled in most areas through a good soil management program. The surface layer can be worked through a fairly wide range of moisture content. Minimizing tillage, planting cover crops, and using grassed waterways can reduce soil loss. Incorporating crop residue or other organic matter into the surface layer increases water infiltration and improves tilth and fertility. These practices also reduce crusting and improve soil-seed contact.

This soil is suited to pasture or hay. Surface compaction, poor tilth, reduced growth, and decreased infiltration rates result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation and deferment of grazing, along with weed control, can help keep the pasture and soil in good condition.

This soil is well suited to trees and shrubs, and a few areas near steeper slopes are producing native hardwoods. Seedlings grow well if competing vegetation is controlled or removed by cutting, spraying, girdling, or mowing. Survival and growth can be improved by good site preparation.

The seasonal wetness, shrink-swell potential, and soil strength limit the use of this soil as a site for buildings, sanitary facilities, and recreation uses. These limitations can be partially or fully overcome by using specially designed facilities. This soil is better suited to houses without basements than to houses with basements. Building sites should be landscaped for good surface drainage away from foundations and septic tank absorption fields. There is a possibility of sanitary facilities polluting local ground water because of the rapidly or very rapidly permeable substratum. Sanitary facilities should be connected to central sewers and treatment facilities, wherever possible.

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

Up—Udorthents, loamy, rolling. These soils are in areas surface-mined for sand and gravel. They are commonly associated with Eldean, Ockley, Ross, Wea, Warsaw, and other soils on kames and outwash and stream terraces that are underlain by outwash gravel and sand. Slopes are dominantly 6 to 12 percent. Most areas are 10 to 75 acres in size; a few extensive areas are more than 300 acres.

Typically, the soils consist of stratified layers of gravel and sand of varying thickness and orientation. The kind and grain size of aggregate are relatively uniform in any one layer, but commonly contrast with the aggregate in adjacent layers. Deposits in kames are usually more variable than those in outwash plains or stream terraces. Nearly all of the large aggregate is rounded. Dolomitic limestone gravel and cobblestones of local origin are dominant in these areas. Granite and other igneous materials are less extensive. In some places, calcareous cementation has formed a weakly bonded conglomerate.

Included with these soils in mapping are small areas of relatively undisturbed soils similar to adjacent soils of less than 12 percent slope. Some included areas have slopes of 1 to 6 percent and 12 to 90 percent. Also included are piles of sand, gravel, cobblestones, and other materials.

The soils are poorly suited to plant growth. Permeability is moderate to very rapid. The organic matter content and available water capacity are very low. Natural fertility is low.

Most areas of these soils have some form of weed cover. Cottonwood trees and seedlings are in some areas. The soils have low potential for cropland and pasture. The potential for building site development and recreation uses is quite variable depending on the extent of reclamation. Specific onsite investigations are needed to determine the potential for a selected use.

Smoothing and revegetating are effective in reducing erosion. Resurfacing with topsoil will aid in the establishment of plant cover. Plants should be selected that are tolerant of a fairly low available water capacity and other unfavorable soil properties. Nutrient deficiencies occur in some plants growing in the calcareous material.

These soils are not well suited as sites for buildings. Some unique or specially designed structures may be well suited to some of these areas. Lawns are difficult to establish and maintain. Sanitary facilities are limited by the hazard of ground water pollution.

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

Ur—Udorthents, loamy, sloping. These soils occur in areas that have been filled with trash, rubbish, concrete, wood, bricks, and other discharged materials. Slopes are smooth to convex with some irregularities because of settling. They are dominantly 6 to 12 percent. Most areas are 4 to 25 acres in size; a few are more than 60 acres.

Typically, the soils are loam and clay loam soil materials about 24 inches thick over the discarded materials.

Included with these soils in mapping are small areas of soils around the edges of these filled areas that are similar to adjacent soils. A few included areas have slopes of 2 to 6 and 12 to 18 percent. Some areas contain mostly solid mineral waste and are very stable; other areas have a very high proportion of organic materials that are very unstable and will gradually decompose. Also included are places where part or all of the original soil has been removed and the subsoil or substratum is exposed. These inclusions make up about 20 percent of most areas.

These soils have poor physical properties. The organic matter content is usually very low. Runoff is quite variable but is dominantly medium or rapid.

These soils have low potential for most uses other than woodland, habitat for openland wildlife, and some recreation uses.

Vegetative cover should be maintained on these soils to reduce the risk of erosion. Resurfacing with topsoil can improve the root zone and increase the water-holding capacity. Special onsite investigations should be made to determine suitability for specific land use.

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

Us—Udorthents, loamy, steep. These soils are in borrow areas that were surface-mined for fill material used under highways and buildings. Most areas are on uplands and stream and outwash terraces. They are commonly 10 to 40 feet deep and roughly rectangular. Many of these areas contain pools of water that are quite variable in depth. Slopes are dominantly 18 to 25 percent. Most areas are 5 to 30 acres in size; a few are more than 50 acres.

Typically, these soils have calcareous loam or clay loam glacial till or gravelly sand glacial outwash to a depth of 60 inches. Some slopes have alternating layers of glacial till and glacial outwash.

Included with these soils in mapping at the edge of some areas are narrow strips and small irregularly shaped areas where rippable bedrock is near the surface and slopes are 2 to 18 percent and 25 to 90 percent.

These Udorthents are poorly suited to plant growth. The available water capacity is quite variable, and the organic matter content is commonly very low. Runoff from side slopes is very rapid, and the erosion hazard is very severe. The soils are mildly alkaline or moderately alkaline at or near the surface.

Side slopes are subject to rill, sheet, and gully erosion, and siltation is common. Maintaining vegetative cover can reduce the risk of erosion. The root zone can be improved by resurfacing the area with topsoil. Plant selection for revegetation is important because nutrient deficiencies are common in some plants because of the calcareous material near the surface. These soils have potential as habitat for openland wildlife and for some recreation uses.

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

Ut—Udorthents-Urban land complex, gently rolling. This complex consists of the pavement, berm, median strip, ditches, and interchanges of major highway systems. Extensive excavations and fillings have occurred in these areas. Most areas are long, narrow strips and contain about 50 percent Udorthents and 40 percent pavement. Slopes are highly variable, but are dominantly 2 to 12 percent.

In excavated areas, the remaining material is similar to the substratum of the adjacent soils. In fills, the soil material varies considerably but normally consists of varying mixtures of material from the subsoil and substratum of the adjacent soils.

Included with this map unit are small areas of undisturbed soils that are similar to adjacent soils. Also included are short slope breaks with slopes of 12 to 55 percent. These inclusions make up about 10 percent of most areas.

The soil material commonly is in poor physical condition. It generally is calcareous where it was removed from soils underlain by glacial drift or limestone bedrock and acid where the soils were underlain by acid shale bedrock. The available water capacity is quite variable and the organic matter content is usually very low. Erosion is a hazard in most areas. In some places this unit is subject to gullying and is commonly a source of sediment.

Resurfacing the soils with topsoil can increase the depth of rooting and facilitate the establishment of vegetative cover. Areas that are reseeded should be mulched and watered. Onsite investigations are needed to determine proper plant selection. Kentucky 31 fescue grows well in most areas. Because of the proximity to high speed traffic, the soils have little or no potential for alternate uses.

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

Uu—Urban land-Bennington complex, 2 to 6 percent slopes. This map unit consists of areas of Urban land and a deep, gently sloping, somewhat poorly drained Bennington soil on undulating uplands. Individual areas of this unit range from 40 to more than 100 acres in size. They are about 65 percent Urban land and 15 percent sharply contrasting Bennington silt loam soil. Areas of Urban land and the Bennington soil are so intricately mixed that it was not practical to separate them in mapping.

The Urban land part of the unit is covered by streets, parking lots, buildings, railroad yards, and other structures. The soils in these areas are so altered or obscured that identification of specific soils is not feasible.

The undeveloped part of this unit is dominantly Bennington soil. Typically, the surface layer is dark grayish brown, friable silt loam about 9 inches thick. The subsoil, which extends to a depth of about 35 inches, is yellowish brown, mottled, firm silty clay loam and silty clay. The substratum to a depth of about 70 inches is glacial till of brown and dark yellowish brown, mottled, firm clay loam and loam. Some areas are eroded.

Included in mapping on low knolls and ridges are well drained Alexandria soils. Also included are areas where slopes are 0 to 2 percent and very poorly drained Pewamo soils in depressions and in strips along waterways. These inclusions make up about 20 percent of most areas.

Most areas of this map unit are artificially drained by sewer systems, subsurface drains, and, to a lesser extent, surface ditches. Undrained areas of Bennington soil have a seasonal high water table near the surface in winter, spring, and other extended wet periods. Permeability is slow in the Bennington soil. The available water capacity and the shrink-swell potential in the subsoil are moderate. The potential frost action is high. Runoff is medium from the Bennington soil and rapid from the Urban land part. Reaction ranges from very strongly acid in the upper part of the subsoil to mildly alkaline in the lower part. The root zone is mainly moderately deep over compact glacial till.

The Bennington soil has low potential for most building site development and sanitary facilities and medium potential for recreation uses.

The Bennington soil is well suited to growing grasses, flowers, vegetables, and shrubs if excess water is removed. It is severely limited for most building site development and sanitary facilities and moderately limited for most recreation uses by the slow permeability, seasonal wetness, and low strength. These limitations can be partially or fully overcome by specially designed facilities. Both surface and subsurface drains are used to remove excess water from this soil. Increased runoff and erosion are problems associated with construction. These can be reduced by maintaining plant cover, wherever possible. Building sites should be landscaped for good surface drainage away from the foundation. Most sanitary facilities are connected to central sewers and treatment facilities.

The Bennington soil is in capability subclass IIe and woodland suitability subclass 2o; Urban land is not assigned to a capability subclass or woodland suitability subclass.

Uv—Urban land-Celina complex, 2 to 12 percent slopes. This map unit consists of areas of Urban land and a deep, gently sloping and sloping, moderately well drained Celina soil on broad convex ridgetops, side slopes above steeper areas, and in long narrow areas along well-defined waterways. Individual areas of this unit range from 40 to more than 100 acres in size and are about 65 percent Urban land and 15 percent sharply contrasting Celina silt loam soil. Areas of Urban land and the Celina soil are so intricately mixed that it was not practical to separate them in mapping.

The Urban land part of the unit is covered by streets, parking lots, buildings, railroad yards, and other structures. Soils in these areas are so altered or obscured that identification of specific soils is not feasible.

The undeveloped part of this unit is dominantly Celina soil. Typically, the surface layer is brown, friable silt loam about 7 inches thick. The subsoil is about 18 inches thick. The upper part of the subsoil is yellowish brown, firm silty clay loam and the lower part is dark yellowish brown, mottled, firm clay and clay loam. The substratum to a depth of about 70 inches is glacial till of brown and dark yellowish brown, mottled, firm loam. A few areas are eroded.

Included with this unit in mapping are well drained Miamian soils on knolls and slope breaks and nearly level, very poorly drained Kokomo and somewhat poorly drained Crosby soils in depressions and strips along waterways. These inclusions make up about 20 percent of most areas.

Most areas of this map unit are artificially drained by sewer systems, subsurface drains, and, to a lesser extent, surface ditches. In undrained areas, the Celina soil has a seasonal high water table at a depth of 18 to 36 inches late in winter, in spring, and in other extended wet periods. Permeability is moderately slow in the subsoil and substratum. The available water capacity and organic matter content are moderate. The shrink-swell potential is moderate in the subsoil, and the potential frost action is high. Runoff from the Celina soil is medium to rapid and is very rapid from the Urban land. Reaction in the subsoil is mainly strongly acid to neutral.

The Celina soil has medium potential for most building site development and recreation uses and low potential for sanitary facilities.

The Celina soil is well suited to grasses, flowers, vegetables, and shrubs. It is moderately limited for building site development, sanitary facilities, and most recreation uses because of the seasonal wetness, moderate shrink-swell potential and strength, and moderately slow permeability. These limitations can be partially or fully overcome by specially designed facilities. Increased runoff and erosion occur during construction, but can be minimized by maintaining plant cover, wherever possible. In some places artificial drains are effective in reducing the wetness. Building sites should be landscaped for good surface drainage away from the foundations. Most sanitary facilities are connected to central sewers and treatment facilities.

The Celina soil is in capability subclass IIIe and woodland suitability subclass 1o; Urban land is not assigned to a capability subclass or woodland suitability subclass.

Uw—Urban land-Genesee complex, occasionally flooded. This map unit consists of areas of Urban land and a deep, nearly level, well drained Genesee soil on flood plains. Areas that are not protected are flooded for brief periods in fall, winter, and spring. Individual areas of this unit range from 40 to more than 100 acres in size and are about 65 percent Urban land and 15 percent sharply contrasting Genesee silt loam soil. The areas of Urban land and Genesee silt loam soil are so intricately mixed or so small in size that it was not practical to separate them in mapping.

The Urban land part of the unit is covered by streets, parking lots, buildings, and other structures. The original soil is so altered or obscured that identification of specific soils is not feasible.

Typically, the Genesee soil has a surface layer of brown, friable silt loam about 9 inches thick. The subsoil is brown and dark yellowish brown, friable silt loam and clay loam about 22 inches thick. The substratum to a depth of about 70 inches is yellowish brown, friable loam and brown, mottled, very friable gravelly sandy loam. Some areas have a darker surface layer.

Included with this unit in mapping are narrow strips of somewhat poorly drained Shoals soils in slight depressions and high water channels. Also included are areas that have been radically altered by cutting and filling. These inclusions make up about 20 percent of most areas.

The Genesee soil has moderate permeability and a high available water capacity. Organic matter content and potential frost action are moderate. The shrink-swell potential is low. Runoff is slow. The subsoil is slightly acid to moderately alkaline. The root zone is deep.

The Genesee soil is used mainly for lawns, trees, flower gardens, and open space. It has high potential for lawns, trees, and flower gardens, but low potential for most building site development and sanitary facilities. It has medium to low potential for most recreation uses.

The Genesee soil is well suited to grasses, flowers, vegetables, and shrubs. The surface layer is easily tilled through a wide range of moisture content. The soil is well suited to irrigation. The areas filled with subsoil and substratum materials from soils on uplands or terraces are very poorly suited to lawns and gardens. The underlying material exposed on the surface has poor tilth. It is sticky when wet and very hard when dry.

The Genesee soil is severely limited for most building site development and sanitary facilities by the flooding hazard. In some places extensive areas have been filled to elevate the area above the level of normal flooding. Most sanitary facilities are connected to central sewers and treatment facilities. This soil is well suited to such recreation uses as picnic areas during nonflooding periods.

The Genesee soil is in capability subclass IIw and woodland suitability subclass 1o; Urban land is not assigned to a capability subclass or woodland suitability subclass.

Ux—Urban land-Ockley complex, 0 to 6 percent slopes. This map unit consists of areas of Urban land and a deep, nearly level and gently sloping, well drained Ockley soil on broad areas of stream terraces. Individual areas of this unit range from 40 to more than 100 acres in size and are about 65 percent Urban land and 15 percent sharply contrasting Ockley silt loam soil. Areas of Urban land and the Ockley soil are so intricately mixed that it was not practical to separate them in mapping.

The Urban land part of the unit is covered by streets, parking lots, buildings, and other structures. The original soil is so altered or obscured that identification of specific soils is not feasible.

The Ockley part of the unit typically has a surface layer of brown, friable silt loam about 8 inches thick. The subsurface layer is brown, friable silt loam about 6 inches thick. The subsoil is about 38 inches thick. The upper and middle parts of the subsoil are brown and reddish brown, firm clay loam; the lower part is dark reddish brown, friable gravelly sandy clay loam. The substratum to a depth of about 70 inches is brown, loose gravelly loamy sand.

Included in mapping are small areas of the more droughty Eldean soils near slope breaks and somewhat poorly drained Sleeth soils in small depressions. Also included are areas where the soil has been radically altered by cutting and filling. These inclusions make up about 20 percent of most areas.

The Ockley soil has moderate permeability in the subsoil and very rapid permeability in the substratum. The available water capacity is moderate or high. The organic matter content, shrink-swell potential in the subsoil, and potential frost action are moderate. Runoff from the Ockley soil is slow or medium. Reaction ranges from strongly acid or medium acid in the upper part of the subsoil to neutral in the lower part. The root zone is deep.

The Ockley soil is used for parks, open space, and flower gardens. It has high potential for lawns, vegetable and flower gardens, trees, and shrubs. This soil has high potential for building site development and recreation uses.

The Ockley soil is well suited to grasses, flowers, vegetables, trees, and shrubs. Soil erosion is not a major problem, except where water concentrates and flows in an unprotected watercourse or where the soil is disturbed and left unprotected. The included spots of cut and fill land are not well suited to lawns and gardens. Subsoil material which is exposed has very poor tilth. It is sticky when wet and hard when dry.

Even though the shrink-swell potential and soil strength are moderate limitations, the Ockley soil is well suited as a site for buildings. The limitations can be partly overcome by extending foundations to the underlying sand and gravel and by backfilling with a suitable material. Streets can be improved by using a suitable base material. Most sanitary facilities are connected to central sewers and treatment facilities. If the Ockley soil is used for sanitary facilities, there is a hazard of ground water pollution.

The Ockley soil is in capability subclass IIe and woodland suitability subclass 1o; Urban land is not assigned to a capability subclass or a woodland suitability subclass.

WdA—Warsaw silt loam, 0 to 2 percent slopes. This nearly level, deep, well drained soil is in moderately broad, long areas on stream terraces and outwash plains. Slopes are dominantly 1 to 2 percent. Most areas are 4 to 50 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 9 inches thick. The subsurface layer is dark brown, friable silt loam about 5 inches thick. The subsoil is about 21 inches thick. The upper part of the subsoil is brown, firm clay loam and gravelly clay; the lower part is yellowish brown, very friable gravelly loam. The substratum to a depth of about 70 inches is yellowish brown, loose gravelly sand. A few areas have slopes of 2 to 4 percent, and some areas have a lighter colored surface layer.

Included with this soil in mapping on low knolls are small areas of Ockley soils that have a thicker subsoil and droughty areas with sand and gravel between depths of 15 to 30 inches. These inclusions make up about 15 percent of most parts.

Permeability is moderate in the subsoil and very rapid in the substratum. The available water capacity and potential frost action are moderate. The organic matter content is high, and the shrink-swell potential is low. Runoff from cultivated areas is slow. Reaction ranges from strongly acid to neutral in the upper part of the subsoil to moderately alkaline in the lower part. This soil has medium natural fertility and good tilth. The root zone is mainly moderately deep over calcareous sand and gravel.

Most areas of this soil are farmed. This soil has high potential for crops, hay, pasture, and trees. It has high potential for most building site development and recreation uses. This soil has high potential as a source of sand and gravel, but low potential for water impoundment because of the very rapidly permeable substratum.

This soil is suited to row crops, small grains, and specialty crops. The moderate droughtiness is the main limitation for crops. Crops can be seeded early because this soil warms and dries early in spring. Row crops can be grown continuously under a high level of management. The surface layer can be worked through a fairly wide range of moisture content. This soil is well suited to irrigation. Minimizing tillage and planting cover crops are good soil management practices. Incorporating crop residue or other organic matter into the surface layer increases water infiltration and improves tilth and fertility. These practices also reduce crusting and improve soil-seed contact.

This soil is well suited to grazing early in spring. Surface compaction, reduced growth, and poor tilth result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing, along with weed control, can help keep the pasture and soil in good condition.

This soil is well suited to trees and shrubs, and a few small areas are in native hardwoods. There are no soil hazards or limitations to growing or harvesting trees and shrubs. Nutrient deficiencies may occur in some deep-rooted plants on the included areas with calcareous sand and gravel between depths of 15 to 30 inches. Plant competition can be reduced by spraying, mowing, or disking. Survival and growth can be improved by good site preparation.

Although soil strength is a moderate limitation, this soil is well suited as a site for buildings. The low strength can be overcome by extending building foundations to the substratum. Local roads and streets can be improved by replacing the subsoil with suitable base material. Sanitary facilities are limited by the possibility of polluting ground water. This soil is somewhat droughty for lawns during dry periods. It is a good source of sand and gravel.

This soil is in capability subclass IIs; it is not assigned to a woodland suitability subclass.

WdB—Warsaw silt loam, 2 to 6 percent slopes. This gently sloping, deep, well drained soil is on moderately broad, long areas on stream terraces and outwash plains. Slopes are dominantly 2 to 4 percent. Most areas are 10 to 40 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 9 inches thick. The subsoil is about 25 inches thick. The upper part of the subsoil is dark brown, friable silty clay loam and reddish brown, firm clay loam; the lower part is dark brown, firm clay loam and dark reddish brown, friable gravelly clay loam. The substratum to a depth of about 70 inches is brown, loose very gravelly sand. Some slope breaks have slopes of 6 to 9 percent and other areas have a lighter colored surface layer.

Included with this soil in mapping on low knolls are small areas of Ockley soils that have a thicker subsoil and droughty areas with sand and gravel between depths of 15 and 30 inches. These inclusions make up about 15 percent of most areas.

Permeability is moderate in the subsoil and very rapid in the substratum. The available water capacity and potential frost action are moderate. The organic matter content is high, and the shrink-swell potential is low. Runoff from cultivated areas is medium. Reaction ranges from strongly acid to neutral in the upper part of the subsoil to moderately alkaline in the lower part. This soil has medium natural fertility and good tilth. The root zone is mainly moderately deep over calcareous sand and gravel.

Most areas of this soil are farmed. Some areas are being mined for sand and gravel. This soil has high potential for row crops, hay, pasture, and trees. It has a high potential for most building site development, recreation uses, and as a source of sand and gravel. It has low potential for water impoundment because of the very rapidly permeable substratum.

This soil is suited for row crops and small grains. The moderate droughtiness and controlling erosion are the main management concerns. It is better suited to early maturing crops than to crops that mature late in summer. This soil is well suited to irrigation. Minimizing tillage, planting cover crops, and using grassed waterways are good management practices. Incorporating crop residue or other organic matter into the surface layer increases water infiltration and improves tilth and fertility. These practices also reduce crusting and improve soil-seed contact.

This soil is well suited to grazing early in spring. Surface compaction, reduced growth, and poor tilth can result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing, along with weed control, can help keep the pasture and soil in good condition.

This soil is well suited to trees and shrubs, and a few small areas are in native hardwoods. Nutrient deficiencies may occur in some deep-rooted plants on the areas that have calcareous sand and gravel between depths of 15 and 30 inches. Plant competition can be reduced by spraying, mowing, or disking. Survival and growth can be improved by good site preparation.

Although soil strength is a moderate limitation, this soil is well suited as a site for buildings. The low strength can be overcome by extending building foundations to the substratum. Local roads and streets can be improved by replacing the subsoil with suitable base material. If this soil is used for sanitary facilities, there is a hazard of polluting ground water. This soil is somewhat droughty for lawns during dry periods. It is a good source of sand and gravel.

This soil is in capability subclass IIe; it is not assigned to a woodland suitability subclass.

WeA—Wea silt loam, 0 to 2 percent slopes. This nearly level, deep, well drained soil is in moderately broad and long areas on stream terraces and outwash plains. Slopes are dominantly 1 to 2 percent. Most areas are about 15 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 9 inches thick. The subsurface layer is very dark grayish brown, friable silt loam about 11 inches thick. The subsoil is about 35 inches thick. The upper part of the subsoil is brown and yellowish brown, firm silty clay loam; the lower part is yellowish brown, firm gravelly clay loam. The substratum to a depth of about 70 inches is yellowish brown, loose gravelly sand. Some areas have a lighter colored surface layer.

Included with this soil in mapping are small areas of the more droughty Eldean and Warsaw soils on low knolls. These inclusions make up about 15 percent of most areas.

Permeability is moderate in the subsoil and very rapid in the substratum. The available water capacity and organic matter content are high. The potential frost action and the shrink-swell potential in the subsoil are moderate. Runoff from cultivated areas is slow. Reaction ranges from strongly acid to neutral in the upper part of the subsoil to mildly alkaline in the lower part. This soil has high natural fertility and good tilth. The root zone is deep.

Most areas of this soil are farmed. Some areas are mined for sand and gravel. This soil has high potential for row crops, hay, pasture, and trees. It has high potential for most building site development and recreation uses and as a source of sand and gravel. It has low potential for water impoundment because of the very rapidly permeable substratum.

This soil is well suited to row crops grown year after year and to specialty crops (fig. 7). It can be tilled and grazed early in spring and is well suited to irrigation. The main management concerns are maintaining high fertility and good soil structure. Minimizing tillage and planting cover crops are good management practices. Incorporating crop residue or other organic matter into the surface layer maintains tilth, increases water infiltration, and improves fertility. These practices also reduce crusting and improve soil-seed contact.

This soil is well suited to pasture and hay. Surface compaction, reduced growth, and poor tilth result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing, along with weed control, can help keep the pasture and soil in good condition.

This soil is well suited to trees and shrubs, and a few small areas are in native hardwoods. Plant survival and growth can be improved by good site preparation. Plant

Figure 7.—Wea silt loam, 0 to 2 percent slopes, is well suited to irrigation and specialty crops.

competition can be reduced by cutting, spraying, girdling, or mowing.

This soil is well suited as a site for buildings even though the shrink-swell potential and soil strength are somewhat limiting. These limitations can be overcome by extending foundations to the underlying sand and gravel and by backfilling with a suitable material. Local roads can be improved by using a suitable base material. The possibility of contaminating ground water limits some sanitary facilities. Sanitary facilities should be connected to central sewers and treatment facilities, wherever possible. This soil is well suited to recreation uses and is a good source of sand and gravel.

This soil is in capability class I; it is not assigned to a woodland suitability subclass.

WeB—Wea silt loam, 2 to 6 percent slopes. This gently sloping, deep, well drained soil is in broad, long areas on stream terraces and outwash plains. Slopes are dominantly 2 to 4 percent. Most areas are 10 to 80 acres in size; a few are about 150 acres.

Typically, the surface layer is black, friable silt loam about 9 inches thick. The subsurface layer is very dark gray, friable silt loam about 5 inches thick. The subsoil is about 42 inches thick. The upper few inches of the subsoil are very dark grayish brown, firm silty clay loam; the rest is brown, yellowish brown, and dark yellowish brown, firm and friable clay loam. The substratum to a depth of about 70 inches is brown, loose, gravelly sand. Some areas have a lighter colored surface layer.

Included with this soil in mapping and making up about 15 percent of most areas are small areas of the more droughty Eldean and Warsaw soils on knolls.

Permeability is moderate in the subsoil and very rapid in the substratum. The available water capacity and organic matter content are high. The potential frost action and shrink-swell potential in the subsoil are moderate. Runoff from cultivated areas is medium. Reaction ranges from strongly acid to neutral in the upper part of the subsoil to mildly alkaline in the lower part. This soil has high natural fertility and good tilth. The root zone is deep.

Most areas of this soil are farmed; some are mined for sand and gravel. It has high potential for row crops, hay, pasture, and trees. This soil has high potential for most building site development and recreation uses and as a source of sand and gravel. It has low potential for water impoundment because of the very rapidly permeable substratum.

This soil is suited to row crops and small grains. Row crops can be grown year after year if erosion is controlled. The soil dries early in spring. The surface layer can be worked through a fairly wide range of moisture content. This soil is well suited to most types of irrigation, although with the high available water capacity irrigation is seldom needed. Minimizing tillage, planting cover crops, and using grassed waterways reduce soil loss. Incorporating crop residue or other organic matter into the surface layer helps maintain tilth, increases water infiltration, and improves fertility. These practices also reduce crusting and improve soil-seed contact.

This soil is well suited to hay and pasture and to grazing early in spring. Surface compaction and poor tilth result from overgrazing or grazing when the soil is soft and sticky because of wetness. Proper stocking rates, plant selection, pasture rotation, and deferment of grazing, along with weed control, can help keep the pasture and soil in good condition.

This soil is well suited to trees and shrubs, and a few small areas are in native hardwoods. Seedlings are easy to establish if competing vegetation is controlled or removed by cutting, spraying, girdling, or mowing.

This soil is well suited as a site for buildings even though the shrink-swell potential and soil strength are somewhat limiting for this use. These limitations can be overcome by extending the foundations to the underlying sand and gravel and by backfilling with a suitable material. Local roads can be improved by using a suitable base material. The possible contamination of ground water limits some sanitary facilities. Sanitary facilities should be connected to central sewers and treatment facilities, wherever possible. Plant cover should be maintained on the site as much as possible during construction to reduce runoff and erosion. This soil is well suited to recreation uses and is a good source of sand and gravel.

This soil is in capability subclass IIe; it is not assigned to a woodland suitability subclass.

Wt—Westland silty clay loam. This nearly level, deep, very poorly drained soil is on outwash plains and stream terraces. It extends into the uplands along some drainageways. This soil is subject to ponding in the lower parts of depressions from runoff from higher adjacent soils. Slope is 0 to 2 percent. Most areas of this soil are 10 to 100 acres in size with some more than 150 acres.

Typically, the surface layer is very dark gray, friable silty clay loam about 9 inches thick. Ths subsoil is about 34 inches thick. The upper and middle parts of the subsoil are very dark gray and dark grayish brown, mottled, firm silty clay loam and clay loam; the lower part is brown, friable sandy clay loam. The substratum to a depth of about 70 inches is brown, mottled, friable loamy sand and dark grayish brown, loose gravelly sand.

Included with this soil in mapping are small areas of Shoals soils on flood plains, Algiers soils at the base of eroded slopes, and Sleeth soils on slight rises. These included soils are somewhat poorly drained. Also included are areas that have silt loam layers in the substratum; these areas are not as good a source of sand and gravel. These inclusions make up about 15 percent of most areas.

Permeability is moderately slow in the subsoil and very rapid in the substratum. The organic matter content and potential frost action are high. The shrink-swell potential in the subsoil is moderate. Runoff is very slow or ponded. Reaction ranges from slightly acid or neutral in the upper part of the subsoil to mildly alkaline in the lower part. This soil has high natural fertility and fair to good tilth. A seasonal high water table is at the surface in fall, winter, spring, and other extended wet periods. The root zone is deep.

Most areas of this soil are farmed. This soil has high potential for crops, hay, pasture, and trees. It has low potential for most building site development, sanitary facilities, and recreation uses.

This soil is suited to growing continuous row crops and small grains. Wetness is the main limitation for farming. Surface drains are commonly used to remove excess surface water. Subsurface drains are used to lower the water table, but suitable outlets are difficult to establish in some areas. Timely tillage is important because the soil puddles and clods if worked when it is soft and sticky as a result of wetness. Minimizing tillage and planting cover crops are good management practices especially when this soil is used for continuous row crops. Incorporating crop residue or other organic matter into the surface layer helps increase water infiltration and improve tilth. These practices also reduce crusting and improve soil-seed contact.

Controlled grazing is a good practice even in drained areas. The surface layer compacts easily if pastured when soft and sticky as a result of wetness. Pasture rotation and restricted grazing during wet periods help keep the pasture and soil in good condition.

This soil is well suited to trees and shrubs that are adapted to wet sites. A few small areas are in native hardwoods. Seedlings grow well if competing vegetation is controlled or removed by cutting, spraying, girdling, or mowing. Wetness limits planting and harvesting equipment during winter and spring.

This soil is severely limited for building site development, sanitary facilities, and recreation uses because of wetness, moderately slow permeability, ponding, and seepage. Surface drains, subsurface drains, and storm sewers are used to improve drainage. Local roads and streets can also be improved by using a suitable base material. Excavations are limited during winter and spring because of the high water table and sloughing of banks. Ground water can be polluted by seepage from sanitary facilities. Sanitary facilities should be connected to central sewers and treatment facilities, wherever possible.

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

Use and management of the soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and pasture

General management needed for crops and pasture is suggested in this section. Estimated yields of the main crops and hay and pasture plants are listed for each soil. The system of land capability classification used by the Soil Conservation Service is also explained.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Soil maps for detailed planning." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

Soil erosion is the major problem on one-third of the cropland and pasture in Franklin County. Where the slope is more than 2 percent, erosion is generally a hazard. Erosion reduces soil productivity and tilth. It also increases the amount of sediment, herbicides, and pesticides in waterways and streams.

On some soils in the county, erosion and wetness are limitations. These include Bennington, Blount, Crosby, and Mitiwanga soils of 2 to 6 percent slope. In many gently sloping and sloping fields, there are eroded spots where preparing a good seedbed and tilling are difficult because the original friable surface layer has been eroded away. Such spots are common on eroded Alexandria, Cardington, Celina, Glynwood, Kendallville, Miamian, Milton, and Ockley soils.

A protective plant cover increases the infiltration of water, lessens runoff, and reduces erosion. Keeping a plant cover on the soil for extended periods can hold soil loss to an amount that will not reduce productivity. Legume and grass forage crops in the cropping system reduce the risk of erosion, provide nitrogen, and improve tilth.

Soil loss can also be reduced by tillage operations which leave all of the crop residue on the surface throughout the year or incorporate part of the residue into the soil. This method requires a high degree of management for weed and insect control. It is best suited to well drained and moderately well drained soils; artificial drainage is needed on the somewhat poorly drained, poorly drained, and very poorly drained soils.

Other erosion control practices include grassed waterways which are natural or constructed outlets or waterways protected by a grass cover. Natural drainageways are the best locations for waterways. They should be wide and flat so that farm machinery can cross them easily. Structures for water control are often needed to stabilize the channel and prevent erosion where waterways enter open ditches. They are commonly constructed of rock riprap or concrete blocks. Contouring, contour stripcropping, and terracing are also effective, but are best suited to smooth, uniform slopes. Slopes in Franklin County are generally short and irregular.

Information about the design of the best erosion control practices for each soil is available in the Technical Guide at local offices of the Soil Conservation Service.

Improvement of soil *drainage* is the major management need on more than half of the cropland and pasture in Franklin County. The soils in these areas have a seasonal high water table, and water ponds on some.

Artificial drainage systems can lower the seasonal high water table. This permits the crops to be planted earlier and harvested later, which increases yields.

Artificial drainage is needed on the very poorly drained and poorly drained Carlisle, Condit, Kokomo, Montgomery, Pewamo, Sloan, and Westland soils. It is also needed for good crop production on the somewhat poorly drained Bennington, Blount, Crane, Crosby, Mitiwanga, Shoals, and Sleeth soils.

The moderately well drained soils have good natural drainage most of the year, but they tend to dry out slowly after rains. Small areas of wetter soils along drainageways and in swales are included with the moderately well drained Cardington, Celina, Eel, Glynwood, Lewisburg, Medway, and Thackery soils. Random artificial drainage is needed in some of these wetter areas.

The design requirements of surface and subsurface drainage systems vary with the kind of soil. A combination of surface and subsurface drainage is needed in some areas of very poorly drained soils used intensively for row cropping. Drains should be spaced closer in slowly or very slowly permeable soils than in the more permeable soils. Subsurface drainage is slow in Condit and Montgomery soils. Locating adequate outlets for subsurface drains is difficult in many areas.

Information about the design of drainage systems for each kind of soil is available in the Technical Guide available at local offices of the Soil Conservation Service.

Irrigation requires very intensive management. Many soils in Franklin County that are suited to crops are also suited to irrigation. Generally, these soils absorb water readily, have adequate available moisture capacity, drain readily, and are nearly level or gently sloping. Among those suited to irrigation are the well drained Eldean, Genesee, Kendallville, Ockley, Ross, Warsaw, and Wea soils and the moderately well drained Eel, Medway, and Thackery soils. Crop response to irrigation is good on the Milton and Ritchey soils that are droughty.

Sites for irrigating with industrial wastewater should be carefully selected to avoid contaminating ground water. Ritchey, Milton, Eldean, and Warsaw soils that are underlain by fractured bedrock or sand and gravel do not provide adequate filtration in many areas.

Soil fertility is naturally low to medium in many soils on the uplands. Soils that have a light-colored surface layer are naturally acid. The soils on flood plains, such as the Algiers, Eel, Genesee, Medway, Ross, Shoals, and Sloan soils, range from slightly acid to mildly alkaline. These soils are naturally higher in plant nutrients than most upland soils. Kokomo, Montgomery, Pewamo, and Westland soils in depressions and drainageways are medium to mildly alkaline.

On all soils, additions of lime and fertilizer should be based on soil tests, the need of the crops, and the expected level of yields. Assistance in determining the kinds and amounts of lime and fertilizer to apply can be obtained from the Cooperative Extension Service.

Soil tilth is an important factor in the germination of seeds and the infiltration of water into the soil. Soils with good tilth are friable and porous.

Many of the soils used for crops in Franklin County have a silt loam surface layer that is light in color and moderately low or moderate in organic matter. Generally, the structure of such soils is weak or moderate, and intense rainfall causes the surface to crust. When dry, this crust is hard, and nearly impervious to water. It reduces infiltration and increases runoff. Crust formation can be reduced and soil structure improved by regular additions of crop residues, manure, and other organic material.

Fall plowing is generally not a good practice on soils with a light-colored silt loam, silty clay loam, or clay loam surface layer because of crusting during winter and spring. If fall plowed, many of the soils are nearly as dense and hard at planting time as they were before they were plowed. In addition, soils that are sloping are subject to water and wind damage if they are plowed in the fall. Even nearly level light-colored soils may be considerably damaged by soil blowing if fall plowed.

The Kokomo, Montgomery, Pewamo, and Westland soils that have a dark surface layer have more clay in their surface layer than the light-colored soils in the county. Tilth is a problem on these clayey soils because they often stay wet longer in spring. If they are plowed wet, they tend to be very cloddy when dry, making good seedbeds difficult to prepare. Fall plowing these soils generally results in good tilth in spring.

Organic matter is an important part of the soil. It influences many other soil properties including infiltration, available water capacity, tilth, and cation exchange capacity.

The mineral soils in Franklin County have an organic matter content that ranges from low to high. Usually the darker the surface, the higher the organic matter content.

It is not economically feasible to make large increases in the organic matter content of a soil. It is important, however, to return crop residue back to the soil.

Methods of maintaining or increasing organic matter content include the use of cover crops, sod crops, green manure crops, and additions of barnyard manure. Well planned cropping systems that include erosion control practices and the use of minimum tillage are also helpful.

Economic conditions often determine which *field crops* are grown in Franklin County. Corn and soybeans are the main row crops, but the soils and climate are also favorable to grain sorghum, sunflowers, and similar crops.

Wheat is the most common close-growing crop. Oats, barley, rye, and spelt could be grown, and grass seed could be produced from bromegrass, fescue, timothy, and bluegrass. Legume seed from red clover and alsike clover could also be produced. Sod for lawns is marketed by several sod farms in the county.

Permanent pasture is of minor extent in Franklin County. Most permanent pasture is on eroded soils that were formerly cultivated or frequently flooded soils that are in narrow strips and irregularly shaped areas.

Yields of permanent pasture vary widely, but most soils in the county can produce high quality forage. Sloping to steep soils, such as Miamian and Alexandria, are commonly eroded, are low in fertility, and have less water available to plants because of rapid runoff. Forage production on these soils is less. Growth is good on the gently sloping soils, such as Crosby, Bennington, Celina, and Cardington soils, but these soils are subject to erosion if the plant cover is damaged by overgrazing.

Severe soil compaction occurs when livestock are allowed to graze during wet periods. Surface and subsurface drains are needed to remove excess water in areas of somewhat poorly drained, poorly drained, and very poorly drained soils, particularly where legumes are grown.

Permanent pasture and cropland require similar management. Lime and fertilizer should be applied at rates indicated by soil tests. Control of weeds by periodic clipping and use of herbicides encourages the growth of desirable pasture plants. Proper stocking rates and controlled grazing help to maintain well established permanent pastures. The latest information about seedling mixtures, herbicide treatment, and other management for specific soils can be obtained from local offices of the Cooperative Extension Service and the Soil Conservation Service.

Special crops grown commercially in Franklin County include vegetables, nursery stock, and fruits. A high level of management is needed to successfully produce these crops. Most are grown for local use.

The soils in Franklin County that have good natural drainage and warm early in the spring are especially well suited to many vegetables and small fruits. These are Eldean, Ockley, Warsaw, and Wea soils of less than 6 percent slope. Irrigation is usually needed on Eldean and Warsaw soils.

Vegetables are also grown in Crane, Sloan, and Westland soils. Subsurface and surface drainage systems are needed for maximum production on these soils and other somewhat poorly drained, poorly drained, and very poorly drained soils.

A wide variety of soils are used for growing nursery stock. The soils are nearly level or gently sloping and range from well drained to very poorly drained. The moderately well drained soils normally require random drainage for maximum production. The somewhat poorly drained and very poorly drained soils need a complete artificial drainage system for maximum production.

Peaches and apples are the major orchard crops. Most of the orchards are on well drained or moderately well drained soils. They are near major stream valleys where cold air drainage reduces the hazard of spring frost damage.

The latest information about growing special crops can be obtained from local offices of the Cooperative Extension Service and the Soil Conservation Service.

Yields per acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 5. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils.

Capability classes and subclasses

Capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland or engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit (*12*). Only class and subclass are used in this survey. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have slight limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c,* used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, woodland, wildlife habitat, or recreation.

The acreage of soils in each capability class and subclass is shown in table 6. The capability classification of each map unit is given in the section "Soil maps for detailed planning."

Woodland management and productivity

Much of Franklin County was once forested. Red oak, white oak, black oak, hickory, sugar maple, and other native trees grew on the better drained soils. Red maple, beech, white ash, and elm grew on the wetter soils.

Most of the remaining woodland is in the northeastern and extreme southwestern parts of the county. A Mid-Ohio Regional Planning Commission study in 1973 reported less than 70 undeveloped, privately owned forest tracts larger than 20 acres in the county. There are, however, many small farm woodlots scattered across the county. The steepest or wettest parts of farms have typically remained wooded.

Most of the woodland has been cut over and much of it has been grazed. In many farm woodlots, this has resulted in a large number of hollow beech and other diseased or damaged trees of little value as commercial timber. Most of the largest tracts of woodland are on the sloping to very steep soils along the valleys of major streams. These tracts are difficult to manage for timber production.

Reforestation on eroded soils of abandoned farms has increased the acreage of coniferous trees during the past 20 to 25 years. White, red, and Austrian pines are most commonly used for planting.

Table 7 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination (woodland suitability) symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *t*, toxic substances in the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: x, w, t, d, c, s, f, and r.

In table 7, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Ratings of *windthrow hazard* are based on soil characteristics that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that a few trees may be blown down by normal winds; *moderate*, that some trees will be blown down during periods of excessive soil wetness and strong winds; and *severe*, that many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index.* This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

Trees to plant are those that are suited to the soils and to commercial wood production.

Recreation

There are recreational facilities throughout Franklin County. The Metropolitan Park District administers four parks entirely within the county and one park situated partly in the county that together make up about 3,400 acres. The Columbus Department of Recreation and Parks also has an extensive park system, which includes about 5,000 acres of reservoir water and about 5,500 acres of land.

The soils of the survey area are rated in table 8 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 8, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 8 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 11 and interpretations for dwellings without basements and for local roads and streets in table 10.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking, horseback riding, and bicycling should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife habitat

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 9, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor (*1*). A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, timothy, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are ragweed, goldenrod, smartweed, johnsongrass, and panicums.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, the available water capacity, and wetness. Examples of these plants are oak, poplar, cherry, maple, beech, hawthorn, dogwood, hickory, blackberry, and black walnut. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are shrub honeysuckle, autumn-olive, and crabapple.

Coniferous plants furnish browse, seeds, and cones. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, and cedar.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, reed canarygrass, willows, duckweed, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, cottontail, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and deer.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building site development

Table 10 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary facilities

Table 11 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 11 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles, perforated plastic tubing, or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to effectively filter the effluent. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 11 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 11 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction materials

Table 12 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering properties and classifications provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 12, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering properties and classifications.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water management

Table 13 gives information on the soil properties and site features that affect water management. The kind of soil limitations, if any, are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed ponds.

This table also gives for each soil the restrictive features that affect drainage, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are considered as a source of material for embankment fill. The descriptions apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ability of the natural soil to support an embankment is not considered. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 17.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering index properties

Table 14 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil series and morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If a soil contains particles coarser than sand, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*3*) and the system adopted by the American Association of State Highway and Transportation Officials (*2*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as Pt. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an oven-dry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

Physical and chemical properties

Table 15 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion and the amount of soil lost. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to wind erosion.

Soil and water features

Table 16 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt and water in swamps and marshes is not considered flooding.

Table 16 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs on an average of once or less in 2 years; and *frequent* that it occurs on an average of more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered is local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 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. A water table that is seasonally high for less than 1 month is not indicated in table 16.

An apparent water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. An artesian water table is under hydrostatic head, generally beneath an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. A perched water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low, moderate,* or *high,* is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Physical and chemical analysis of selected soils

Samples of many of the soils in Franklin County were tested by the Soil Characterization Laboratory, Department of Agronomy, Ohio State University, Columbus, Ohio. The physical and chemical data obtained on most samples include particle-size distribution, reaction, organic matter content, calcium carbonate equivalent, and extractable cations. These data were used in classifying these soils and evaluating their behavior under various land uses.

Thirteen of the pedons were selected as representative of soil series and are described in this survey. These series and their laboratory identification numbers are: Bennington (FR-43), Cardington (FR-48), Celina (FR-53), Crosby (FR-41), Genesee (FR-47), Kendallville (FR-51), Kokomo (FR-40), Lewisburg (FR-39), Pewamo (FR-42), Ockley (FR-49), Ross (FR-50), Warsaw (FR-46), and Westland (FR-52).

Laboratory data are also available from nearby counties that have many of the same soils. These data and the Franklin 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. Some of these data have been published in studies of soils in Ohio (*10, 15*).

Engineering index test data

Table 17 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. The pedons are typical of the series and are described in the section "Soil series and morphology." The soil samples were tested by the State Department of Transportation, Division of Highways, Testing Laboratory.

The testing methods generally are those of the American Association of State Highway and Transportation Officials (AASHTO) or the American Society for Testing and Materials (ASTM).

The tests and methods are: AASHTO classification—M 145 (AASHTO), D 3282 (ASTM); Unified classification—D 2487 (ASTM); Mechanical analysis—T 88 (AASHTO), D2217 (ASTM); Liquid limit—T 89 (AASHTO), D 423 (ASTM); Plasticity index—T 90 (AASHTO), D 424 (ASTM); Moisture density, Method A—T 99 (AASHTO), D 698 (ASTM).

Classification of the soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*13*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. In table 18, the soils of the survey area are classified according to the system. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Alfisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udalf (*Ud*, meaning humid, plus *alf*, from Alfisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hapludalfs (*Hapl*, meaning minimal horizonation, plus *udalf*, the suborder of the Alfisols that have an udic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Hapludalfs.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, mesic Typic Hapludalfs.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Soil series and morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*11*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*13*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Soil maps for detailed planning."

Alexandria series

The Alexandria series consists of deep, well drained, moderately slowly permeable soils formed in medium-lime glacial till on uplands. Slope ranges from 2 to 25 percent.

Alexandria soils are similar to Kendallville, Miamian, and Milton soils and are commonly adjacent to Bennington and Cardington soils. Kendallville soils formed in glacial outwash over high-lime glacial till. Miamian soils contain less sandstone and shale fragments than Alexandria soils and have mixed mineralogy. Milton soils have limestone bedrock at depths of 20 to 40 inches. Bennington and Cardington soils are wetter with mottling closer to the soil surface.

Typical pedon of Alexandria silt loam, 6 to 12 percent slopes, eroded, in meadow in Jefferson Township, T. 1 N., R. 16 W., about three miles south-southwest of New Albany, 1,380 yards south and 800 yards west of the northeast corner of sec. 2:

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam; moderate fine granular structure; friable; many fine roots; 2 percent coarse fragments; medium acid; abrupt smooth boundary.

B1—8 to 12 inches; brown (7.5YR 4/4) silty clay loam; moderate fine subangular blocky structure; firm; common fine roots; thin continuous yellowish brown (10YR 5/4) coatings on vertical faces of peds; 4 percent coarse fragments; medium acid; gradual wavy boundary.

B21t—12 to 18 inches; dark yellowish brown (10YR 4/4) silty clay loam; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; thin, very patchy brown (10YR 4/3) clay films on horizontal and vertical faces of peds; thin, patchy yellowish brown (10YR 5/4) coatings on vertical faces of peds; 4 percent coarse fragments; medium acid; clear wavy boundary.

B22t—18 to 25 inches; dark yellowish brown (10YR 4/4) silty clay loam; weak coarse prismatic structure parting to moderate medium subangular blocky; very firm; few fine roots; medium patchy dark yellowish brown (10YR 4/4) clay films on horizontal and vertical faces of peds; 4 percent coarse fragments; strongly acid; clear wavy boundary.

B23t—25 to 35 inches; brown (10YR 4/3) clay loam; common medium distinct yellowish brown (10YR 5/6) and few medium distinct grayish brown (10YR 5/2) mottles; weak coarse prismatic structure parting to moderate coarse subangular blocky; very firm; medium patchy dark yellowish brown (10YR 4/4) clay films on vertical faces of peds; common fine and medium iron and manganese stains; 10 percent coarse fragments; slightly acid; gradual wavy boundary.

B3—35 to 42 inches; dark yellowish brown (10YR 4/4) clay loam; few medium distinct yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) mottles; moderate coarse subangular blocky structure; firm; 12 percent coarse fragments; neutral; clear wavy boundary.

C1—42 to 51 inches; brown (10YR 4/3) clay loam; common medium distinct yellowish brown (10YR 5/4) and grayish brown (10YR 5/2) mottles; massive; firm; many fine and medium distinct very pale brown (10YR 7/3) weathered limestone fragments; 14 percent coarse fragments; slight effervescence; mildly alkaline; clear wavy boundary.

C2—51 to 70 inches; brown (10 YR 4/3) loam; massive; firm; 14 percent coarse fragments; strong effervescence; mildly alkaline.

Solum thickness and depth to carbonates range from 24 to 44 inches. Coarse fragments generally increase with depth, ranging from none in the Ap horizon to 14 percent by volume in the C horizon. They are mostly sandstone, limestone, and igneous pebbles with some shale fragments.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. Where limed, reaction ranges from medium acid to neutral. The B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is silty clay loam and clay loam with individual subhorizons of clay. Reaction ranges from very strongly acid in the upper part to neutral in the lower part. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is dominantly mildly alkaline but ranges to moderately alkaline.

Algiers series

The Algiers series consists of deep, somewhat poorly drained, moderately permeable soils on flood plains and in slight depressions on terraces and uplands. These soils formed in recent alluvium over a buried soil. Slope is 0 to 2 percent.

Algiers soils are commonly adjacent to Medway, Shoals, and Sloan soils on flood plains; Montgomery and Westland soils on stream terraces and outwash plains; Montgomery soils in slack water basins; and Kokomo soils on uplands. Unlike Algiers soils, all of these soils except Shoals have a mollic epipedon. Medway, Shoals, and Sloan soils formed entirely in alluvium. Montgomery, Westland, and Kokomo soils have less than 20 inches of recent alluvium on the soil surface.

Typical pedon of Algiers silt loam, in cropland field, in Madison Township, T. 10 N., R. 21 W., about three miles south of Canal Winchester, 115 yards north and 85 yards west of the southeast corner of sec. 2:

Ap—0 to 9 inches; brown (10YR 4/3) silt loam; weak medium granular structure; friable; common fine roots; 2 percent coarse fragments; neutral; abrupt smooth boundary.

C1—9 to 16 inches; brown (10YR 4/3) silt loam; massive; friable; few fine roots; 2 percent coarse fragments; gradual wavy boundary.

C2—16 to 23 inches; brown (10YR 4/3) loam; massive; friable; few fine roots; neutral; abrupt smooth boundary.

IIA11b—23 to 27 inches; very dark gray (10YR 3/1) silty clay loam; few fine distinct dark yellowish brown (10YR 4/4) and few fine faint black (10YR 2/1) mottles; moderate medium granular structure; friable; few fine roots; neutral; abrupt wavy boundary.

IIA12b—27 to 33 inches; black (10YR 2/1) silty clay loam; weak medium prismatic structure parting to moderate fine subangular blocky; friable; few fine roots; mildly alkaline; gradual wavy boundary.

B21tb—33 to 38 inches; very dark brown (10YR 2/2) silty clay loam; few fine distinct dark yellowish brown (10YR 4/4) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; medium very patchy black (10YR 2/1) clay films on horizontal and vertical faces of peds; mildly alkaline; clear wavy boundary.

IIB22tb—38 to 43 inches; dark grayish brown (10YR 4/2) silty clay loam; common fine distinct dark yellowish brown (10YR 4/4) and very dark gray (10YR 3/1) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; medium very patchy very dark grayish brown (10YR 3/2) clay films on horizontal and vertical faces of peds; mildly alkaline; clear irregular boundary.

IIB23tb—43 to 48 inches; gray (10YR 5/1) clay loam; many medium distinct brown (10YR 4/3) and yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to weak coarse subangular blocky; firm; few fine roots; medium very patchy dark grayish brown (10YR 4/2) clay films on horizontal and vertical faces of peds; 3 percent coarse fragments; mildly alkaline; clear wavy boundary.

IIB3b—48 to 56 inches; grayish brown (10YR 5/2) clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; 5 percent coarse fragments; mildly alkaline; clear wavy boundary.

IIC—56 to 70 inches; gray (10YR 5/1) loam; many medium distinct yellowish brown (10YR 5/6) mottles; massive; friable; 7 percent coarse fragments; mildly alkaline.

Solum thickness ranges from 39 to 62 inches. The thickness of the recent alluvium ranges from 20 to 30 inches. The depth to carbonates commonly ranges from 43 to 60 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. In some pedons the recent alluvium below 20 inches is mottled. Texture of the recent alluvium below the Ap horizon is commonly silt loam but includes loam and silty clay loam. Reaction is slightly acid or neutral. The IIA1b horizon and the upper part of the IIB2b horizon has hue of 10YR or neutral, value of 2 or 3, and chroma of 0 to 2. The IIA1b horizon is silt loam, silty clay loam, or clay loam. The lower part of the IIB2b horizon has hue of 10YR, value of 4 or 5, and chroma of 1 or 2. It is silty clay loam, silty clay, clay loam, or loam. Reaction is neutral or mildly alkaline.

Bennington series

The Bennington series consists of deep, somewhat poorly drained soils that have slow permeability. These soils formed in medium-lime glacial till on uplands. Slope ranges from 0 to 6 percent.

Bennington soils are similar to Blount, Crosby, and Mitiwanga soils and are commonly adjacent to Cardington, Condit, and Pewamo soils. Blount and Crosby soils have less sandstone and shale fragments throughout than the Bennington soils and have formed in glacial till that has a higher lime content. Blount soils also have more clay in the argillic horizon. Mitiwanga soils are moderately deep to sandstone and shale bedrock and have less clay in the subsoil. Cardington soils are better drained and do not have low-chroma mottles immediately below the Ap horizon. Condit and Pewamo soils are wetter and have dominant low-chroma colors between the A horizon and a depth of 30 inches. Pewamo soils also have a mollic epipedon.

Typical pedon of Bennington silt loam, 2 to 6 percent slopes, in meadow, in Plain Township, T. 2 N., R. 16 W., 2.2 miles northeast of New Albany, 410 yards north and 230 yards east of the southwest corner of sec. 10:

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam; moderate medium granular structure; friable; many medium roots; 2 percent coarse fragments; slightly acid; abrupt smooth boundary.

B21t—9 to 14 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; common fine roots; medium patchy dark grayish brown (10YR 4/2) clay films on vertical and horizontal faces of peds; continuous dark grayish brown (10YR 4/2) coatings on vertical faces of peds; 2 percent coarse fragments; strongly acid; clear wavy boundary.

B22t—14 to 18 inches; yellowish brown (10YR 5/4) silty clay; common medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/8) mottles; moderate medium and fine subangular blocky structure; firm; few fine roots; medium patchy dark grayish brown (10YR 4/2) and dark yellowish brown (10YR 4/4) clay films on horizontal and vertical faces of peds; continuous dark grayish brown (10YR 4/2) coatings on vertical faces of peds; 2 percent coarse fragments; medium acid; clear wavy boundary.

B23t—18 to 23 inches; yellowish brown (10YR 5/4) heavy silty clay loam; common fine distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; few fine roots; medium patchy grayish brown (10YR 5/2) clay films on horizontal and vertical faces of peds; continuous dark grayish brown (10YR 4/2) coatings on vertical faces of peds; 2 percent coarse fragments; neutral; gradual wavy boundary.

B24t—23 to 31 inches; yellowish brown (10YR 5/4) heavy silty clay loam; common medium distinct light brownish gray (10YR 6/2) and yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; few fine roots; medium patchy dark grayish brown (10YR 4/2) and brown (10YR 5/3) clay films on vertical faces of peds; patchy grayish brown (10YR 5/2) coatings on vertical faces of peds; 5 percent coarse fragments; neutral; clear wavy boundary.

B3—31 to 35 inches; yellowish brown (10YR 5/4) heavy silty clay loam; common medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure; firm; few fine prominent light gray (10YR 7/2) weathered limestone fragments; 8 percent coarse fragments; mildly alkaline; gradual wavy boundary.

C1—35 to 45 inches; dark yellowish brown (10YR 4/4) clay loam; few medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; massive; firm; common medium prominent light gray (10YR 7/2) weathered limestone fragments; 12 percent coarse fragments; slight effervescence; mildly alkaline; abrupt wavy boundary.

C2—45 to 62 inches; brown (10YR 4/3) loam; massive; firm; common medium prominent light gray (10YR 7/2) weathered limestone fragments; 12 percent coarse fragments; slight effervescence; mildly alkaline; abrupt wavy boundary.

C3—62 to 70 inches; dark yellowish brown (10YR 4/4) loam; massive; firm; 14 percent coarse fragments; slight effervescence; mildly alkaline.

Solum thickness ranges from 29 to 45 inches. Depth to carbonates ranges from 26 to 43 inches. Coarse fragments generally increase with depth, ranging from none in the Ap horizon to 14 percent by volume in the C horizon. They are usually sandstone, limestone, shale, and igneous pebbles with an occasional large stone.

The Ap horizon has hue of 10YR, value of 4, and chroma of 1 or 2. Reaction, where limed, ranges from strongly acid to slightly acid. The B horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. It is dominantly silty clay loam or clay loam with subhorizons of silty clay in some pedons. Reaction ranges from strongly acid in the upper part to mildly alkaline in the lower part. The C horizon has hue of 10YR, value of 3 or 4, and chroma of 3 or 4. Texture is commonly clay loam or loam but ranges to silt loam. Reaction is dominantly mildly alkaline but ranges to moderately alkaline.

Blount series

The Blount series consists of deep, somewhat poorly drained soils that have slow permeability. These soils formed in high-lime glacial till on uplands. Slope ranges from 0 to 6 percent.

Blount soils are similar to Bennington and Crosby soils and are commonly adjacent to Glynwood and Pewamo soils. Compared with Blount soils, Bennington soils formed in glacial till with a lower calcium carbonate equivalent and contain significant amounts of sandstone and shale fragments. Crosby soils have mixed mineralogy and less clay in the B and C horizons. Glynwood soils are moderately well drained and not as gray in the subsoil. Pewamo soils have a mollic epipedon and a grayer subsoil.

Typical pedon of Blount silt loam, 2 to 6 percent slopes, in cropland field in Perry Township, T. 2 N., R. 19 W., 3 miles north-northwest of Linworth, about 500 yards south and 1,750 yards east of the northwest corner of sec. 1:

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam; moderate medium granular structure; friable; common roots; 2 percent coarse fragments; neutral; abrupt smooth boundary.

B21t—10 to 16 inches; yellowish brown (10YR 5/4) silty clay; common medium distinct yellowish brown (10YR 5/8) and dark gray (10YR 4/1) mottles; moderate fine and medium subangular blocky structure; firm; few roots; thin very patchy brown (10YR 4/3) clay films on horizontal and vertical faces of peds; thin continuous dark gray (10YR 4/1) coatings on vertical faces of peds; 2 percent coarse fragments; slightly acid; clear wavy boundary.

B22t—16 to 23 inches; yellowish brown (10YR 5/4) silty clay; common medium distinct yellowish brown (10YR 5/8) and dark gray (10YR 4/1) mottles; moderate medium and coarse subangular blocky structure; firm; few roots; thin patchy dark gray (10YR 4/1) and dark grayish brown (10YR 4/2) clay films on horizontal and vertical faces of peds; 2 percent coarse fragments; slightly acid; gradual wavy boundary.

B23t—23 to 30 inches; brown (10YR 5/3) silty clay loam; common medium distinct yellowish brown (10YR 5/6) and gray (10YR 5/1) mottles; moderate medium subangular blocky structure; firm; few roots; thin very patchy dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2) clay films on horizontal and vertical faces of peds; 5 percent coarse fragments; slightly acid; clear wavy boundary.

B3—30 to 35 inches; yellowish brown (10YR 5/4) clay loam; common medium distinct yellowish brown (10YR 5/8) and grayish brown (10YR 5/2) mottles; weak medium and coarse subangular blocky structure; firm; few roots; 10 percent coarse fragments; mildly alkaline; clear wavy boundary.

C1—35 to 49 inches; brown (10YR 4/3) clay loam; few medium distinct yellowish brown (10YR 5/6) and common medium distinct gray (10YR 5/1) mottles; massive; firm; 14 percent coarse fragments; strong effervescence; moderately alkaline.

C2—49 to 70 inches; brown (10YR 4/3) clay loam; few medium distinct yellowish brown (10YR 5/6) and gray (10YR 5/1) mottles; massive; firm; 14 percent coarse fragments; strong effervescence; moderately alkaline.

Solum thickness ranges from 25 to 45 inches. Depth to carbonates ranges from 21 to 45 inches. Coarse fragments generally increase with depth ranging from none in the Ap horizon to 15 percent by volume in the C horizon. They are usually igneous, limestone, and chert pebbles with an occasional igneous boulder.

The Ap horizon has hue of 10YR, value of 4, and chroma of 1 or 2. Reaction, where limed, ranges from medium acid to neutral. The B horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. Reaction ranges from strongly acid in the upper part to mildly alkaline in the lower part. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. Reaction is dominantly moderately alkaline but ranges to mildly alkaline.

Cardington series

The Cardington series consists of deep, moderately well drained soils with moderately slow permeability. These soils formed in medium-lime glacial till on uplands. Slope ranges from 2 to 12 percent.

Cardington soils are similar to Celina and Glynwood soils and are commonly adjacent to Alexandria, Bennington, and Pewamo soils. Alexandria soils are better drained than Cardington soils and do not have low-chroma mottles in the upper part of the argillic horizon. Celina and Glynwood soils have less sandstone and shale fragments throughout and formed in glacial till that has a higher lime content. Bennington and Pewamo soils are wetter and have mottles immediately below the A horizon. Pewamo soils also have a mollic epipedon.

Typical pedon of Cardington silt loam, 2 to 6 percent slopes, in pasture, in Jefferson Township, T. 1 N., R. 16 W., about 5 miles south of New Albany, 550 yards south and 2,230 yards west of the northeast corner of sec. 4:

Ap—0 to 6 inches; brown (10YR 4/3) silt loam; weak fine granular structure; friable; many fine roots; 2 percent coarse fragments; neutral; abrupt smooth boundary.

B1—6 to 9 inches; yellowish brown (10YR 5/4) silty clay loam; weak medium subangular blocky structure; friable; common fine roots; 2 percent coarse fragments; very strongly acid; clear wavy boundary.

B21t—9 to 14 inches; strong brown (7.5YR 5/6) silty clay loam; common fine distinct brown (10YR 5/3) mottles; moderate medium angular blocky structure; friable; few fine roots; thin patchy brown (10YR 5/3) clay films on horizontal and vertical faces of peds; thin patchy yellowish brown (10YR 5/4) coatings on vertical faces of peds; 2 percent coarse fragments; strongly acid; clear wavy boundary.

B22t—14 to 19 inches; yellowish brown (10YR 5/4) silty clay loam; common fine and medium faint yellowish brown (10YR 5/6) and common medium distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; friable; few fine roots; medium continuous grayish brown (10YR 5/2) clay films on horizontal and vertical faces of peds; 2 percent coarse fragments; strongly acid; clear wavy boundary.

B23t—19 to 22 inches; yellowish brown (10YR 5/6) silty clay; common medium distinct grayish brown (10YR 5/2) and common fine faint brown (10YR 5/3) mottles; moderate medium subangular blocky structure; firm; few fine roots; medium patchy yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) clay films on horizontal and vertical faces of peds; 2 percent coarse fragments; strongly acid; clear wavy boundary.

B24t—22 to 27 inches; yellowish brown (10YR 5/4) silty clay; common fine distinct yellowish brown (10YR 5/8) and grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; medium patchy grayish brown (10YR 5/2) and dark grayish brown (10YR 4/2) clay films on vertical and horizontal faces of peds; few fine prominent black (10YR 2/1) iron and manganese stains; 5 percent coarse fragments; slightly acid; gradual wavy boundary.

B3—27 to 34 inches; brown (10YR 5/3) silty clay loam; common fine and medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; thin very patchy grayish brown (2.5Y 5/2) coatings on vertical faces of peds; few fine prominent black (10YR 2/1) iron and manganese stains; 5 percent coarse fragments; mildly alkaline; gradual wavy boundary.

C1—34 to 44 inches; brown (10YR 4/3) clay loam; common medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/4) mottles; massive; very firm; 5 percent coarse fragments; strong effervescence; mildly alkaline; gradual wavy boundary.

C2—44 to 70 inches; brown (10YR 4/3) clay loam; common medium distinct gray (10YR 5/1) and yellowish brown (10YR 5/6) mottles; massive; very firm; 8 percent coarse fragments; strong effervescence; mildly alkaline.

Solum thickness ranges from 28 to 41 inches. Depth to carbonates ranges from 26 to 35 inches. Coarse fragments generally increase with depth ranging from none in the Ap horizon to 10 percent by volume in the C horizon. They are mostly sandstone, limestone, and igneous pebbles with some shale fragments.

The Ap horizon has hue of 10YR, value of 4, and chroma of 2 or 3. Reaction, where limed, is slightly acid or neutral. The B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is dominantly silty clay loam, silty clay, or clay loam but includes individual subhorizons of clay and silt loam. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is dominantly mildly alkaline but ranges to moderately alkaline.

Carlisle series

The Carlisle series consists of deep, very poorly drained, organic soils that have moderately rapid permeability. These soils formed in organic deposits more than 5 feet thick over mineral material in depressions on uplands and terraces. Slope is 0 to 2 percent.

Carlisle soils are commonly adjacent to Eldean, Miamian, Montgomery, Pewamo, Sloan, and Westland soils. These soils formed mainly in mineral material.

Typical pedon of Carlisle muck, in weedy area, in Pleasant Township, about 1.8 miles northeast of Darbydale, 250 yards west of Norton Road, 420 yards north of the intersection of Lambert and Norton Roads:

Oap—0 to 7 inches; black (N 2/0) broken face and rubbed silty sapric material; less than 1 percent fiber broken and rubbed; moderate medium granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

Oa1—7 to 13 inches; black (N 2/0) broken face and rubbed sapric material; about 2 percent fiber, less than 1 percent rubbed; weak coarse prismatic structure parting to weak coarse granular; friable; common fine roots; mostly herbaceous fibers; neutral; clear wavy boundary.

Oa2—13 to 19 inches; black (N 2/0) broken face and rubbed sapric material; about 7 percent fiber, less than 1 percent rubbed; weak coarse prismatic structure parting to weak coarse granular; friable; few fine roots; mostly herbaceous fiber; slightly acid; clear wavy boundary.

Oa3—19 to 24 inches; dark reddish brown (5YR 2/2) broken face; black (5YR 2/1) rubbed sapric material; about 40 percent fiber, 8 percent rubbed; thin platy depositional structure; friable; few fine roots; mostly herbaceous and woody fiber; medium acid; abrupt smooth boundary.

Oe1—24 to 31 inches; dark yellowish brown (10YR 4/4) broken face; reddish brown (5YR 3/3) rubbed hemic material; about 75 percent fiber, 25 percent rubbed; thin platy depositional structure; friable; mostly herbaceous and woody fiber; medium acid; abrupt wavy boundary.

Oa4—31 to 37 inches; dark brown (10YR 3/3) broken face; very dark grayish brown (10YR 3/2) rubbed sapric material; about 35 percent fiber, 8 percent rubbed; thin platy depositional structure; friable; mostly herbaceous and woody fiber; neutral; clear wavy boundary.

Oa5—37 to 58 inches; dark brown (10YR 3/3) broken face; very dark grayish brown (10YR 3/2) rubbed sapric material; about 20 percent fiber, 8 percent rubbed; massive; very friable; mostly herbaceous fiber; neutral; clear wavy boundary.

IILco—58 to 70 inches; dark grayish brown (2.5Y 4/2) broken face; olive gray (5Y 4/2) rubbed coprogenous earth; about 10 percent fiber, 3 percent fiber rubbed; massive; very friable; mostly herbaceous fiber; neutral.

Thickness of the organic material is greater than 60 inches. Some pedons contain partly rotted limbs and twigs.

The surface tier has hue of 5YR, 10YR, or neutral; value of 2; and chroma of 0 or 1. It is slightly acid to mildly alkaline. The subsurface tier has hue of 5YR to 10YR or neutral, value of 2 to 4, and chroma of 0 to 4. It is dominantly sapric material but a layer of hemic material occurs in some pedons. It is medium acid to mildly alkaline. The bottom tier has hue of 10YR, value of 2 or 3, and chroma of 1 to 3. It is dominantly sapric material but a layer of hemic material occurs in some pedons. Reaction is neutral or mildly alkaline.

Celina series

The Celina series consists of deep, moderately well drained soils that have moderately slow permeability. These soils formed in high-lime glacial till on uplands. Slope ranges from 0 to 12 percent.

Celina soils are similar to Cardington and Glynwood soils and are commonly adjacent to Crosby, Kendallville, and Miamian soils. Compared with Celina soils, Cardington soils formed in glacial till with a lower calcium carbonate equivalent and contain significant amounts of sandstone and shale fragments. Glynwood soils have B and C horizons with more clay and have illitic mineralogy. Crosby soils are grayer in the subsoil and Kendallville and Miamian soils do not have low-chroma mottles in the upper part of the argillic horizon.

Typical pedon of Celina silt loam, 2 to 6 percent slopes, in cropland, in Madison Township, T. 11 N., R. 21 W., 2 miles north-northeast of Groveport, 1,030 yards south and 470 yards east of the northwest corner of sec. 15:

Ap—0 to 7 inches; dark brown (10YR 4/3) silt loam; moderate medium granular structure; friable; many fine roots; 3 percent coarse fragments; neutral; abrupt smooth boundary.

B1—7 to 11 inches; yellowish brown (10YR 5/4) silty clay loam; weak medium prismatic structure parting to moderate medium subangular blocky; firm; common fine roots; medium patchy brown (10YR 4/3) coatings on horizontal and vertical faces of peds; 3 percent coarse fragments; neutral; clear wavy boundary.

B21t—11 to 16 inches; yellowish brown (10YR 5/4) silty clay loam; few fine distinct grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; common fine roots; brown (10YR 4/3) thin patchy clay films and medium patchy coatings on horizontal and vertical faces of peds; few fine prominent black (10YR 2/1) stains; 3 percent coarse fragments; slightly acid; clear wavy boundary.

B22t—16 to 21 inches; dark yellowish brown (10YR 4/4) clay; common fine distinct grayish brown (10YR 5/2) and few fine distinct yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; common fine roots; medium patchy brown (10YR 4/3) clay films on horizontal and vertical faces of peds; few fine prominent black (10YR 2/1) stains; 5 percent coarse fragments; slightly acid; clear wavy boundary.

B3t—21 to 25 inches; dark yellowish brown (10YR 4/4) clay loam; common fine distinct grayish brown (10YR 5/2) and few fine distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; few fine roots; brown (10YR 4/3) clay films on horizontal and vertical faces of peds; few fine prominent black (10YR 2/1) stains; 5 percent coarse fragments; neutral; abrupt irregular boundary.

C1—25 to 33 inches; brown (10YR 4/3) loam; common fine distinct grayish brown (10YR 5/2) and few fine distinct yellowish brown (10YR 5/6) mottles; massive; firm; few fine prominent black (10YR 2/1) stains; 10 percent coarse fragments; slight effervescence; mildly alkaline; gradual wavy boundary.

C2—33 to 43 inches; brown (10YR 4/3) loam; common medium distinct light gray (10YR 6/1) and yellowish brown (10YR 5/6) mottles; massive; firm; few fine prominent black (10YR 2/1) stains; 10 percent coarse fragments; slight effervescence; mildly alkaline; gradual wavy boundary.

C3—43 to 55 inches; yellowish brown (10YR 5/4) loam; many medium distinct gray (10YR 6/1) and many medium faint yellowish brown (10YR 5/6) mottles; massive; firm; few fine prominent black (10YR 2/1) stains; 14 percent coarse fragments; strong effervescence; moderately alkaline; gradual wavy boundary.

C4—55 to 70 inches; yellowish brown (10YR 5/4) loam; common medium distinct light brownish gray (10YR 6/2) mottles; massive, firm; 14 percent coarse fragments; strong effervescence; moderately alkaline.

The solum thickness ranges from 22 to 33 inches. Depth to carbonates ranges from 20 to 33 inches. Coarse fragments generally increase with depth, ranging from none in the Ap horizon to 14 percent by volume in the C horizon. They are mostly igneous and limestone pebbles, but chert and shale fragments occur in some pedons. Occasional large stones or boulders also occur.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is neutral or slightly acid. The B horizon has hue of 10YR and rarely 7.5YR, value of 4 or 5, and chroma of 3 to 6. Texture includes silty clay loam, clay loam, silty clay, and clay. Reaction ranges from strongly acid to mildly alkaline. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is loam or silt loam.

Condit series

The Condit series consists of deep, poorly drained, slowly permeable soils formed in medium-lime glacial till on uplands. Slope is 0 to 2 percent.

Condit soils are commonly adjacent to Bennington and Pewamo soils. Bennington soils are better drained than Condit soils and are not as gray in the subsoil. Pewamo soils have a mollic epipedon.

Typical pedon of Condit silt loam in cropland, in Jefferson Township, T. 1 N., R. 16 W., about 3 miles northeast of Blacklick, 1,610 yards north and 500 yards west of the southeast corner of sec. 1:

Ap—0 to 9 inches; dark gray (10YR 4/1) silt loam; moderate medium granular structure; friable; common fine roots; common fine distinct very dark grayish brown (10YR 3/2) iron and manganese concretions; 2 percent coarse fragments; slightly acid; abrupt smooth boundary.

A2g—9 to 11 inches; gray (10YR 5/1 and 6/1) silt loam; common fine distinct yellowish brown (10 YR 5/4) mottles; weak thick platy structure parting to weak medium granular; friable; few fine roots; common fine prominent black (10YR 2/1) iron and manganese stains and concretions; 2 percent coarse fragments; slightly acid; clear wavy boundary.

B1g—11 to 15 inches; gray (10YR 6/1) silty clay loam; common medium distinct light yellowish brown (10YR 6/4) mottles; weak medium subangular blocky structure; friable; few fine roots; medium continuous gray (10YR 6/1) coatings on horizontal and vertical faces of peds; common fine and medium prominent black (10YR 2/1) iron and manganese stains and concretions; 2 percent coarse fragments; medium acid; clear wavy boundary.

B21tg—15 to 23 inches; gray (10YR 5/1) silty clay loam; common medium distinct strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium and coarse subangular blocky; firm; few fine roots; medium gray (N 5/0) clay films that are continuous on vertical faces of peds and patchy on horizontal faces; 2 percent coarse fragments; strongly acid; gradual wavy boundary.

B22tg—23 to 32 inches; gray (10YR 5/1) silty clay; common medium distinct yellowish brown (10YR 5/4 & 5/6) mottles; moderate medium prismatic structure parting to moderate medium and coarse subangular blocky; firm; few fine roots; medium patchy dark gray (N 4/0) clay films on horizontal and vertical faces of peds; 2 percent coarse fragments; strongly acid; clear wavy boundary.

B23tg—32 to 39 inches; gray (10YR 5/1) silty clay loam; common medium distinct yellowish brown (10YR 5/4) mottles; weak medium prismatic structure parting to weak coarse subangular blocky; firm; few fine roots; thin very patchy gray (N 5/0) and yellowish brown (10YR 5/4) clay films on horizontal and vertical faces of peds; 2 percent coarse fragments; medium acid; gradual wavy boundary.

B3—39 to 53 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct gray (10YR 5/1) and yellowish brown (10YR 5/8) mottles; weak medium and coarse subangular blocky structure; firm; few fine roots; 4 percent coarse fragments; slightly acid; clear wavy boundary.

C1g—53 to 61 inches; olive gray (5Y 5/2) clay loam; common medium distinct yellowish brown (10YR 5/4 and 5/6) mottles; massive; firm; 4 percent coarse fragments; slight effervescence; mildly alkaline; clear wavy boundary.

C2—61 to 70 inches; olive brown (2.5Y 4/4) loam; common medium distinct yellowish brown (10YR 5/4) and gray (10YR 5/1) mottles; massive; firm; 4 percent coarse fragments; strong effervescence; moderately alkaline.

Solum thickness and depth to carbonates ranges from 43 to 55 inches. Coarse fragments generally increase with depth, ranging from none in the Ap horizon to 14 percent by volume in the C horizon. They are usually sandstone, limestone, shale, and igneous pebbles with an occasional large stone.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 1 or 2. Reaction is medium acid or slightly acid. The B2 horizon has hue of 10YR, value of 4 to 6, and chroma of 1. In some pedons individual subhorizons below a depth of 30 inches have chroma of 3 to 6. Texture is silty clay loam, silty clay, or clay loam. Reaction ranges from very strongly acid in the upper part to mildly alkaline in the lower part. The C horizon has hue of 2.5Y or 5Y, value of 4 or 5, and chroma of 2 to 4. Reaction is dominantly mildly alkaline but ranges to moderately alkaline.

Crane series

The Crane series consists of deep, somewhat poorly drained soils that have moderately slow over very rapid permeability. These soils formed in silty and loamy material over outwash sand and gravel on stream terraces and outwash plains. Slope is 0 to 2 percent.

Crane soils are commonly adjacent to Medway, Ockley, Sloan, Wea, and Westland soils. Unlike Crane soils, Medway and Sloan soils formed in alluvium and do not have an argillic horizon. Ockley and Wea soils are better drained and do not have low-chroma mottles in the upper part of the subsoil. Ockley soils also have an ochric epipedon. Westland soils are wetter and have dominant low-chroma colors in the upper part of the subsoil.

Typical pedon of Crane silt loam, 0 to 2 percent slopes, in cropland, in Pleasant Township, approximately 1.3 miles east-southeast of Darbydale, 1,200 yards southwest of the intersection of State Route 665 and Lambert Road:

Ap—0 to 9 inches; black (10YR 2/1) silt loam; weak medium granular structure; friable; few fine roots; 1 percent coarse fragments; neutral; abrupt smooth boundary.

A12—9 to 16 inches; black (10YR 2/1) silty clay loam; moderate medium granular structure; friable; few fine roots; thin patchy black (N 2/0) coatings on horizontal and vertical faces of peds; 1 percent coarse fragments; neutral; clear wavy boundary.

B21t—16 to 21 inches; dark grayish brown (10YR 4/2) silty clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; weak thick platy structure parting to moderate fine subangular blocky; firm; medium patchy very dark brown (10YR 2/2) and very dark grayish brown (10YR 3/2) clay films on horizontal and vertical faces of peds; thin patchy very dark brown (10YR 2/2) coatings on vertical faces of peds; few fine distinct black (10YR 2/1) stains; 1 percent coarse fragments; neutral; clear wavy boundary.

B22t—21 to 29 inches; dark grayish brown (10YR 4/2) clay loam; few fine distinct yellowish brown (10YR 5/6) and few fine faint grayish brown (10YR 5/2) mottles; weak thick platy structure parting to moderate fine subangular blocky; firm; medium patchy very dark brown (10YR 2/2) and very dark grayish brown (10YR 3/2) clay films on horizontal and vertical faces of peds; thin patchy very dark brown (10YR 2/2) coatings on vertical faces of peds; common fine distinct black (10YR 2/1) stains; 5 percent coarse fragments; neutral; gradual wavy boundary.

B23t—29 to 39 inches; brown (10YR 4/3) clay loam; many medium distinct dark gray (10YR 4/1) and common fine distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; medium patchy very dark grayish brown (10YR 3/2) clay films on vertical faces of peds and thin patchy dark grayish brown (10YR 4/2) clay films on horizontal faces of peds; common fine distinct black (10YR 2/1) stains; 5 percent coarse fragments; neutral; clear wavy boundary.

B3—39 to 43 inches; yellowish brown (10YR 5/4) clay loam; common medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure; friable; few fine prominent black (10YR 2/1) stains; 12 percent coarse fragments; slight effervescence; mildly alkaline; clear wavy boundary.

C1—43 to 52 inches; pale brown (10YR 6/3) gravelly loam; massive; friable; 30 percent coarse fragments; strong effervescence; mildly alkaline; clear wavy boundary.

C2—52 to 70 inches; light brownish gray (10YR 6/2) gravelly sand; single grained; loose; 30 percent coarse fragments; strong effervescence; moderately alkaline.

Solum thickness ranges from 40 to 55 inches. Thickness of the mollic epipedon ranges from 12 to 19 inches. In some places there is up to 25 inches of silty alluvium overlying the loamy outwash. The depth to carbonates ranges from 36 to 55 inches.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. Reaction is slightly acid or neutral. The B horizon has hue of 10YR, value of 3 to 5, and chroma of 2 to 4. It is silty clay loam, clay loam, and loam and gravelly analogs of these textures in the extreme lower part of the B horizon. Individual subhorizons of clay occur in some pedons. Reaction of the B horizon ranges from slightly acid or neutral in the upper part to mildly alkaline in the lower part. The C horizon has hue of 10YR, value of 4 to 6, and chroma of 1 to 4. It is sand, loamy sand, loam, and sandy loam and their gravelly analogs.

Crosby series

The Crosby series consists of deep, somewhat poorly drained, slowly permeable soils formed in high-lime glacial till on uplands. Slope ranges from 0 to 6 percent.

Crosby soils are similar to Bennington and Blount soils and are commonly adjacent to Celina, Kendallville, Kokomo, and Lewisburg soils. Compared with Crosby soils, Bennington soils contain significant amounts of sandstone and shale fragments throughout the soils and formed in glacial till with a lower calcium carbonate equivalent. Blount soils have illitic mineralogy and a higher clay content in the subsoil and substratum. Celina, Kendallville, and Lewisburg soils are better drained and do not have low-chroma mottles immediately below the A horizon. Kendallville soils also formed in glacial outwash over glacial till, and Lewisburg soils have a thinner solum. Kokomo soils are wetter and have a mollic epipedon.

Typical pedon of Crosby silt loam, 0 to 2 percent slopes, in meadow, in Norwich Township, three miles south of Hilliard, 175 yards south of Hickory Hill Road, 220 yards east of Spindler Road:

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam; moderate medium granular structure; friable; common medium roots; 2 percent coarse fragments; neutral; abrupt smooth boundary.

B&A—9 to 13 inches; brown (10YR 4/3) silty clay loam (B2); common fine distinct gray (10YR 5/1) and yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; firm; few medium roots; 15 percent gray (10YR 6/1) surfaces on peds (A2); medium very patchy dark grayish brown (10YR 4/2) clay films on horizontal and vertical faces of peds; thin patchy dark gray (10YR 4/1) coatings on vertical faces of peds; 2 percent coarse fragments; neutral; abrupt wavy boundary.

B21t—13 to 18 inches; brown (10YR 4/3) silty clay loam; common fine distinct gray (10YR 5/1) and yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; very firm; few fine roots; medium continuous dark grayish brown (10YR 4/2) clay films on horizontal and vertical faces of peds; 2 percent coarse fragments; medium acid; clear wavy boundary.

B22t—18 to 24 inches; brown (10YR 4/3) silty clay loam; common medium distinct yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; very firm; few fine roots; medium continuous dark grayish brown (2.5Y 4/2 and 10YR 4/2) clay films on horizontal and vertical faces of peds; 2 percent coarse fragments; medium acid; clear wavy boundary.

B3t—24 to 28 inches; yellowish brown (10YR 5/4) clay loam; many medium distinct gray (10YR 5/1) and dark gray (10YR 4/1) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; medium patchy dark grayish brown (10YR 4/2) clay films on vertical faces of peds; 4 percent coarse fragments; neutral; abrupt wavy boundary.

C1—28 to 36 inches; yellowish brown (10YR 5/4) clay loam; common medium distinct gray (10YR 5/1) and common medium faint yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure; firm; few fine roots; thin patchy grayish brown (10YR 5/2) coatings on vertical faces of peds; 8 percent coarse fragments; slight effervescence; mildly alkaline; clear wavy boundary.

C2—36 to 46 inches; yellowish brown (10YR 5/4) clay loam; common coarse faint yellowish brown (10YR 5/6) and common coarse distinct gray (10YR 5/1) mottles; massive; firm; few fine roots; 8 percent coarse fragments; strong effervescence; moderately alkaline; clear wavy boundary.

C3—46 to 54 inches; yellowish brown (10YR 5/4) loam; common coarse distinct gray (10YR 5/1) and common coarse faint yellowish brown (10YR 5/6) mottles; massive; firm; 12 percent coarse fragments; strong effervescence; moderately alkaline; clear wavy boundary.

C4—54 to 70 inches; brown (10YR 4/3) loam; common medium distinct gray (10YR 5/1) mottles; massive; firm; 14 percent coarse fragments; strong effervescence; moderately alkaline.

Solum thickness ranges from 23 to 39 inches. Depth to carbonates ranges from 20 to 36 inches. Coarse fragments generally increase with depth, ranging from none in the Ap horizon to 14 percent by volume in the C horizon. They are usually igneous limestone and chert pebbles with an occasional igneous boulder.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2. Reaction ranges from strongly acid to neutral. The B horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. Texture is silty clay loam, silty clay, clay loam, or clay. Reaction ranges from medium acid in the upper part of the B horizon to mildly alkaline in the lower part.

Eel series

The Eel series consists of deep, moderately well drained, moderately permeable soils formed in alluvium on flood plains. The sediments eroded mainly from uplands and terraces. These soils are subject to occasional flooding. Slope is 0 to 2 percent.

Eel soils are commonly adjacent to Genesee, Medway, Sleeth, and Shoals soils and are similar to Medway soils. Genesee soils are better drained than Eel soils and have greater depth to low-chroma mottles. Medway soils have a mollic epipedon. Sleeth and Shoals soils are wetter and are mottled immediately below the surface layer. Sleeth soils also formed mainly in glacial outwash.

Typical pedon of Eel silt loam, occasionally flooded, in meadow, in Madison Township, T. 11 N., R. 21 W., about 2.5 miles north-northwest of Groveport, 420 yards south and 760 yards west of the northeast corner of sec. 17:

Ap—0 to 8 inches; brown (10YR 4/3) silt loam; moderate medium granular structure; friable; common medium roots; neutral; abrupt smooth boundary.

C1—8 to 17 inches; brown (10YR 4/3) silt loam; weak fine subangular blocky structure; friable; few fine roots; thin continuous dark grayish brown (10YR 4/2) coatings on vertical faces of peds; neutral; clear wavy boundary.

C2—17 to 28 inches; brown (10YR 4/3) silt loam; many medium faint dark grayish brown (10YR 4/2) and yellowish brown (10YR 5/4) mottles; weak fine subangular blocky structure; friable; few fine roots; thin patchy dark grayish brown (10YR 4/2) coatings on vertical faces of peds; mildly alkaline; gradual wavy boundary.

C3—28 to 42 inches; brown (10YR 4/3) silt loam; many medium faint dark yellowish brown (10YR 4/4) and many medium distinct gray (10YR 5/1) mottles; weak medium subangular blocky structure; friable;

slight effervescence; mildly alkaline; clear wavy boundary.

C4—42 to 59 inches; brown (10YR 5/3) clay loam; common medium distinct dark yellowish brown (10YR 4/4) and light gray (10YR 6/1) mottles; weak medium subangular blocky structure; friable; 5 percent coarse fragments; slight effervescence; mildly alkaline; clear wavy boundary.

C5—59 to 70 inches; light brownish gray (10YR 6/2) clay loam; common medium distinct yellowish brown (10YR 5/4) and gray (10YR 5/1) mottles; massive; friable; 7 percent coarse fragments; slight effervescence; mildly alkaline.

Depth to carbonates ranges from 12 to 37 inches. The Ap horizon has hue of 10YR, value of 4, and chroma of 2 or 3. The C horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 4. It is silt loam, silty clay loam, or clay loam above depths of about 40 inches and loam, silt loam, sandy loam, clay loam, sand, or gravel below about 40 inches. Reaction ranges from neutral in the upper part to moderately alkaline in the lower part.

Eldean series

The Eldean series consists of deep, well drained soils. These soils formed in glacial outwash on stream terraces, outwash plains, and a few kames. Permeability is moderate or moderately slow in the subsoil and rapid or very rapid in the substratum. Slope ranges from 0 to 18 percent.

Eldean soils are similar to Ockley soils and are commonly adjacent to Ockley, Thackery, Warsaw, and Wea soils. All of these soils have less clay in the argillic horizon than Eldean soils. Ockley, Thackery, and Wea soils have a thicker solum. Thackery soils are wetter and have mottles in the lower part of the subsoil. Warsaw and Wea soils have a mollic epipedon.

Typical pedon of Eldean silt loam, 2 to 6 percent slopes, in cropland, in Hamilton Township, T. 11 N., R. 22 W., about 1.5 miles east-southeast of Obetz, 690 yards north and 260 yards west of the southeast corner of sec. 24:

Ap—0 to 7 inches; brown (10YR 4/3) silt loam; moderate medium granular structure; friable; common medium roots; 5 percent coarse fragments; neutral; abrupt smooth boundary.

B1—7 to 10 inches; brown (7.5YR 4/4) clay loam; weak fine subangular blocky structure; friable; common medium roots; medium continuous brown (10YR 4/3) coatings on vertical faces of peds; 8 percent coarse fragments; slightly acid; abrupt wavy boundary.

B21t—10 to 17 inches; reddish brown (5YR 4/4) clay loam; moderate medium subangular blocky structure; firm; few fine roots; medium patchy brown (7.5YR 4/4) clay films on horizontal and vertical faces of peds; 12 percent coarse fragments; slightly acid; clear wavy boundary.

B22t—17 to 23 inches; reddish brown (5YR 4/4) clay loam; moderate coarse subangular blocky structure; firm; few fine roots; medium patchy brown (7.5YR 4/4) clay films on horizontal and vertical faces of peds; 12 percent coarse fragments; medium acid; clear wavy boundary.

B23t—23 to 28 inches; brown (7.5YR 4/4) gravelly clay; moderate coarse subangular blocky structure; firm; few fine roots; medium patchy dark brown (7.5YR 4/4) clay films on horizontal and vertical faces of peds; 25 percent coarse fragments; medium acid; clear wavy boundary.

B3—28 to 35 inches; dark brown (7.5YR 4/4) gravelly sandy clay loam; weak coarse subangular blocky structure; friable; few fine roots; brown (10YR 4/3) clay coatings on pebbles and bridging between sand grains; common medium prominent light gray (10YR 7/2) weathered limestone fragments; 22 percent coarse fragments; slight effervescence; mildly alkaline; clear wavy boundary.

IIC1—35 to 45 inches; brown (10YR 4/3) gravelly sand; single grained; loose; 22 percent coarse fragments; strong effervescence; moderately alkaline; gradual wavy boundary.

IIC2—45 to 70 inches; brown (10YR 5/3) gravelly sand; single grained; loose; 22 percent coarse fragments; strong effervescence; moderately alkaline.

Solum thickness and depth to sand and gravel range from 25 to 40 inches. In some places there is up to 20 inches of silty alluvium overlying the loamy outwash. The depth to carbonates ranges from 22 to 34 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3. Reaction ranges from medium acid to neutral. The B horizon has hue of 5YR to 10YR, value of 3 to 5, and chroma of 3 or 4. Textures of subhorizons include clay loam, clay, sandy clay loam, and gravelly analogs of these textures. The B1 horizon is silty clay loam or silty loam in some pedons. Reaction of the B horizon ranges from medium acid in the upper part to mildly alkaline in the lower part. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is gravelly sand or gravelly loamy sand. Reaction is mildly alkaline or moderately alkaline.

Genesee series

The Genesee series consists of deep, well drained, moderately permeable soils formed in alluvium on flood plains. They are subject to occasional flooding. Slope is 0 to 2 percent.

In Franklin County, these soils have more subsoil development than is defined for the Genesee series. This difference, however, does not alter the use or behavior of the soils.

Genesee soils are commonly adjacent to Eel, Medway, and Ross soils and are similar to Ross soils. Eel and Medway soils are wetter than Genesee soils and have mottles closer to the surface. Medway and Ross soils have a mollic epipedon.

Typical pedon of Genesee silt loam, occasionally flooded, in cropland, in Madison Township, T. 11 N., R. 21 W., 2.2 miles north of Groveport, 250 yards south and 1,480 yards east of the northwest corner of sec. 16:

Ap—0 to 9 inches; brown (10YR 4/3) silt loam; moderate medium granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

B21—9 to 16 inches; brown (10YR 4/3) silt loam; weak fine and medium subangular blocky structure; friable; few fine roots; medium continuous very dark grayish brown (10YR 3/2) coatings on horizontal and vertical faces of peds; neutral; clear wavy boundary.

B22—16 to 23 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium subangular blocky structure; friable; few fine roots; medium patchy dark yellowish brown (10YR 3/4) coatings on vertical faces of peds; neutral; clear wavy boundary.

C1—23 to 29 inches; yellowish brown (10YR 5/4) silt loam; massive parting to weak medium subangular blocky structure; friable; few fine roots; medium patchy brown (10YR 4/3) coatings on vertical faces of peds; neutral; gradual wavy boundary.

C2—29 to 37 inches; yellowish brown (10YR 5/4) clay loam; massive parting to weak medium subangular blocky structure; friable; few fine roots; medium patchy dark brown (10YR 3/3) coatings on vertical faces of peds; neutral; clear wavy boundary.

C3—37 to 49 inches; yellowish brown (10YR 5/4) loam; common fine faint yellowish brown (10YR 5/6) and common fine distinct dark grayish brown (10YR 4/2) mottles; massive; friable; few fine prominent very dark grayish brown (10YR 3/2) stains; slight effervescence; mildly alkaline; clear wavy boundary.

C4—49 to 61 inches; yellowish brown (10YR 5/4) loam; common fine faint yellowish brown (10YR 5/6) and common fine distinct dark grayish brown (10YR 4/2) mottles; massive; friable; slight effervescence; mildly alkaline; abrupt wavy boundary.

C5—61 to 70 inches; brown (10YR 4/3) gravelly sandy loam; common fine distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; massive; very friable; 20 percent coarse fragments; slight effervescence; mildly alkaline.

Solum thickness ranges from 20 to 35 inches. Depth to carbonates ranges from 30 to 40 inches.

The Ap horizon has hue of 10YR, value of 4, and chroma of 2 or 3. It is slightly acid or neutral. The B horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It is dominantly loam and silt loam but includes individual horizons of silty clay loam or clay loam. Reaction ranges from slightly acid to moderately alkaline. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. Textures include loam, silt loam, clay loam, sandy loam, and their gravelly analogs. Stratified sand and gravel are below depths of 40 inches in some pedons. Reaction is neutral to moderately alkaline.

Glynwood series

The Glynwood series consists of deep, moderately well drained soils that have slow permeability. These soils formed in high-lime glacial till on uplands. Slope ranges from 2 to 12 percent.

Glynwood soils are similar to Cardington and Celina soils and are commonly adjacent to Blount soils. Compared with Glynwood soils, Cardington soils formed in glacial till with a lower calcium carbonate equivalent and contain significant amounts of sandstone and shale fragments. Celina soils have mixed mineralogy and less clay in the B and C horizons. Blount soils are wetter and are mottled closer to the soil surface.

Typical pedon of Glynwood silt loam, 2 to 6 percent slopes, in meadow, in Washington Township, about 2 miles north-northwest of Dublin, 700 yards north of Brand Road and 60 yards east of Ashbaugh Road:

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam; moderate medium granular structure; friable; many fine roots; 2 percent coarse fragments; neutral; abrupt smooth boundary.

B21t—7 to 11 inches; yellowish brown (10YR 5/4) silty clay loam; weak medium prismatic structure parting to moderate medium subangular blocky; friable; common fine roots; thin very patchy brown (10YR 5/3) clay films on horizontal and vertical faces of peds; thin patchy brown (10YR 5/3) coatings on vertical faces of peds; 2 percent coarse fragments; neutral; clear wavy boundary.

B22t—11 to 15 inches; yellowish brown (10YR 5/4) clay; weak medium prismatic structure parting to moderate medium subangular blocky; firm; common fine roots; medium patchy yellowish brown (10YR 5/4) clay films on horizontal and vertical faces of peds; thin patchy brown (10YR 5/3) coatings on vertical faces of peds; 2 percent coarse fragments; slightly acid; clear wavy boundary.

B23t—15 to 21 inches; dark yellowish brown (10YR 4/4) clay; common medium distinct grayish brown (10YR 5/2) and gray (10YR 5/1) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; medium patchy dark yellowish brown (10YR 4/4) clay films on horizontal and vertical faces of peds; thin patchy yellowish brown (10YR 5/4) coatings on vertical faces of peds; 2 percent coarse fragments; medium acid; gradual wavy boundary.

B3t—21 to 26 inches; dark yellowish brown (10YR 4/4) clay; common medium distinct dark gray (10YR 4/1) and grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; few fine roots; medium patchy dark yellowish brown (10YR 4/4) clay films on horizontal and vertical faces of peds; 2 percent coarse fragments; neutral; clear wavy boundary.

C1—26 to 32 inches; brown (10YR 4/3) clay loam; common medium distinct gray (10YR 5/1) and few fine faint yellowish brown (10YR 5/6) mottles; massive; firm; 5 percent coarse fragments; slight effervescence; mildly alkaline; clear wavy boundary.

C2—32 to 42 inches; yellowish brown (10YR 5/4) clay loam; common medium distinct gray (10YR 5/1) and common medium distinct yellowish brown (10YR 5/6) mottles; massive; firm; 10 percent coarse fragments; strong effervescence; moderately alkaline; gradual wavy boundary.

C3—42 to 70 inches; yellowish brown (10YR 5/4) clay loam; many medium distinct grayish brown (10YR 5/2) and common medium faint yellowish brown (10YR 5/6) mottles; massive; firm; 7 percent coarse fragments; strong effervescence; moderately alkaline.

Solum thickness ranges from 24 to 39 inches. Depth to carbonates ranges from 20 to 36 inches. Coarse fragments generally increase with depth ranging from 1 percent by volume in the Ap horizon to 14 percent in the C horizon. They are mostly limestone and igneous pebbles with some chert fragments. Shale fragments are also common in the lower part of the solum.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. Reaction is medium acid to neutral. The B horizon has hue of 10YR or, rarely, 7.5YR; value of 4 or 5; and chroma of 3 or 4. It is dominantly clay or silty clay with subhorizons of silty clay loam or clay loam. Reaction ranges from strongly acid to neutral in the upper part and slightly acid to mildly alkaline in the lower part. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is dominantly moderately alkaline but has subhorizons that are mildly alkaline in some pedons.

Hennepin series

The Hennepin series consists of deep, well drained, slowly or moderately slowly permeable soils formed in high-lime glacial till on uplands. Slope ranges from 18 to 50 percent.

Hennepin soils are similar to Lewisburg soils, and are commonly adjacent to Celina and Miamian soils. Unlike Hennepin soils, Celina, Lewisburg, and Miamian soils have an argillic horizon. Celina and Miamian soils have a thicker solum and a higher clay content in the subsoil. Celina soils are wetter with mottling in the subsoil. Lewisburg soils also occur on low knolls and ridges.

Typical pedon of Hennepin loam, from an area of Hennepin and Miamian loams, 25 to 50 percent slopes, eroded, in meadow, in Pleasant Township, about 1.5 miles northwest of Darbydale, 900 yards west of Harrisburg-Georgesville Road, 1,700 yards north of State Route 665 bridge over Big Darby Creek:

Ap—0 to 6 inches; dark brown (10YR 3/3) loam; weak medium granular structure; friable; many fine roots; 3 percent coarse fragments; slight effervescence; mildly alkaline; abrupt wavy boundary.

B21—6 to 10 inches; dark yellowish brown (10YR 4/4) clay loam; moderate fine and medium subangular blocky structure; firm; common fine roots; thin continuous dark brown (10YR 3/3) coatings on vertical faces of peds and thin patchy dark brown (10YR 3/3) coatings on horizontal faces of peds; 7 percent coarse fragments; slight effervescence; mildly alkaline; clear wavy boundary.

B22—10 to 14 inches; yellowish brown (10YR 5/4) clay loam; weak fine subangular blocky structure; firm; few fine roots; thin patchy brown (10YR 4/3) coatings on vertical faces of peds; 14 percent coarse fragments; strong effervescence; mildly alkaline; clear wavy boundary.

B3—14 to 18 inches; yellowish brown (10YR 5/4) gravelly clay loam; weak medium subangular blocky structure; firm; few fine roots; thin patchy dark yellowish brown (10YR 4/4) coatings on vertical faces of peds; 20 percent coarse fragments; strong effervescence; mildly alkaline; clear wavy boundary.

C—18 to 70 inches; brown (10YR 5/3) gravelly loam; firm; 20 percent coarse fragments; strong effervescence; moderately alkaline.

Solum thickness ranges from 10 to 20 inches. Depth to carbonates ranges from 1 to 10 inches. Coarse fragments generally increase with depth, ranging from none in the Ap horizon to 20 percent by volume in the C horizon. They are mostly limestone and igneous pebbles with some chert fragments.

The Ap horizon has hue of 10YR, value of 3 to 5, and chroma of 2 or 3. It is neutral or mildly alkaline. The B horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. Textures include clay loam and loam and gravelly analogs. Reaction is neutral or mildly alkaline. The C horizon has hue of 10YR, value of 5, and chroma of 3 or 4. It is loam, gravelly loam, or sandy loam. The reaction is dominantly moderately alkaline but ranges to mildly alkaline.

Kendallville series

The Kendallville series consists of deep, well drained, moderately slowly permeable soils formed in glacial outwash over high-lime glacial till on low kames and uplands. Slope ranges from 0 to 12 percent.

Kendallville soils are similar to Miamian and Ockley soils and are commonly adjacent to Celina and Crosby soils. Celina, Crosby, and Miamian soils formed in glacial till and contain more clay in the subsoil than Kendallville soils. Celina and Crosby soils are also wetter and have mottles in all or part of the subsoil. Ockley soils formed in silty and loamy glacial outwash over stratified sand and gravel.

Typical pedon of Kendallville silt loam, 2 to 6 percent slopes, in cropland, in Madison Township, T. 11 N., R. 21 W., about 1.8 miles southwest of Brice, 430 yards south and 300 yards east of the northwest corner of sec. 11:

Ap—0 to 9 inches; brown (10YR 4/3) silt loam; moderate medium granular structure; friable; many fine roots; 2 percent coarse fragments; neutral; abrupt smooth boundary.

B1—9 to 14 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium subangular blocky structure; friable; common fine roots; thin patchy dark brown (10YR 3/3) coatings on horizontal and vertical faces of peds; 2 percent coarse fragments; slightly acid; clear wavy boundary.

IIB21t—14 to 19 inches; dark brown (7.5YR 4/4) clay loam; moderate medium subangular blocky structure; firm; common fine roots; thin patchy dark brown (7.5YR 4/4) clay films on horizontal and vertical faces of peds; thin patchy brown (10YR 4/3) coatings on horizontal and vertical faces of peds; 5 percent coarse fragments; slightly acid; clear wavy boundary.

IIB22t—19 to 23 inches; dark brown (7.5YR 4/4) clay loam; moderate medium subangular blocky structure; firm; common fine roots; medium patchy dark reddish brown (5YR 3/3) clay films on horizontal and vertical faces of peds; 10 percent coarse fragments; medium acid; clear wavy boundary.

IIB23t—23 to 27 inches; dark brown (7.5YR 4/4) gravelly clay loam; moderate medium subangular blocky structure; firm; few fine roots; medium patchy dark brown (7.5YR 4/4) clay films on horizontal and vertical faces of peds; 18 percent coarse fragments; medium acid; abrupt wavy boundary.

IIIB24t—27 to 33 inches; dark yellowish brown (10YR 4/4) clay loam; moderate medium subangular blocky structure; firm; few fine roots; medium patchy brown (10YR 4/3) clay films on horizontal and vertical faces of peds; 8 percent coarse fragments; slightly acid; gradual wavy boundary.

IIIB3—33 to 38 inches; brown (10YR 4/3) clay loam; weak coarse subangular blocky structure; firm; few fine roots; medium very patchy brown (10YR 4/3) clay films on vertical faces of peds; 8 percent coarse fragments; neutral; clear wavy boundary.

IIIC1—38 to 51 inches; brown (10YR 4/3) clay loam; few fine distinct grayish brown (10YR 5/2) mottles; massive; very firm; 10 percent coarse fragments; slight effervescence; mildly alkaline; gradual wavy boundary.

IIIC2—51 to 63 inches; brown (10YR 4/3) clay loam; few fine distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; massive; very firm; 10 percent coarse fragments; strong effervescence; moderately alkaline; gradual wavy boundary.

IIIC3—63 to 70 inches; yellowish brown (10YR 5/4) loam; common medium distinct gray (10YR 6/1) and yellowish brown (10YR 5/8) mottles; massive; very firm; 12 percent coarse fragments; strong effervescence; moderately alkaline.

Solum thickness and depth to carbonates ranges from 33 to 40 inches. Coarse fragments generally increase with depth, ranging from none to 20 percent in the outwash and from 5 to 14 percent in the glacial till. They are mostly limestone and igneous pebbles with some chert fragments.

The Ap horizon has hue of 10YR, value of 4, and chroma of 2 or 3. Reaction is slightly acid or neutral. The B horizon has hue of 10YR or 7.5YR, value of 4 or 5, chroma of 3 or 4. It is dominantly clay loam, silty clay loam, or gravelly clay loam but includes individual subhorizons of silt loam and clay. Reaction ranges from medium acid to mildly alkaline. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is mildly alkaline or moderately alkaline.

Kokomo series

The Kokomo series consists of deep, very poorly drained, moderately slowly permeable soils formed in high-lime Wisconsin age glacial till on uplands. Slope is 0 to 2 percent.

Kokomo soils are similar to Pewamo soils and are commonly adjacent to Celina, Crosby, and Lewisburg soils on higher landscape positions. Pewamo soils have a thinner mollic epipedon than Kokomo soils and contain more clay in the subsoil and substratum. Celina, Crosby, and Lewisburg soils are better drained and have a lighter colored surface layer.

Typical pedon of Kokomo silty clay loam, in meadow, in Norwich Township, 3.2 miles south of Hilliard, 230 yards north of Renner Road, 265 yards east of Spindler Road:

Ap—0 to 9 inches; very dark gray (10YR 3/1) silty clay loam; moderate medium granular structure; friable;

common medium roots; 2 percent coarse fragments; neutral; abrupt smooth boundary.

A12—9 to 16 inches; very dark gray (10YR 3/1) silty clay loam; moderate fine and medium subangular blocky structure; firm; few fine roots; medium patchy black (10YR 2/1) coatings on horizontal and vertical faces of peds; 2 percent coarse fragments; neutral; clear wavy boundary.

B21tg—16 to 20 inches; dark gray (10YR 4/1) silty clay; few medium distinct dark yellowish brown (10YR 4/4) mottles; strong medium subangular blocky structure; firm; few fine roots; medium patchy very dark gray (5YR 3/1) and dark gray (5YR 4/1) clay films on horizontal and vertical faces of peds; 2 percent coarse fragments; neutral; clear wavy boundary.

B22tg—20 to 25 inches; dark gray (10YR 4/1) silty clay; common medium distinct yellowish brown (10YR 5/4 and 5/6) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; medium patchy dark grayish brown (2.5Y 4/2) and dark gray (10YR 4/1) clay films on horizontal and vertical faces of peds; 2 percent coarse fragments; neutral; gradual wavy boundary.

B23tg—25 to 31 inches; dark gray (10YR 4/1) silty clay loam; common medium distinct brown (10YR 5/3) and yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; medium continuous dark grayish brown (10YR 4/2) clay films on vertical faces of peds and medium patchy dark grayish brown (10YR 4/2) clay films on horizontal faces of peds; 2 percent coarse fragments; neutral; gradual wavy boundary.

B24tg—31 to 36 inches; dark gray (10YR 4/1) silty clay loam; common medium distinct brown (10YR 5/3) and yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; medium patchy dark grayish brown (10YR 4/2) clay films on horizontal and vertical faces of peds; 5 percent coarse fragments; neutral; clear wavy boundary.

B3—36 to 43 inches; dark gray (10YR 4/1) clay loam; many medium distinct yellowish brown (10YR 5/4) mottles; weak medium and coarse subangular blocky structure; firm; 5 percent coarse fragments; neutral; abrupt wavy boundary.

C1—43 to 50 inches; brown (10YR 5/3) clay loam; common medium faint yellowish brown (10YR 5/4) and common medium distinct gray (10YR 5/1) mottles; massive; firm; common fine prominent light gray (10YR 7/2) weathered limestone pebbles; 10 percent coarse fragments; slight effervescence; mildly alkaline; clear wavy boundary.

C2—50 to 59 inches; brown (10YR 5/3) clay loam; common medium distinct gray (10YR 5/1) mottles; massive; firm; 14 percent coarse fragments; slight effervescence; mildly alkaline; gradual wavy boundary.

C3—59 to 70 inches; yellowish brown (10YR 5/4) loam; common medium distinct gray (10YR 5/1) mottles; massive; firm; 14 percent coarse fragments; strong effervescence; moderately alkaline.

Solum thickness ranges from 36 to 60 inches. Depth to carbonates ranges from 30 to more than 60 inches. Thickness of the mollic epipedon ranges from 14 to 18 inches. Coarse fragments, mostly of igneous rock, limestone, and chert fragments, commonly increase in size and number with depth, ranging from none in the Ap horizon to 15 percent by volume in the C horizon.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The B horizon below the mollic epipedon has hue of 10YR to 5Y, value of 4 or 5, and chroma of 0 to 2. It is dominantly silty clay loam or clay loam but includes individual subhorizons of silty clay or clay. The C horizon has hue of 10YR or 2.5Y, value of 5, and chroma of 2 to 4. Reaction is mildly alkaline or moderately alkaline.

Lewisburg series

The Lewisburg series consists of deep, moderately well drained soils formed in high-lime till on uplands. Permeability is moderate or moderately slow in the subsoil and slow in the substratum. Slope ranges from 2 to 6 percent.

Lewisburg soils are similar to Hennepin and Miamian soils and are commonly adjacent to Crosby and Kokomo soils. Hennepin soils are steeper than Lewisburg soils and do not have an argillic horizon. Crosby and Miamian soils have a thicker solum. Crosby and Kokomo soils are wetter and are mottled immediately below the A horizon. Kokomo soils have a mollic epipedon.

Typical pedon of Lewisburg silt loam from an area of Lewisburg-Crosby complex, 2 to 6 percent slopes, in meadow, in Norwich Township, about 3 miles south of Hilliard, 120 yards north of Renner Road, 300 yards east of Spindler Road:

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam; moderate fine granular structure; friable; many roots; 1 percent coarse fragments; neutral; abrupt smooth boundary.

B21t—6 to 8 inches; brown (10YR 4/3) silty clay loam; strong medium subangular blocky structure; firm; many roots; medium very patchy dark brown (10YR 3/3) clay films on vertical faces of peds; thin continuous dark grayish brown (10YR 4/2) coatings on horizontal and vertical faces of peds; 1 percent coarse fragments; neutral; abrupt wavy boundary.

B22t—8 to 11 inches; brown (7.5YR 4/4) silty clay loam; moderate medium subangular blocky structure; firm;

common roots; medium continuous dark brown (10YR 3/3) clay films on vertical and horizontal faces of peds; 5 percent coarse fragments; neutral; abrupt wavy boundary.

B3t—11 to 16 inches; dark yellowish brown (10YR 4/4) silty clay loam; weak coarse subangular blocky structure; firm; few roots; medium patchy brown (10YR 4/3) clay films on horizontal and vertical faces of peds; common fine prominent light gray (10YR 7/2) weathered limestone fragments; 10 percent coarse fragments; slight effervescence; mildly alkaline; clear wavy boundary.

C1—16 to 26 inches; yellowish brown (10YR 5/4) loam; weak coarse subangular blocky structure; firm; few roots; thin very patchy brown (10YR 4/3) clay films on vertical faces of peds; 10 percent coarse fragments; strong effervescence; moderately alkaline; gradual wavy boundary.

C2—26 to 36 inches; brown (10YR 5/3) loam; few medium distinct gray (10YR 5/1) and yellowish brown (10YR 5/6) mottles; massive; firm; light gray (10YR 6/1) vertical streaks in the matrix; 14 percent coarse fragments; strong effervescence; moderately alkaline; diffuse boundary.

C3—36 to 70 inches; brown (10YR 5/3) loam; few medium distinct gray (10YR 5/1) and yellowish brown (10YR 5/6) mottles; massive; firm; light gray (10YR 6/1) vertical streaks in the matrix; 14 percent coarse fragments; strong effervescence; moderately alkaline.

The solum thickness ranges from 14 to 22 inches. Depth to carbonates ranges from 11 to 18 inches. Coarse fragments are mostly igneous and limestone.

The Ap horizon has hue of 10YR, value of 4, and chroma of 2 or 3. It is slightly acid or neutral. The B horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. Mottles with chroma of 2 or less occur at depths of 16 to 20 inches in some pedons. The B horizon is silty clay loam, clay loam, or silty clay with thin subhorizons of gravelly analogs in the lower part of some pedons. Reaction ranges from slightly acid to mildly alkaline. The C horizon has hue of 10YR, value of 5, and chroma of 3 or 4. It is loam or silt loam with individual subhorizons of clay loam and gravelly loam in some pedons. Reaction is mildly alkaline or moderately alkaline.

Medway series

The Medway series consists of deep, moderately well drained, moderately permeable soils formed in alluvium eroded from uplands and terraces. They are on flood plains and are subject to occasional flooding. Slope is 0 to 2 percent.

Medway soils are commonly adjacent to Algiers, Crane, Eel, Genesee, Ross, and Sloan soils. Unlike Medway soils, Algiers, Eel, and Genesee soils have an ochric epipedon. Crane soils have an argillic horizon. Ross soils have a thicker mollic epipedon and no low-chroma mottles in the upper part of the solum. Sloan soils are wetter and are dominantly gray in the subsoil.

Typical pedon of Medway silt loam, occasionally flooded, in cultivated field, in Jefferson Township, T. 1 N., R. 16 W., about 1/2 mile north of Blacklick, 1,520 yards south and 1,030 yards east of the northwest corner of sec. 4:

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam; moderate medium granular structure; friable; common roots; slightly acid; abrupt smooth boundary.

A3—7 to 15 inches; very dark grayish brown (10YR 3/2) silt loam; weak medium prismatic structure parting to weak medium subangular blocky; friable; few roots; thin patchy very dark grayish brown (10YR 3/2) coatings on vertical faces of peds; neutral; abrupt wavy boundary.

B21—15 to 21 inches; very dark gray (10YR 3/1) silt loam; weak medium prismatic structure parting to moderate fine subangular blocky; firm; few roots; thin patchy very dark grayish brown (10YR 3/2) coatings on vertical faces of peds; neutral; clear wavy boundary.

B22—21 to 30 inches; brown (10YR 4/3) loam; common medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure parting to weak coarse subangular blocky; firm; few roots; neutral; clear wavy boundary.

B3—30 to 39 inches; dark grayish brown (10YR 4/2) sandy loam; common medium distinct dark gray (10YR 4/1) and yellowish brown (10YR 5/6) mottles; massive; firm; few roots; dark grayish brown (10YR 4/2) coatings in worm channels; 8 percent coarse fragments; neutral; clear wavy boundary.

C—39 to 70 inches; grayish brown (10YR 5/2) gravelly sandy loam; common medium distinct yellowish brown (10YR 5/6) mottles; massive; very friable; 40 percent coarse fragments; strong effervescence; mildly alkaline.

Solum thickness ranges from 30 to 46 inches. Depth to carbonates ranges from 23 to 46 inches. Thickness of the mollic epipedon ranges from 14 to 24 inches.

The Ap horizon has hue of 10YR and value and chroma of 2 or 3. It is slightly acid to mildly alkaline. The upper part of the B horizon has hue of 10YR, value of 3 or 4, and chroma of 1 to 3. It is silt loam or loam and slightly acid to mildly alkaline. The lower part of the B horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It is sandy loam or loam and slightly acid to moderately alkaline. Thin sandy or gravelly lenses occur in some pedons. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is sandy loam, silt loam, loam, sand, and their gravelly analogs. Reaction ranges from neutral to moderately alkaline.

Miamian series

The Miamian series consists of deep, well drained, moderately slowly permeable soils formed in high-lime glacial till on uplands. Slope ranges from 2 to 50 percent.

Miamian soils are similar to Alexandria and Lewisburg soils and are commonly adjacent to Celina, Hennepin, and Milton soils. Compared with Miamian soils, Alexandria soils formed in glacial till with a lower calcium carbonate equivalent and have a significant proportion of sandstone and shale fragments. Alexandria soils have illitic mineralogy. Lewisburg and Hennepin soils have a thinner solum, and Hennepin soils do not have an argillic horizon. Celina soils are wetter and have low-chroma mottles in the upper part of the argillic horizon. Milton soils are moderately deep to limestone bedrock.

Typical pedon of Miamian silty clay loam, 6 to 12 percent slopes, eroded, in meadow, in Pleasant Township, about 4.5 miles south-southeast of Galloway, 200 yards west of Norton Road, 200 yards south of Johnson Road:

Ap—0 to 9 inches; brown (10YR 4/3) silty clay loam; moderate medium granular structure; friable; many fine roots; 3 percent coarse fragments; slightly acid; abrupt smooth boundary.

B21t—9 to 14 inches; dark yellowish brown (10YR 4/4) clay loam; weak medium prismatic structure parting to weak medium subangular blocky; firm; common fine roots; medium brown (10YR 4/3) clay films that are continuous on vertical faces of peds and patchy on horizontal faces; 3 percent coarse fragments; neutral; gradual wavy boundary.

B22t—14 to 20 inches; yellowish brown (10YR 5/4) clay loam; moderate medium prismatic structure parting to moderate medium subangular blocky; very firm; few fine roots; brown (10YR 4/3) clay films that are medium continuous on vertical faces of peds and thin patchy on horizontal faces of peds; 5 percent coarse fragments; neutral; clear wavy boundary.

B3t—20 to 25 inches; yellowish brown (10YR 5/4) clay loam; weak coarse prismatic structure parting to weak coarse subangular blocky; very firm; few fine roots; medium patchy brown (10YR 4/3) clay films on vertical faces of peds; common fine and medium prominent light gray (10YR 7/2) weathered limestone fragments; 8 percent coarse fragments; slight effervescence; mildly alkaline; clear wavy boundary.

C1—25 to 36 inches; yellowish brown (10YR 5/4) clay loam; few fine distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/8) mottles; massive; very firm; 12 percent coarse fragments; strong effervescence; moderately alkaline; clear wavy boundary.

C2—36 to 70 inches; yellowish brown (10YR 5/4) loam; common medium distinct yellowish brown (10YR 5/8) mottles; massive; firm; 12 percent coarse fragments; strong effervescence; moderately alkaline.

Solum thickness ranges from 19 to 39 inches. Depth to carbonates ranges from 19 to 32 inches. Coarse fragments generally increase with depth ranging from none in the Ap horizon to 13 percent by volume in the C horizon. They are mostly limestone and igneous pebbles with some chert fragments.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is silt loam, loam, silty clay loam, or clay loam. Reaction ranges from medium acid to neutral. The B horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. Textures include silty clay loam, clay loam, and clay. Reaction ranges from slightly acid in the upper part to mildly alkaline in the lower part. The C horizon has hue of 10YR, value of 5, and chroma of 3 or 4. It is dominantly moderately alkaline but ranges to mildly alkaline.

Milton series

The Milton series consists of moderately deep, well drained soils that have moderate or moderately slow permeability. These soils formed in high-lime glacial till and weathered limestone bedrock on uplands. Slope ranges from 2 to 12 percent.

Milton soils are commonly adjacent to Glynwood, Miamian, and Ritchey soils and are similar to Miamian soils. Glynwood and Miamian soils are deep to bedrock, and Ritchey soils are shallow to bedrock.

Typical pedon of Milton silt loam, 2 to 6 percent slopes, in cropland, in Washington Township, about 1 mile south of Dublin, 300 yards north of Rings Road and 200 yards west of Dublin Road:

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam; moderate medium granular structure; friable; many fine roots; 2 percent coarse fragments; slightly acid; abrupt smooth boundary.

B1—9 to 14 inches; brown (10YR 4/3) silty clay loam; weak medium subangular blocky structure; friable; common fine roots; thin patchy dark brown (7.5YR 3/2) coatings on horizontal and vertical faces of peds; 2 percent coarse fragments; slightly acid; clear wavy boundary.

B21t—14 to 20 inches; dark brown (7.5YR 4/4) silty clay loam; moderate medium subangular blocky structure; firm; few fine roots; medium continuous dark reddish brown (5YR 3/3) clay films on horizontal and vertical faces of peds; 8 percent coarse fragments; slightly acid; clear wavy boundary.

IIB22t—20 to 27 inches; dark reddish brown (5YR 3/4) clay; moderate medium subangular blocky structure; firm; few fine roots; medium continuous dark reddish brown (5YR 3/3) clay films on horizontal and vertical faces of peds; 10 percent coarse fragments; slightly acid; abrupt irregular boundary.

IIB3—27 to 31 inches; reddish brown (5YR 4/4) channery clay; weak coarse subangular blocky structure; firm; thin very patchy dark brown (7.5YR 3/2) clay films on vertical faces of peds; 20 percent coarse fragments; slightly acid; abrupt irregular boundary.

IIIR—31 inches; limestone bedrock.

Solum thickness and depth to bedrock ranges from 25 to 40 inches. Depth to carbonates ranges from 22 to 40 inches. Coarse fragments generally increase with depth ranging from 1 percent in the Ap horizon to 25 percent by volume in the C horizon. They are mostly igneous and limestone pebbles in the horizons formed in till and flat limestone fragments in the horizons formed in residuum from limestone.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is slightly acid to neutral. The B horizon has hue of 10YR to 5YR, value of 3 to 5, and chroma of 3 or 4. It is silty clay loam, clay loam, silty clay, or clay with channery analogs in the lower part of most pedons. Reaction ranges from medium acid to neutral. The C horizon, where present, has hue or 10YR, value of 5 or 6, and chroma of 3 or 4. It is loam or clay loam. The reaction is mildly alkaline or moderately alkaline.

Mitiwanga series

The Mitiwanga series consists of moderately deep, somewhat poorly drained, moderately permeable soils. These soils formed in medium-lime glacial till and weathered sandstone and shale bedrock on uplands. Slope ranges from 2 to 6 percent.

Mitiwanga soils are similar to Bennington soils and are commonly adjacent to Alexandria, Bennington, and Condit soils. All of these soils are deep over bedrock. Bennington soils have illitic mineralogy and fewer coarse fragments in the lower part of the B horizon than the Mitiwanga soils. Alexandria soils are better drained, have no mottles in the upper part of the solum, and are commonly steeper. Condit soils are wetter and are grayer in the subsoil.

Typical pedon of Mitiwanga silt loam, 2 to 6 percent slopes, in cropland, in Blendon Township, T. 2 N., R. 17 W., 5 miles northeast of New Albany, 3,230 yards north and 780 yards west of the southeast corner of sec. 1:

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam; moderate medium granular structure; friable; many fine roots; 2 percent coarse fragments; neutral; abrupt smooth boundary.

B&A—7 to 11 inches; 70 percent yellowish brown (10YR 5/4) (B2t) and 30 percent grayish brown (10YR 5/2)(A2) silty clay loam; common fine distinct light brownish gray (10YR 6/2) and yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; common fine roots; thin patchy brown (10YR 5/3) coatings on vertical faces of peds; 2 percent coarse fragments; medium acid; clear wavy boundary.

B21t—11 to 15 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct gray (10YR 6/1) and common medium faint yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; very firm; common fine roots; thin grayish brown (10YR 5/2) clay films that are patchy on horizontal and continuous on vertical faces of peds; common medium distinct black (10YR 2/1) iron and manganese stains; 5 percent coarse fragments; very strongly acid; clear wavy boundary.

B22t—15 to 21 inches; yellowish brown (10YR 5/4) clay loam; many medium distinct gray (10YR 6/1) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; very firm; few fine roots; medium dark grayish brown (10YR 4/2) clay films that are patchy on horizontal and continuous on vertical faces of peds; 8 percent coarse fragments; strongly acid; gradual wavy boundary.

B23t—21 to 26 inches; brown (10YR 4/3) clay loam; common medium distinct gray (10YR 5/1) and yellowish brown (10YR 5/6) mottles; moderate medium and coarse subangular blocky structure; very firm; few fine roots; medium patchy dark grayish brown (10YR 4/2) and very dark grayish brown (10YR 3/2) clay films on horizontal and vertical faces of peds; 10 percent coarse fragments; medium acid; clear wavy boundary.

IIB3—26 to 31 inches; brown (10YR 5/3) channery clay loam; common medium distinct gray (10YR 5/1) and yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; 25 percent coarse fragments; slightly acid; gradual wavy boundary.

IIC—31 to 35 inches; dark yellowish brown (10YR 4/4) channery clay loam; common medium distinct brown (10YR 5/3) mottles; thick platy structure breaking to blocky fragments; firm; 40 percent soil material in cracks; slightly acid; abrupt smooth boundary.

IIR—35 inches; light brownish gray (10YR 6/2) fine-grained sandstone bedrock.

Solum thickness ranges from 26 to 40 inches. Depth to bedrock ranges from 29 to 40 inches. Coarse fragments occur throughout the solum and commonly are more than 15 percent by volume in the lower part. They are usually sandstone, limestone, shale, and igneous pebbles in the upper part of the solum and sandstone and shale fragments in the lower part.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2. It is slightly acid or neutral, where limed. The B horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. Texture is silty clay loam or clay loam and includes channery or gravelly analogs in the lower part. Reaction ranges from very strongly acid in the upper part to slightly acid in the lower part. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. Texture is clay loam or loam and their channery analogs.

Montgomery series

The Montgomery series consists of deep, very poorly drained soils that have slow or very slow permeability. These soils formed in lacustrine deposits on flat or depressional areas in slack water basins. Slope is 0 to 2 percent.

Montgomery soils are commonly adjacent to Algiers, Crosby, and Sleeth soils that have an ochric epipedon. Algiers soils formed in recent alluvium over a buried soil. Crosby soils formed in glacial till on uplands, and Sleeth soils formed mainly in glacial outwash on terraces.

Typical pedon of Montgomery silty clay loam, in meadow, in Prairie Township, about 1/2 mile south of Alton, 150 yards west of Alton Road, 750 yards south of U.S. Route 40:

Ap—0 to 8 inches; very dark gray (10YR 3/1) silty clay loam; moderate fine subangular blocky structure; friable; common fine roots; mildly alkaline; abrupt smooth boundary.

B1—8 to 12 inches; very dark gray (10YR 3/1) silty clay loam; moderate fine angular blocky structure; friable; few fine roots; thin continuous black (10YR 2/1) coatings on horizontal and vertical faces of peds; mildly alkaline; clear wavy boundary.

B21—12 to 18 inches; very dark gray (10YR 3/1) silty clay; few fine distinct olive brown (2.5Y 4/4) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; firm; few fine roots; thin continuous black (10YR 2/1) coatings on horizontal and vertical faces of peds; mildly alkaline; clear wavy boundary.

B22g—18 to 26 inches; dark gray (N 4/0) silty clay; common fine distinct light olive brown (2.5Y 5/4) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; firm; few fine roots; thin patchy dark gray (N 4/0) coatings on vertical faces of peds; mildly alkaline; abrupt wavy boundary.

B23g—26 to 34 inches; gray (5Y 5/1) silty clay; few fine distinct light olive brown (2.5Y 5/4) mottles; firm; few fine roots; thin patchy gray (5Y 5/1) coatings on vertical faces of peds; few fine prominent black (10YR 2/1) stains; mildly alkaline; gradual wavy boundary.

B3g—34 to 43 inches; gray (5Y 5/1) silty clay loam; common medium prominent light olive brown (2.5Y 5/6) mottles; weak coarse prismatic structure parting to weak coarse subangular blocky; firm; few fine roots; thin patchy gray (10YR 5/1) coatings on vertical faces of peds; mildly alkaline; gradual wavy boundary.

C1g—43 to 55 inches; gray (5Y 5/1) silty clay loam; common medium prominent light olive brown (2.5Y 5/6) mottles; weak coarse prismatic structure parting to weak coarse subangular blocky; firm; slight effervescence; mildly alkaline; clear wavy boundary.

C2g—55 to 70 inches; gray (5Y 5/1) silty clay loam; common medium distinct light olive brown (2.5Y 5/4) mottles; massive; firm; 3 percent coarse fragments; slight effervescence; mildly alkaline.

Solum thickness ranges from 34 to 48 inches. Thickness of the mollic epipedon ranges from 12 to 24 inches. Depth to carbonates ranges from 22 to 48 inches.

The Ap horizon has hue of 10YR, value of 3, and chroma of 1 or 2. Reaction where limed is neutral or mildly alkaline. The B horizon has hue of 10YR to 5Y or is neutral, value of 2 to 5, and chroma of 0 to 2. Reaction is neutral or mildly alkaline in the upper part and mildly alkaline in the lower part. The C horizon has hue of 10YR to 5Y, value of 4 or 5, and chroma of 1 or 2. It is silty clay loam or clay in the upper part and silt loam in the lower part. Coarse fragments range from none to 5 percent by volume. Reaction is mildly alkaline or moderately alkaline.

Ockley series

The Ockley series consists of deep, well drained soils that have moderate over very rapid permeability. These soils formed in silty and loamy glacial outwash or loess over stratified sand and gravel on stream terraces, outwash plains, and a few kames. Slope ranges from 0 to 12 percent.

Ockley soils are similar to Eldean and Kendallville soils and are commonly adjacent to Crane, Eldean, Thackery, Warsaw, and Wea soils. Eldean and Warsaw soils are shallower over sand and gravel than Ockley soils, and Eldean soils have a higher clay content in the argillic horizon. Kendallville soils formed in glacial outwash over glacial till. Crane, Warsaw, and Wea soils have a mollic epipedon. Crane and Thackery soils are wetter and mottled closer to the surface.

Typical pedon of Ockley silt loam, 2 to 6 percent slopes, in cropland, in Madison Township, T. 11 N., R. 21 W., about 2 miles north of Groveport, 660 yards south and 1,050 yards east of the northwest corner of sec. 16:

Ap—0 to 8 inches; brown (10YR 4/3) silt loam; moderate medium granular structure; friable; common fine roots; 3 percent coarse fragments; medium acid; abrupt smooth boundary.

A2—8 to 14 inches; brown (10YR 4/3) silt loam; weak medium subangular blocky structure; friable; few fine roots; 3 percent coarse fragments; slightly acid; abrupt wavy boundary.

B21t—14 to 19 inches; brown (7.5YR 4/4) clay loam; weak medium subangular blocky structure; firm; few fine roots; thin very patchy dark brown (10YR 3/3) clay films on horizontal and vertical faces of peds; 5 percent coarse fragments; medium acid; clear wavy boundary.

B22t—19 to 24 inches; reddish brown (5YR 4/4) clay loam; moderate medium subangular blocky structure; firm; few fine roots; thin very patchy dark reddish brown (5YR 3/3) clay films on horizontal and vertical faces of peds; 12 percent coarse fragments; medium acid; clear wavy boundary.

B23t—24 to 30 inches; reddish brown (5YR 4/4) clay loam; moderate medium subangular blocky structure; firm, few fine roots; thin patchy dark reddish brown (5YR 3/2) clay films on horizontal and vertical faces of peds; 12 percent coarse fragments; medium acid; clear wavy boundary.

B24t—30 to 35 inches; brown (7.5YR 4/4) clay loam; moderate medium subangular blocky structure; firm; few fine roots; thin patchy dark reddish brown (5YR 3/2) clay films on horizontal and vertical faces of peds; 8 percent coarse fragments; slightly acid; gradual wavy boundary.

B25t—35 to 41 inches; brown (7.5YR 4/4) clay loam; weak coarse subangular blocky structure; firm; thin very patchy dark brown (7.5YR 3/2) clay films on vertical and horizontal faces of peds; 8 percent coarse fragments; neutral; clear wavy boundary.

B3—41 to 52 inches; dark reddish brown (5YR 3/3) gravelly sandy clay loam; common coarse faint dark brown (7.5YR 3/2) mottles; massive; friable; 16 percent coarse fragments; neutral; clear wavy boundary.

IIC—52 to 70 inches; brown (10YR 4/3) gravelly loamy sand; single grained; loose; 40 percent coarse fragments; slight effervescence; moderately alkaline.

Solum thickness ranges from 40 to 60 inches and is commonly the same as the depth to sand and gravel. In some places there is up to 27 inches of silty alluvium overlying the loamy outwash. The depth to carbonates ranges from 38 to 60 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3. Reaction is medium acid or slightly acid. The B horizon has hue of 5YR to 10YR, value of 3 to 5, and chroma of 3 to 6. Textures dominantly include silt loam, silty clay loam, and clay loam with individual subhorizons of clay in the upper part of the B horizon. Textures of the lower B horizon dominantly include silty clay loam, clay loam, sandy clay loam and gravelly analogs of these textures with individual subhorizons of clay. Reaction of the B horizon ranges from medium acid or strongly acid in the upper part to neutral in the lower part. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. Textures include sand, loamy sand, sandy loam, and their gravelly analogs. Reaction is mildly alkaline or moderately alkaline.

Pewamo series

The Pewamo series consists of deep, very poorly drained soils that have moderately slow permeability. These soils formed in glacial till on uplands. Slope is 0 to 2 percent.

Pewamo soils are similar to Kokomo soils and are commonly adjacent to Bennington, Cardington, and Condit soils. Kokomo soils have a thicker mollic epipedon than Pewamo soils and less clay in the upper part of the B horizon and in the C horizon. Bennington, Cardington, and Condit soils are better drained and have a lighter colored surface layer.

Typical pedon of Pewamo silty clay loam, in meadow, in Plain Township, T. 2 N., R. 16 W., about 2.5 miles northeast of New Albany, 750 yards north and 120 yards east of the southwest corner of sec. 10:

Ap—0 to 8 inches; very dark gray (10YR 3/1) silty clay loam; moderate medium granular structure; friable; common fine and medium roots; 1 percent coarse fragments; slightly acid; abrupt smooth boundary.

A3—8 to 13 inches; very dark gray (10YR 3/1) silty clay loam; moderate medium subangular blocky structure; friable; common fine roots; thin patchy black (10YR 2/1) coatings on vertical faces of peds; 3 percent coarse fragments; slightly acid; clear wavy boundary.

B21tg—13 to 18 inches; dark gray (10YR 4/1) silty clay; common medium distinct yellowish brown (10YR 5/4) and gray (10YR 6/1) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; medium patchy dark gray (10YR 4/1) and grayish brown (10YR 5/2) clay films on horizontal and vertical faces of peds and medium patchy black (10YR 2/1) clay films on vertical faces of peds; 3 percent coarse fragments; slightly acid; clear wavy boundary.

B22tg—18 to 28 inches; gray (10YR 5/1) clay; common medium distinct dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6) mottles; moderate coarse prismatic structure parting to moderate medium subangular blocky; very firm; few fine roots; medium continuous very dark gray (10YR 3/1) clay films on vertical faces of peds and medium patchy gray (5Y 5/1) clay films on horizontal and vertical faces of peds; 3 percent coarse fragments; slightly acid; clear wavy boundary.

B23tg—28 to 36 inches; gray (10YR 5/1) clay; many medium distinct yellowish brown (10YR 5/4 and 10YR 5/8) mottles; moderate coarse prismatic structure parting to moderate coarse subangular blocky; very firm; few fine roots; medium patchy gray (10YR

5/1) and dark gray (10YR 4/1) clay films on horizontal and vertical faces of peds; 5 percent coarse fragments; neutral; gradual wavy boundary.

B24tg—36 to 44 inches; gray (10YR 5/1) clay; common medium distinct dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; very firm; medium patchy gray (10YR 5/1) and grayish brown (10YR 5/2) clay films on horizontal and vertical faces of peds; 5 percent coarse fragments; neutral; gradual wavy boundary.

B3g—44 to 50 inches; gray (10YR 5/1) clay loam; common medium distinct dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; very firm; medium very patchy dark gray (10YR 4/1) clay films on horizontal and vertical faces of peds; 5 percent coarse fragments; neutral; gradual wavy boundary.

C1—50 to 62 inches; brown (10YR 4/3) clay loam; common medium distinct gray (10YR 5/1) and common medium faint yellowish brown (10YR 5/4) mottles; massive; very firm; 10 percent coarse fragments; mildly alkaline; clear wavy boundary.

C2—62 to 70 inches; brown (10YR 4/3) loam; few fine faint yellowish brown (10YR 5/4) mottles; massive; firm; common light gray (10YR 7/2) weathered limestone fragments; 14 percent coarse fragments; strong effervescence; moderately alkaline.

Solum thickness ranges from 46 to 65 inches. Thickness of the mollic epipedon ranges from 11 to 14 inches. Depth to carbonates ranges from 40 to 70 inches. Coarse fragments of dominantly sandstone, limestone, igneous, and shale commonly increase in size and amount with depth. They range from 1 to 14 percent by volume.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The B horizon has hue of 10YR to 5Y, value of 4 or 5, and chroma of 1 or 2. Texture is silty clay loam, clay loam, silty clay, or clay. Reaction increases with depth and ranges from slightly acid in the upper part to mildly alkaline in the lower part. The C horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 to 4. It is dominantly mildly alkaline but ranges to moderately alkaline.

Ritchey series

The Ritchey series consists of shallow, well drained, moderately permeable soils. These soils formed in high-lime till and weathered limestone bedrock. Slope ranges from 2 to 18 percent.

In Franklin County, these soils have a higher clay content in the subsoil than is defined for the Ritchey series. This difference, however, does not significantly alter the use or behavior of the soils.

Ritchey soils are commonly adjacent to Glynwood and Milton soils. Glynwood soils are deep to bedrock, and Milton soils are moderately deep.

Typical pedon of Ritchey silt loam, 2 to 6 percent slopes, in meadow, in Washington Township, about 4 miles northeast of Hilliard, 40 yards south of Tuttle Road, 50 yards west of Dublin Road:

Ap—0 to 7 inches; brown (10YR 4/3) silt loam; moderate medium granular structure; friable; many medium roots; 5 percent coarse fragments; medium acid; abrupt smooth boundary.

B1—7 to 11 inches; brown (7.5YR 4/4) silt loam; moderate medium subangular blocky structure; friable; many fine roots; thin continuous dark brown (10YR 3/3) coatings on horizontal and vertical faces of peds; 5 percent coarse fragments; slightly acid; abrupt wavy boundary.

IIB2t—11 to 16 inches; reddish brown (5YR 4/3) clay loam; strong fine subangular blocky structure; firm; common roots; thin continuous dark brown (7.5YR 3/2) clay films on horizontal and vertical faces of peds; 10 percent coarse fragments; neutral; abrupt smooth boundary.

IIB3t—16 to 17 inches; brown (7.5YR 4/4) clay loam; weak medium subangular blocky structure; firm; common roots; thin patchy dark brown (7.5YR 3/2) clay films on horizontal and vertical faces of peds; 10 percent coarse fragments; neutral; abrupt smooth boundary.

IIR—17 inches; limestone bedrock.

The solum thickness ranges from 12 to 19 inches. Depth to carbonates ranges from 8 to 19 inches. Coarse fragments generally increase with depth ranging from none in the Ap horizon to 14 percent by volume in the lower part of the solum. They are mostly igneous and limestone pebbles in the horizons formed in till and chert and limestone fragments in horizons formed in weathered limestone.

The Ap horizon has hue of 10YR, value of 4, and chroma of 2 or 3. It is medium acid to neutral. The B horizon has hue of 5YR to 10YR, value of 3 to 5, and chroma of 3 or 4. It is silt loam, silty clay loam, clay loam, or clay. Reaction ranges from slightly acid in the upper part to mildly alkaline in the lower part.

Ross series

The Ross series consists of deep, well drained, moderately permeable soils on flood plains. These soils formed in alluvium and outwash and are subject to occasional flooding. Slope is 0 to 2 percent.

Ross soils are similar to Wea soils and are commonly adjacent to Genesee and Medway soils. Wea soils formed in glacial outwash and have an argillic horizon. Genesee soils have an ochric epipedon. Medway soils are wetter than Ross soils, have a thinner mollic epipedon, and have low-chroma mottles closer to the surface.

Typical pedon of Ross silt loam, occasionally flooded, in cropland, in Madison Township, T. 11 N., R. 21 W., about 2.5 miles north-northwest of Groveport, 500 yards north and 600 yards east of the southwest corner of sec. 8:

Ap—0 to 11 inches; very dark grayish brown (10YR 3/2) silt loam; weak medium granular structure; friable; many fine roots; mildly alkaline; abrupt smooth boundary.

A3—11 to 16 inches; very dark grayish brown (10YR 3/2) silt loam; weak medium subangular blocky structure; friable; few fine roots; mildly alkaline; abrupt wavy boundary.

B21—16 to 23 inches; very dark gray (10YR 3/1) silty clay loam; moderate medium prismatic structure parting to moderate fine subangular blocky; friable; few fine roots; thin continuous dark gray (10YR 3/1) coatings on horizontal and vertical faces of peds; mildly alkaline; gradual wavy boundary.

B22—23 to 30 inches; very dark grayish brown (10YR 3/2) silty clay loam; weak medium prismatic structure parting to moderate medium subangular blocky; friable; few fine roots; thin patchy very dark gray (10YR 3/1) coatings on vertical faces of peds; mildly alkaline; gradual wavy boundary.

B23—30 to 35 inches; brown (10YR 4/3) silty clay loam; weak medium subangular blocky structure; friable; few fine roots; thin patchy dark brown (10YR 3/3) coatings on vertical faces of peds; 1 percent coarse fragments; mildly alkaline; clear irregular boundary.

B24—35 to 40 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium subangular blocky structure; friable; few fine roots; thin very patchy brown (10YR 5/3) coatings on vertical faces of peds; 1 percent coarse fragments; mildly alkaline; clear wavy boundary.

C1—40 to 49 inches; dark yellowish brown (10YR 4/4) silt loam; massive; friable; few fine roots; 1 percent coarse fragments; mildly alkaline; clear wavy boundary.

C2—49 to 70 inches; yellowish brown (10YR 5/4) loam; common medium distinct gray (10YR 6/1) and yellowish brown (10YR 5/8) mottles; massive; friable; 4 percent coarse fragments; slight effervescence; mildly alkaline.

Solum thickness ranges from 38 to 50 inches. Depth to carbonates ranges from 0 to 60 inches or more. Thickness of the mollic epipedon ranges from 24 to 40 inches.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 2 or 3. It is neutral or mildly alkaline. The upper part of the B horizon has hue of 10YR, value of 2 or 3, and chroma of 1 to 3. It is silt loam or silty clay loam. The lower part of the B horizon has hue of 10YR, value of 3 to 5, and chroma of 3 or 4. It is silt loam, silty clay loam, or clay loam. Thin lenses of sandy or gravelly textures are in the B horizon of some pedons. The B horizon is slightly acid to mildly alkaline. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It is sandy loam, loam, silt loam, silty clay loam, clay loam, and gravelly sand. Reaction ranges from neutral to moderately alkaline.

Shoals series

The Shoals series consists of deep, somewhat poorly drained, moderately permeable soils formed in alluvium eroded from uplands and terraces. These soils are on flood plains and are subject to occasional flooding. Slope is 0 to 2 percent.

Shoals soils are commonly adjacent to Algiers, Eel, and Sloan soils. Algiers soils formed in recent alluvium over a buried soil. Eel soils are better drained than Shoals soils and are not mottled immediately under the A horizon. Sloan soils are wetter and have a mollic epipedon.

Typical pedon of Shoals silt loam, occasionally flooded, in cropland, in Madison Township, T. 11 N., R. 21 W., about 2.5 miles east of Groveport, 660 yards north and 50 yards west of the southeast corner of sec. 26:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam; moderate medium granular structure; friable; common fine roots; mildly alkaline; abrupt smooth boundary.

A12—8 to 13 inches; brown (10YR 4/3) silt loam; common medium distinct gray (10YR 5/1) and yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; few fine roots; thin patchy dark grayish brown (10YR 4/2) coatings on vertical faces of peds; mildly alkaline; clear wavy boundary.

C1g—13 to 21 inches; grayish brown (10YR 5/2) silt loam; many medium distinct yellowish brown (10YR 5/4 and 5/6) mottles; weak medium subangular blocky structure; friable; few fine roots; thin patchy light brownish gray (10YR 6/2) coatings on vertical faces of peds; mildly alkaline; abrupt wavy boundary.

C2g—21 to 28 inches; grayish brown (10YR 5/2) silt loam; many medium distinct gray (10YR 6/1) and yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; few fine roots; thin very patchy brown (10YR 4/3) coatings on horizontal and vertical faces of peds; neutral; gradual wavy boundary.

C3—28 to 35 inches; brown (10YR 4/3) silt loam; many coarse distinct gray (10YR 6/1) and yellowish brown

(10YR 5/6) mottles; weak coarse subangular blocky structure; friable; common fine prominent black (10YR 2/1) iron and manganese concretions; neutral; clear wavy boundary.

C4—35 to 45 inches; dark yellowish brown (10YR 4/4) loam; many coarse distinct gray (10YR 6/1) and yellowish brown (10YR 5/6) mottles; massive; friable; common fine prominent black (10YR 2/1) iron and manganese concretions; neutral; clear wavy boundary.

C5—45 to 70 inches; brown (10YR 5/3) loam; many medium distinct gray (10YR 5/1) and yellowish brown (10YR 5/6) mottles; massive; friable; common fine prominent black (10YR 2/1) iron and manganese concretions; 4 percent coarse fragments; neutral.

Depth to carbonates ranges from 30 to more than 50 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2. It is slightly acid to mildly alkaline. The C horizon to depths of about 40 inches has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. Texture is silt loam, silty clay loam, loam, or clay loam with thin lenses of gravelly or sandy material in some pedons. The C horizon below 40 inches has hue of 10YR, value of 4 to 6, and chroma of 1 to 4. Textures include loam, silt loam, sandy loam, and sand plus gravelly analogs of these textures. The C horizon is slightly acid to mildly alkaline in the upper part and neutral to moderately alkaline in the lower part.

Sleeth series

The Sleeth series consists of deep, somewhat poorly drained soils formed in silty or loamy glacial outwash or loess over stratified sand and gravel on stream terraces and outwash plains. Permeability is moderate in the subsoil and very rapid in the substratum. Slope is 0 to 2 percent.

Sleeth soils are commonly adjacent to Eel, Montgomery, Thackery, and Westland soils. Eel soils formed in alluvium on flood plains and do not have an argillic horizon. Montgomery and Westland soils are wetter than Sleeth soils and have a mollic epipedon. Thackery soils are better drained and are not mottled immediately under the surface layer.

Typical pedon of Sleeth silt loam, 0 to 2 percent slopes, in cropland, in Madison Township, T. 11 N., R. 21 W., about 2.5 miles north of Groveport, 400 yards south and 360 yards east of the northwest corner of sec. 15:

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam; moderate medium granular structure; friable; common fine roots; medium acid; abrupt smooth boundary.

B1—8 to 14 inches; yellowish brown (10YR 5/4) silt loam; common fine distinct gray (10YR 5/1) and common fine faint yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; few fine roots; thin continuous dark grayish brown (10YR 4/2) coatings on horizontal and vertical faces of peds; medium acid; clear wavy boundary.

B21t—14 to 20 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct gray (10YR 5/1) and common medium faint yellowish brown (10YR 5/6) mottles; moderate coarse prismatic structure parting to moderate medium subangular blocky; very firm; few fine roots; medium patchy brown (10YR 5/3) clay films on horizontal and vertical faces of peds; thin grayish brown (10YR 5/2) coatings that are continuous on vertical faces of peds and patchy on horizontal faces; strongly acid; gradual wavy boundary.

B22t—20 to 27 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct light gray (10YR 6/1) and common medium faint yellowish brown (10YR 5/6) mottles; moderate coarse prismatic structure parting to moderate medium subangular blocky; very firm; few fine roots; medium patchy brown (10YR 5/3) clay films on horizontal and vertical faces of peds; thin grayish brown (10YR 5/2) coatings that are continuous on vertical faces of peds and patchy on horizontal faces; strongly acid; clear wavy boundary.

IIB23t—27 to 36 inches; dark yellowish brown (10YR 4/4) clay loam; common medium distinct light gray (10YR 6/1) and yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; medium patchy dark grayish brown (10YR 4/2) clay films on horizontal and vertical faces of peds; thin patchy grayish brown (10YR 5/2) coatings on horizontal and vertical faces of peds; few medium prominent black (10YR 2/1) iron and manganese stains; 2 percent coarse fragments; medium acid; clear wavy boundary.

IIB31—36 to 43 inches; dark yellowish brown (10YR 4/4) loam; common medium distinct light gray (10YR 6/1) and yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure parting to weak coarse subangular blocky; friable; few fine roots; thin patchy grayish brown (10YR 5/2) coatings on vertical faces of peds; 5 percent coarse fragments; neutral; clear wavy boundary.

IIB32—43 to 55 inches; brown (10YR 4/3) sandy clay loam; common coarse distinct grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; very friable; 8 percent coarse fragments; slight effervescence; mildly alkaline; gradual wavy boundary.

IIIC—55 to 70 inches; grayish brown (10YR 5/2) gravelly sand; common coarse distinct light gray (10YR 6/1) and yellowish brown (10YR 5/4) mottles; single grained; loose; 25 percent coarse fragments; strong effervescence; mildly alkaline.

Solum thickness ranges from 40 to 57 inches and is usually the same as the depth to sand and gravel. Thickness of the silty mantle, overlying the loamy outwash, ranges from 0 to 37 inches. The depth of carbonates ranges from 38 to 58 inches.

The Ap horizon has hue of 10YR, value of 4, and chroma of 1 or 2. Reaction ranges from medium acid to neutral. The B horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. Textures include loam, silty clay loam, and clay loam in the upper part of the B horizon and silty clay loam, clay loam, loam, and gravelly analogs of these textures along with some individual subhorizons of clay in the lower part of the B horizon. Reaction of the B horizon ranges from strongly acid to slightly acid in the upper part to mildly alkaline in the lower part. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 1 to 4. It is sand or loamy sand and their gravelly analogs. Reaction is mildly alkaline or moderately alkaline.

Sloan series

The Sloan series consists of deep, very poorly drained soils formed in alluvium eroded from uplands and terraces. These soils are on flood plains and are subject to frequent flooding. Permeability is moderate or moderately slow. Slope is 0 to 2 percent.

Sloan soils are similar to Westland soils and are commonly adjacent to the better drained Algiers, Crane, Medway, and Shoals soils. Crane and Westland soils have an argillic horizon and a regular decrease in organic matter content with depth. Algiers and Shoals soils have an ochric epipedon. Medway and Shoals soils do not have dominant low-chroma colors in the subsoil.

Typical pedon of Sloan silt loam, frequently flooded, in meadow, in Madison Township, T. 11 N., R. 21 W., about 2 miles north of Groveport, 250 yards north and 250 yards east of the southwest corner of sec. 16:

Ap—0 to 11 inches; very dark brown (10YR 2/2) silt loam; moderate medium granular structure; friable; many fine roots; 1 percent coarse fragments; neutral; abrupt smooth boundary.

B1—11 to 15 inches; very dark grayish brown (10YR 3/2) silty clay loam; moderate medium subangular blocky structure; firm; common fine roots; thin continuous very dark gray (10YR 3/1) organic coatings on horizontal and vertical faces of peds; 1 percent coarse fragments; neutral; clear wavy boundary.

B21g—15 to 20 inches; dark grayish brown (10YR 4/2) silty clay loam; common medium distinct gray (10YR 5/1) and yellowish brown (10YR 5/6) mottles; moderate medium and coarse subangular blocky structure; firm; few fine roots; thin patchy dark gray (5Y 4/1) coatings on vertical faces of peds; 1 percent coarse fragments; neutral; clear wavy boundary.

B22g—20 to 26 inches; gray (10YR 5/1) silty clay loam; common medium distinct dark gray (N 4/0) and yellowish brown (10YR 5/6) mottles; moderate coarse subangular blocky structure; firm; few fine roots; thin patchy dark gray (5Y 4/1) coatings on vertical faces of peds; 4 percent coarse fragments; mildly alkaline; clear wavy boundary.

B3g—26 to 34 inches; gray (10YR 5/1) clay loam; many medium distinct strong brown (7.5YR 5/6) mottles; weak coarse subangular blocky structure; firm; few fine roots; 10 percent coarse fragments; mildly alkaline; clear wavy boundary.

C1g—34 to 42 inches; mottled light gray (10YR 6/1 and 7/2) and yellowish brown (10YR 5/6) loam; massive; friable; 4 percent coarse fragments; slight effervescence; moderately alkaline; clear wavy boundary.

C2g—42 to 55 inches; very dark grayish brown (10YR 3/2) gravelly loam; few fine distinct yellowish brown (10YR 5/6) mottles; massive; friable; 15 percent coarse fragments; strong effervescence; moderately alkaline; gradual wavy boundary.

C3g—55 to 70 inches; very dark grayish brown (10YR 3/2) gravelly loam; common medium distinct yellowish brown (10YR 5/6) and common medium faint gray (10YR 5/1) mottles; massive; friable; 25 percent coarse fragments; strong effervescence; moderately alkaline.

Solum thickness ranges from 30 to 60 inches. Thickness of the mollic epipedon ranges from 12 to 21 inches. The depth to carbonates ranges from 25 to 50 inches.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. Reaction ranges from slightly acid to mildly alkaline. The B horizon below the mollic epipedon has hue of 10YR or neutral, value of 4 or 5, and chroma of 0 to 2. Textures include silty clay loam, clay loam, silt loam, and gravelly analogs in the lower part of the B horizon. Reaction ranges from slightly acid to moderately alkaline. The C horizon has hue of 10YR, value of 2 to 6, and chroma of 0 to 4. It is stratified silt loam to gravelly sand. Reaction ranges from neutral to moderately alkaline.

Thackery series

The Thackery series consists of deep, moderately well drained soils formed in silty or loamy glacial outwash or loess over stratified sand and gravel on stream terraces and outwash plains. Permeability is moderate in the subsoil and rapid or very rapid in the substratum. Slope ranges from 0 to 6 percent.

Thackery soils are commonly adjacent to Eldean, Ockley, and Sleeth soils. Eldean and Ockley soils are better drained than Thackery soils and do not have low-chroma mottles in the upper part of the subsoil. Eldean soils are not as deep over stratified sand and gravel and have a higher clay content in the argillic horizon. Sleeth soils are wetter and are mottled immediately below the surface layer.

Typical pedon of Thackery silt loam, 0 to 2 percent slopes, in meadow, in Madison Township, T. 11 N., R. 21 W., about 3 miles north-northeast of Groveport, 700 yards south and 100 yards east of the northwest corner of sec. 10:

Ap—0 to 10 inches; brown (10YR 4/3) silt loam; moderate medium granular structure; friable; common fine roots; 3 percent coarse fragments; slightly acid; abrupt smooth boundary.

B1—10 to 15 inches; brown (10YR 4/3) silt loam; moderate medium subangular blocky structure; friable; few fine roots; thin patchy dark grayish brown (10YR 4/2) coatings on vertical faces of peds; 3 percent coarse fragments; medium acid; abrupt wavy boundary.

IIB21t—15 to 21 inches; brown (7.5YR 4/4) loam; few medium distinct brown (10YR 5/3) and yellowish brown (10YR 5/4) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; friable; few fine roots; thin patchy dark brown (10YR 3/3) and dark yellowish brown (10YR 4/4) clay films on horizontal and vertical faces of peds; dark brown (10YR 3/3) and dark yellowish brown (10YR 4/4) clay coatings on pebbles and bridges between sand grains; 3 percent coarse fragments; medium acid; clear wavy boundary.

IIB22t—21 to 29 inches; brown (7.5YR 4/4) clay loam; common medium distinct grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; friable; thin patchy dark brown (10YR 3/3) and dark yellowish brown (10YR 4/4) clay films on horizontal and vertical faces of peds; dark brown (10YR 3/3) and dark yellowish brown (10YR 4/4) clay coatings on pebbles and bridges between sand grains; 3 percent coarse fragments; slightly acid; clear wavy boundary.

IIB23t—29 to 37 inches; yellowish brown (10YR 5/4) clay loam; many medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/8) mottles; moderate coarse subangular blocky structure; friable; thin patchy dark brown (10YR 3/3) and dark yellowish brown (10YR 4/4) clay films on horizontal and vertical faces of peds; dark brown (10YR 3/3) and dark yellowish brown (10YR 4/4) clay coatings on pebbles and bridges between sand grains; 3 percent coarse fragments; slightly acid; clear wavy boundary.

IIB24t—37 to 49 inches; brown (10YR 4/3) clay loam; many medium faint dark grayish brown (10YR 4/2) and many medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure; firm; clay coating and bridging of sand grains; 10 percent coarse fragments; neutral; gradual wavy boundary.

IIB3t—49 to 54 inches; brown (10YR 4/3) gravelly sandy loam; common medium distinct yellowish brown (10YR 5/6) and light gray (10YR 6/1) mottles; massive; friable; clay coating and bridging of sand grains; 25 percent coarse fragments; neutral; clear wavy boundary.

IIC—54 to 70 inches; dark gray (10YR 4/1) gravelly sand; single grained; loose; common medium distinct light gray (10YR 7/2) weathered limestone fragments; 25 percent coarse fragments; strong effervescence; moderately alkaline.

Solum thickness and depth to sand and gravel range from 45 to 60 inches. Thickness of the silty mantle overlying the loamy outwash ranges from none to 20 inches. The depth to carbonates ranges from 45 to 55 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3. Reaction ranges from medium acid to neutral. The B2 horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 or 4. Textures include silty clay loam, clay loam, silt loam, loam, clay loam, and sandy clay loam plus gravelly analogs of these textures in the lower part. Reaction ranges from strongly acid in the upper part to mildly alkaline in the lower part. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 1 to 3. The C horizon is commonly stratified with textures ranging from loamy sand to very gravelly sand. Reaction is mildly alkaline or moderately alkaline.

Warsaw series

The Warsaw series consists of deep, well drained soils on stream terraces and outwash plains. These soils formed in silty alluvium and loamy outwash, or in loamy glacial outwash over stratified sand and gravel. Permeability is moderate in the subsoil and very rapid in the substratum. Slope ranges from 0 to 6 percent.

Warsaw soils are similar to Wea soils and are commonly adjacent to Eldean, Ockley, and Wea soils. Eldean and Ockley soils do not have a mollic epipedon, and Eldean soils have a higher clay content in the argillic horizon than Warsaw soils. Ockley and Wea soils have a thicker solum.

Typical pedon of Warsaw silt loam, 2 to 6 percent slopes, in cropland, in Pleasant Township, about 0.5 mile north-northeast of Harrisburg, 200 yards east of Harrisburg-Georgeville Road, 500 yards south of Interstate 71:

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam; moderate medium granular structure; friable; common medium roots; 2 percent coarse fragments; neutral; abrupt smooth boundary.

B1—9 to 15 inches; dark brown (7.5YR 3/2) silty clay loam; moderate fine subangular blocky structure; friable; few fine roots; thin very dark gray (10YR 3/1) coatings on vertical faces of peds; 2 percent coarse fragments; neutral; clear wavy boundary.

B21t—15 to 19 inches; reddish brown (5YR 4/3) clay loam; moderate medium subangular blocky structure; firm; few fine roots; medium patchy very dark grayish brown (10YR 3/2) clay films on horizontal and vertical faces of peds; thin patchy very dark grayish brown (10YR 3/2) coatings on horizontal and vertical faces of peds; 5 percent coarse fragments; neutral; clear wavy boundary.

B22t—19 to 23 inches; reddish brown (5YR 4/4) clay loam; moderate medium subangular blocky structure; firm; few fine roots; medium patchy very dark grayish brown (10YR 3/2) clay films on horizontal and vertical faces of peds; 5 percent coarse fragments; neutral; clear wavy boundary.

B23t—23 to 27 inches; dark brown (7.5YR 4/4) clay loam; moderate coarse subangular blocky structure; firm; few fine roots; medium patchy very dark grayish brown (10YR 3/2) clay films on horizontal and vertical faces of peds; 10 percent coarse fragments; neutral; abrupt wavy boundary.

B3—27 to 34 inches; dark reddish brown (5YR 3/3) gravelly clay loam; weak coarse subangular blocky structure; friable; many fine and medium light gray (10YR 7/2) weathered limestone fragments; 25 percent coarse fragments; mildly alkaline; gradual wavy boundary.

IIC—34 to 70 inches; brown (10YR 4/3) very gravelly sand; single grained; loose; 55 percent coarse fragments; strong effervescence; moderately alkaline.

Solum thickness ranges from 30 to 40 inches and is usually the same as the depth to sand and gravel. Thickness of the mollic epipedon ranges from 12 to 20 inches. Thickness of the silty alluvium ranges from 0 to 20 inches. The depth to carbonates ranges from 24 to 36 inches.

The Ap horizon has hue of 10YR or 7.5YR, value of 2 or 3, and chroma of 1 or 2. Reaction is medium acid to neutral. The B horizon has hue of 10YR to 5YR, value of 3 to 5, and chroma of 3 or 4, but chroma ranges to 2 in the upper part. It is dominantly silty clay loam, clay loam, loam, or sandy clay loam and includes gravelly analogs of these textures. Individual subhorizons of clay occur in some pedons. Reaction ranges from strongly acid to neutral in the upper part to neutral or moderately alkaline in the lower part. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is commonly stratified with texture ranging from loamy sand to very gravelly sand.

Wea series

The Wea series consists of deep, well drained soils on stream terraces and outwash plains. Wea soils formed in loamy outwash or silty alluvium and loamy outwash material over stratified sand and gravel. Permeability is moderate in the subsoil and very rapid in the substratum. Slope ranges from 0 to 6 percent.

Wea soils are similar to Ross and Warsaw soils and are commonly adjacent to Crane, Eldean, Ockley, and Warsaw soils. Ross soils formed in alluvium and have no argillic horizon. Eldean and Warsaw soils are shallower over stratified sand and gravel than Wea soils. Crane soils have low-chroma mottles in the upper part of the subsoil. Eldean and Ockley soils have an ochric epipedon.

Typical pedon of Wea silt loam, 2 to 6 percent slopes, in cropland, in Pleasant Township, about 1.3 miles east-southeast of Darbydale, 1,400 yards southwest of intersection of Lambert Road and State Route 665:

Ap—0 to 9 inches; black (10YR 2/1) silt loam; moderate medium granular structure; friable; common fine roots; 4 percent coarse fragments; neutral; abrupt smooth boundary.

A12—9 to 14 inches; very dark gray (10YR 3/1) silt loam; weak medium prismatic structure parting to moderate fine subangular blocky; friable; common fine roots; thin continuous black (10YR 2/1) coatings on faces of peds; 1 percent coarse fragments; neutral; clear wavy boundary.

B21t—14 to 19 inches; very dark grayish brown (10YR 3/2) silty clay loam; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; thin very patchy very dark gray (10YR 3/1) clay films on horizontal and vertical faces of peds; thin patchy very dark grayish brown (10YR 3/2) coatings on horizontal and vertical faces of peds; 1 percent coarse fragments; neutral; clear wavy boundary.

B22t—19 to 27 inches; brown (10YR 4/3) clay loam; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; thin patchy very dark gray (10YR 3/1) clay films on horizontal and vertical faces of peds; thin patchy dark grayish brown (10YR 4/2) coatings on horizontal and vertical faces of peds; 1 percent coarse fragments; neutral; clear wavy boundary.

B23t—27 to 35 inches; dark yellowish brown (10YR 4/4) clay loam; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; thin patchy brown (10YR 4/3) clay films on horizontal and vertical faces of peds; thin very patchy dark grayish brown (10YR 4/2) coatings on vertical faces of peds; 3 percent coarse fragments; mildly alkaline; gradual wavy boundary.

B24t—35 to 45 inches; dark yellowish brown (10YR 4/4) clay loam; weak medium subangular blocky structure; firm; thin patchy brown (10YR 4/3) clay films on horizontal and vertical faces of peds; common fine light gray (10YR 7/2) weathered limestone fragments; 3 percent coarse fragments; mildly alkaline; clear wavy boundary.

B3—45 to 56 inches; yellowish brown (10YR 5/4) clay loam; many fine faint yellowish brown (10YR 5/6) mottles; massive; friable; common fine and medium light gray (10YR 7/2) weathered limestone fragments; 5 percent coarse fragments; mildly alkaline; abrupt wavy boundary.

IIC—56 to 70 inches; brown (10YR 5/3) gravelly sand; single grained; loose; 30 percent coarse fragments; strong effervescence; moderately alkaline.

Solum thickness and depth to carbonates range from 45 to 60 inches and is commonly the same as the depth to sand and gravel. Thickness of the mollic epipedon ranges from 12 to 24 inches. Thickness of the silty alluvium ranges from 0 to 20 inches.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. It is medium acid to mildly alkaline. The upper part of the B horizon has hue of 10YR, value of 3 to 5, and chroma of 2 to 4. It is silty clay loam, clay loam, or silt loam. The lower part of the B horizon has hue of 10YR or 7.5YR, value of 4 or 5, chroma of 3 or 4. It is silty clay loam, clay loam, sandy clay loam, or gravelly analogs of these textures and includes individual subhorizons of clay in some pedons. Reaction of the B horizon ranges from strongly acid to neutral in the upper part to mildly alkaline in the lower part. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 6. It is very gravelly sand, gravelly sand, sand, or sandy loam. It is mildly alkaline or moderately alkaline.

Westland series

The Westland series consists of deep, very poorly drained soils formed in silty alluvium and loamy glacial outwash or in loamy glacial outwash over stratified sand and gravel on stream terraces and outwash plains. Permeability is moderately slow in the subsoil and very rapid in the substratum. Slope is 0 to 2 percent.

Westland soils are commonly adjacent to the better drained Algiers, Crane, and Sleeth soils. Algiers and Sleeth soils do not have a mollic epipedon. Crane and Sleeth soils do not have low-chroma colors dominant in the upper part of the subsoil.

Typical pedon of Westland silty clay loam, in a meadow, in Madison Township, T. 10 N., R. 21 W., 2.6 miles southwest of Canal Winchester, 160 yards north and 300 yards east of the southwest corner of sec. 1:

Ap—0 to 9 inches; very dark gray (10YR 3/1) silty clay loam; moderate medium granular structure; friable; many fine roots; 3 percent coarse fragments; neutral; abrupt smooth boundary.

B21—9 to 14 inches; very dark gray (10YR 3/1) silty clay loam; common fine distinct dark brown (10YR 4/3) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; medium patchy very dark gray (10YR 3/1) clay films on vertical and horizontal faces of peds; 3 percent coarse fragments; neutral; clear wavy boundary.

B22t—14 to 21 inches; dark grayish brown (10YR 4/2) silty clay loam; common fine faint dark brown (10YR 4/3) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; medium patchy dark gray (10YR 4/1) clay films on horizontal and vertical faces of peds; few fine prominent black (10YR 2/1) iron and manganese concretions; 3 percent coarse fragments; neutral; gradual wavy boundary.

B23t—21 to 28 inches; dark grayish brown (10YR 4/2) clay loam; many medium distinct dark yellowish brown (10YR 4/4) mottles; moderate coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; medium patchy dark grayish brown (10YR 4/2) clay films on horizontal and vertical faces of peds; common fine prominent black (10YR 2/1) iron and manganese concretions; 2 percent coarse fragments; neutral; clear wavy boundary.

B24t—28 to 35 inches; dark grayish brown (10YR 4/2) clay loam; common medium faint dark gray (10YR 4/1) and common medium distinct dark yellowish brown (10YR 4/4) mottles; weak coarse prismatic structure parting to weak medium subangular blocky; firm; few fine roots; medium patchy dark gray (10YR 4/1) clay films on vertical faces of peds; common fine prominent black (10YR 2/1) iron and manganese concretions; 3 percent coarse fragments; mildly alkaline; clear wavy boundary.

IIB3—35 to 43 inches; brown (10YR 4/3) sandy clay loam; common medium faint dark grayish brown (10YR 4/2) and common medium distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; friable; few fine roots; 3 percent coarse fragments; mildly alkaline; clear wavy boundary.

IIC1—43 to 52 inches; brown (10YR 4/3) loamy sand; common medium faint dark grayish brown (10YR 4/2) and common medium distinct yellowish brown (10YR 5/6) mottles; massive; very friable; 6 percent coarse fragments; mildly alkaline; clear wavy boundary.

IIC2—52 to 70 inches; dark grayish brown (10YR 4/2) gravelly sand; single grained; loose; 40 percent coarse fragments; slight effervescence; moderately alkaline.

Solum thickness and depth to carbonates range from 40 to 60 inches. Thickness of the mollic epipedon ranges from 12 to 22 inches. Depth to sand and gravel ranges from 50 to 60 inches. Thickness of the silty alluvium ranges from 0 to 20 inches.

The Ap horizon has hue of 10YR, value of 2 or 3, and chroma of 1. Reaction is slightly acid or neutral. The B2 horizon has hue of 10YR or neutral, value of 3 to 6, and chroma of 0 to 2. The B horizon is silty clay loam or clay loam in the upper part and silty clay loam, clay loam, or sandy clay loam and gravelly analogs in the lower part. Reaction of the B horizon ranges from slightly acid or neutral in the upper part to mildly alkaline in the lower part. The C horizon has hue of 10YR, value of 2 to 6, and chroma of 1 to 6. Textures include sand or loamy sand and gravelly analogs. Reaction is mildly alkaline or moderately alkaline.

Formation of the soils

This section lists the factors and processes of soil formation and describes how they have affected the soils in Franklin County.

Factors of soil formation

A soil is a three-dimensional, natural body capable of supporting plant growth. The nature of any soil is the result of the interaction of many factors. These factors are grouped into five general categories: parent material, climate, living organisms, relief, and time. Theoretically, if all these factors were identical at different sites, the soil at these sites would also be identical. Variations among soils are caused by variations in one or more of these factors.

Parent material

Parent material is the raw material acted upon by the other soil-forming factors. It largely determines soil texture.

The soils of Franklin County formed in different kinds of parent material. Most of the parent material was deposited by glaciers during the Wisconsin stage of glaciation that covered the area thousands of years ago, or by melt water from these glaciers. Another kind of parent material is alluvium that was deposited by streams in relatively recent times. Other kinds are rock that has weathered in place and organic material formed by decaying plants.

Glacial till is material that was deposited directly by glacial ice, with little or no action by water. The composition of the till depends on the nature of the area over which the ice passed before deposition. Glacial till typically contains particles that vary in size, including some large stones (fig. 8). The smaller stones and pebbles have sharp angles, indicating that they have not been rounded by the action of water. Some boulders were carried for long distances, but most of the till is of local origin.

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 size of the soil particles.

The glacial till in the northeastern part of the county is moderately high in content of clay and lime. Bennington and Cardington soils, which formed in this till, have a subsoil of clay loam, silty clay, or silty clay loam and have a medium amount of natural lime below a depth of about 3 feet.

Farther south and west the till contains more limestone and less shale and sandstone. Crosby and Kokomo soils formed in this till. They have a subsoil of silty clay loam and clay and have a high amount of natural lime within a depth of 3 feet.

In a small area of the northwestern part of the county are glacial till deposits that are relatively high in clay and lime content. Glynwood and Blount soils formed in these deposits.

Melt water deposits were deposited by water from the melting glaciers. They are of two general kinds: outwash deposits, laid down by moving water, and lacustrine deposits, laid down in still water. The size of particles that can be carried by water depends on the speed at which the water is moving. When water slows to a certain speed, all suspended particles larger than a certain size will settle. Water slows wherever a stream changes grade or flows into still water. When a stream enters still water the coarser sand and gravel particles settle near the mouth of the stream, and the fine silt and the clay particles are carried far into the pool where they slowly settle.

Soils that formed in outwash deposits are of moderate extent in Franklin County. These deposits were laid down as glacial melt water flowed down the valleys. Because of the speed of the water, the smaller silt and clay particles were carried in suspension, but the sand and gravel were deposited. Eldean and Ockley soils formed in these deposits and are gravelly and porous in the lower part of the soils.

The speed of water did not remain constant. This caused the deposition of thin layers of material which are coarser or finer than the layers above and below. This phenomenon is called stratification, and the individual layers are called strata. In many areas of Eldean and Ockley soils, for example, there are alternating strata of silt loam, sand, and gravel in the substratum.

Figure 8.—Polygonal cracking in high-lime Wisconsin glacial till. The largest cobblestone is about 8 inches across.

Lacustrine deposits are not extensive in Franklin County. Montgomery soils formed in deposits layed down in slackwater pools and in small lakes that were left after the glacier retreated. The largest of these areas is west of Columbus.

Alluvium is soil material deposited by flowing streams. The source of most alluvium is other soils farther upstream in the watershed. The texture of alluvium varies because the speed and duration of floodwater varies considerably within small areas. The soil horizons are poorly expressed because the alluvium is recent, and soil-forming processes start over again with each new deposition. One or more surface layers have been buried in many areas, and the soils are highly stratified. Genesee, Shoals, and Ross soils formed in alluvium. Algiers soils are a special kind of soil that formed partly in recent alluvium and partly in a dark soil that was buried by the alluvium.

Weathered bedrock is a minor part of the parent material of the lower subsoil of a few soils in the county.

Organic material from plants accumulated during the pond filling cycle. The permanently wet condition reduced oxidation and slowed decomposition while the material accumulated. Carlisle soils are the only soils formed in organic parent material in the county.

Climate

The soils in Franklin County formed under a humid, temperate continental climate. Climatic factors such as precipitation, temperature, and the evapotranspiration ratio are closely related to biotic communities and, on a regional basis, help determine the kind of soils that form. The climate in Franklin County is fairly uniform, however, and soil differences within the county are determined more by differences in vegetation, parent material, relief, drainage, and the age of soil material.

Climate, among its other influences, regulates the rate of weathering and decomposition of minerals and influences the removal of materials by leaching. Soluble bases are removed when they are released by decomposition of the mineral material. Clay and sesquioxides are translocated by water percolating downward from the surface to the lower horizons because the bases are continually leached downward. Crosby and Eldean soils, as well as others, show evidence of clay movement from the A horizon to the B horizon.

Kokomo and Pewamo soils, because of their position on the landscape, formed under a wetter microclimate than most soils in the county. This resulted in saturation for extended lengths of time and in gleying, which is caused by the reduction and leaching of iron.

A further description of the climate is in the section "General nature of the county."

Relief

Relief influences soil formation by its effect on the movement of water, erosion, temperature, and plant cover. Runoff, ponding, depth to water table, internal drainage, accumulation and removal of organic matter, and other phenomena are affected by relief, either directly or indirectly.

Relief can account for the development of different soils from the same kind of parent material. For this reason relief is commonly a dominant factor in differentiating soil series. Certain soil characteristics are generally related to slope and internal drainage. This is illustrated in comparing the Hennepin, Celina, and Kokomo soils, all of which formed in Wisconsin Age glacial till.

Water that runs off sloping soils collects in depressions or is removed through the drainage system. Therefore, from an equal amount of rainfall, sloping soils receive less total water and depressional soils receive more total water than flat, nearly level soils. Thus, gently sloping soils generally show the most development because they are neither saturated nor droughty. Soil formation on steep slopes tends to be inhibited by erosion and the reduced amount of water entering the soil because of the influence of slope on runoff.

Living organisms

The vegetation under which a soil forms influences the color, structure, and organic matter content of the soil. Soils that formed under forest are generally lighter in color than those formed under grass because grass is more effective than trees in returning organic matter to the soil. Grass also promotes granular structure in the surface layer of the soil.

Many of the soils in Franklin County formed under hardwood forest. Alexandria, Celina, and Ockley soils formed under a forest consisting mostly of such hardwoods as oak and maple. Warsaw, Crane, and Wea soils formed mainly under grass.

Bacteria, fungi, and many other micro-organisms aid in the breakdown and return of plant residue to the soil. The kind of organic residue that is returned to the soil depends, to some extent, on the kind of organism involved in the breakdown. Generally, fungi are most active under acid conditions and bacteria are most active under neutral or alkaline conditions.

Earthworms, burrowing insects, and other small animals constantly mix the soil. Their burrows help to make the soil porous and permit passage of water. Earthworms help to incorporate organic matter into the soil. Leaf litter that is well populated with earthworms is usually incorporated into the soil by early the following spring. If the earthworm population is low, part of the leaf litter will remain on the surface for 2 or 3 years.

Time

The length of time that parent material has been exposed to other factors of soil formation is important in soil development. Generally, the longer that climate and living organisms have acted upon the parent material, the more distinct are the horizons in the profile. The distinctness of horizons indicates the relative maturity of the soil.

The soils of Franklin County have formed since the last glaciation, which was about 15,000 years ago. In steep areas, geologic erosion has kept pace with soil formation; thus, soil horizons are thin and the depth to parent material in places is only a few inches. In areas that are rolling or flat, horizons are much thicker and the depth to parent material generally is more than 24 inches.

Soils that formed in recent alluvium, such as Eel, Genesee, and Shoals soils, have no distinct horizons. These soils are the youngest in the county, and the other factors of soil formation have not had enough time to significantly influence them.

Processes of soil formation

Soils are formed by the five soil-forming factors through complex, interrelated, continuing processes that are grouped into four general categories: addition, removal, transfer, and transformation (*9*). These four processes occur in the formation of all soils, although their predominance varies.

In Franklin County the accumulation of organic matter in soils is an example of the process of *addition*. This organic matter, which is from plants that grew in the soil, is mainly responsible for the darkness of the surface layer. Examples of such additions are found in Kokomo and Wea soils. Where the parent material is deposited, the color is relatively uniform with depth.

The loss of lime from the upper 2 to 4 feet of many of the soils in Franklin County is an example of the *removal* process. The parent material of these soils was limy, but the lime has been leached from the upper part of the profile by water moving through the soil.

Water is the carrier for most of the *transfers* in the soils in this county. In many of the soils, clay has been transferred from the A horizon to the B horizon. Thus, the Bt horizon, especially the B2t horizon, is a zone of illuviation, or gain. In the Cardington, Eldean, Miamian, and other soils, the B horizon contains more clay than the parent material and the A horizon contains less. In the B horizon of some soils, there are thin films of clay in the pores and on faces of peds. This clay has been transferred from the A horizon. The presence or absence of these clay films is an important criterion in soil classification.

Transformations of mineral compounds occur in most soils. They are most apparent if the formation of horizons has not been subjected to rapid erosion or accumulation of material on the surface. The primary silicate minerals are weathered chemically to produce secondary minerals, mainly those of the layer-lattice silicate clays. Most of the layer-lattice clays remain in the soil profile, but clay from the A horizon is transferred to deeper horizons.

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Glossary

Ablation till. Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	More than 12

Basal till. Compact glacial till deposited beneath the ice.

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a fragment.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Coarse fragments. Mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

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 that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or arresting grazing for a prescribed period.

Depth to rock. Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically 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.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Esker (geology). A narrow, winding ridge of stratified gravelly and sandy drift deposited by a stream flowing in a tunnel beneath a glacier.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Excess lime (in tables). Excess carbonates in the soil that restrict the growth of some plants.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, and clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 37.5 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial melt water.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Green manure (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual.* The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Kame (geology). An irregular, short ridge or hill of stratified glacial drift.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous areas. Areas that have little or no natural soil and support little or no vegetation.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Outwash, glacial. Stratified sand and gravel produced by glaciers and carried, sorted, and deposited by glacial melt water.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.20 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, differences in slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Pitting (in tables). Pits caused by melting ground ice. They form on the soil after plant cover is removed.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Productivity (soil). The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and 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 (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	Less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. 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 layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that 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.

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 (in tables). Otherwise suitable soil material too thin for the specified use.

Till plain. An extensive flat to undulating area underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

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 a 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.

Weathering. All physical and chemical changes produced in rocks of other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

TABLES

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1951-75 at Columbus, Ohio]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days[1]	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F		In	In	In		In
January----	36.3	20.4	28.4	64	-7	0	2.68	1.44	3.69	7	6.9
February---	39.2	22.4	30.8	66	-4	0	2.31	1.33	3.10	7	6.1
March------	49.0	30.2	39.6	78	7	28	3.32	1.78	4.57	8	5.5
April------	62.4	40.6	51.5	84	22	114	3.53	2.17	4.74	8	.8
May--------	72.8	50.2	61.5	91	31	370	3.94	2.68	5.09	9	.0
June-------	81.9	59.1	70.5	96	43	615	3.95	2.15	5.40	7	.0
July-------	85.0	63.0	74.0	97	48	744	3.93	2.40	5.29	7	.0
August-----	83.9	61.4	72.7	97	45	704	3.24	1.80	4.40	7	.0
September--	77.3	54.3	65.8	94	34	474	2.68	1.38	3.73	6	.0
October----	66.1	43.2	54.6	86	24	182	1.83	.80	2.66	5	.1
November---	51.1	33.6	42.3	75	12	11	2.70	1.48	3.68	7	2.6
December---	39.7	24.8	32.3	68	-2	12	2.60	1.45	3.54	7	6.0
Yearly:											
Average--	62.1	41.9	52.0	---	---	---	---	---	---	---	---
Extreme--	---	---	---	98	-10	---	---	---	---	---	---
Total----	---	---	---	---	---	3,254	36.71	32.29	40.97	85	28.0

[1]A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1951-75 at Columbus, Ohio]

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	April 12	April 25	May 10
2 years in 10 later than--	April 7	April 20	May 5
5 years in 10 later than--	March 31	April 10	April 26
First freezing temperature in fall:			
1 year in 10 earlier than--	October 20	October 18	September 29
2 years in 10 earlier than--	October 26	October 21	October 5
5 years in 10 earlier than--	November 6	October 29	October 16

TABLE 3.--GROWING SEASON

[Recorded in the period 1951-75 at Columbus, Ohio]

Probability	Daily minimum temperature		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	199	181	149
8 years in 10	206	188	157
5 years in 10	219	201	172
2 years in 10	233	214	187
1 year in 10	240	221	195

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
AdB	Alexandria silt loam, 2 to 6 percent slopes	401	0.1
AdC2	Alexandria silt loam, 6 to 12 percent slopes, eroded	514	0.2
AdD2	Alexandria silt loam, 12 to 18 percent slopes, eroded	1,120	0.3
AdE2	Alexandria silt loam, 18 to 25 percent slopes, eroded	1,707	0.5
Ag	Algiers silt loam	308	0.1
BeA	Bennington silt loam, 0 to 2 percent slopes	9,993	2.9
BeB	Bennington silt loam, 2 to 6 percent slopes	17,773	5.2
BfA	Bennington-Urban land complex, 0 to 2 percent slopes	20,653	6.0
BfB	Bennington-Urban land complex, 2 to 6 percent slopes	12,719	3.7
BoA	Blount silt loam, 0 to 2 percent slopes	358	0.1
BoB	Blount silt loam, 2 to 6 percent slopes	1,657	0.5
CaB	Cardington silt loam, 2 to 6 percent slopes	7,754	2.3
CaB2	Cardington silt loam, 2 to 6 percent slopes, eroded	911	0.3
CaC2	Cardington silt loam, 6 to 12 percent slopes, eroded	2,564	0.7
CbB	Cardington-Urban land complex, 2 to 6 percent slopes	5,027	1.5
CbC	Cardington-Urban land complex, 6 to 12 percent slopes	1,090	0.3
Cc	Carlisle muck	200	0.1
CeA	Celina silt loam, 0 to 2 percent slopes	354	0.1
CeB	Celina silt loam, 2 to 6 percent slopes	12,308	3.6
CeB2	Celina silt loam, 2 to 6 percent slopes, eroded	1,788	0.5
CeC2	Celina silt loam, 6 to 12 percent slopes, eroded	721	0.2
CfB	Celina-Urban land complex, 2 to 6 percent slopes	5,545	1.6
Cn	Condit silt loam	1,686	0.5
CpA	Crane silt loam, 0 to 2 percent slopes	434	0.1
CrA	Crosby silt loam, 0 to 2 percent slopes	32,306	9.4
CrB	Crosby silt loam, 2 to 6 percent slopes	19,803	5.8
CsA	Crosby-Urban land complex, 0 to 2 percent slopes	16,813	4.9
CsB	Crosby-Urban land complex, 2 to 6 percent slopes	12,505	3.6
Ee	Eel silt loam, occasionally flooded	3,233	0.9
ElA	Eldean silt loam, 0 to 2 percent slopes	344	0.1
ElB	Eldean silt loam, 2 to 6 percent slopes	2,016	0.6
ElC2	Eldean silt loam, 6 to 12 percent slopes, eroded	654	0.2
ElD2	Eldean silt loam, 12 to 18 percent slopes, eroded	617	0.2
EmA	Eldean-Urban land complex, 0 to 2 percent slopes	774	0.2
EmB	Eldean-Urban land complex, 2 to 6 percent slopes	6,488	1.9
Gn	Genesee silt loam, occasionally flooded	2,424	0.7
GwB	Glynwood silt loam, 2 to 6 percent slopes	1,473	0.4
GwC2	Glynwood silt loam, 6 to 12 percent slopes, eroded	658	0.2
HeE2	Hennepin and Miamian loams, 18 to 25 percent slopes, eroded	1,178	0.3
HeF2	Hennepin and Miamian loams, 25 to 50 percent slopes, eroded	1,334	0.4
KeA	Kendallville silt loam, 0 to 2 percent slopes	363	0.1
KeB	Kendallville silt loam, 2 to 6 percent slopes	2,965	0.9
KeC2	Kendallville silt loam, 6 to 12 percent slopes, eroded	357	0.1
Ko	Kokomo silty clay loam	36,442	10.6
Ku	Kokomo-Urban land complex	1,803	0.5
LeB	Lewisburg-Crosby complex, 2 to 6 percent slopes	14,865	4.3
Mh	Medway silt loam, occasionally flooded	4,522	1.3
MkB	Miamian silt loam, 2 to 6 percent slopes	4,669	1.4
MlB2	Miamian silty clay loam, 2 to 6 percent slopes, eroded	692	0.2
MlC2	Miamian silty clay loam, 6 to 12 percent slopes, eroded	4,163	1.2
MlD2	Miamian silty clay loam, 12 to 18 percent slopes, eroded	1,401	0.4
MmC3	Miamian clay loam, 6 to 12 percent slopes, severely eroded	482	0.1
MnC	Miamian-Urban land complex, 6 to 12 percent slopes	1,199	0.4
MoB	Milton silt loam, 2 to 6 percent slopes	1,168	0.3
MoC2	Milton silt loam, 6 to 12 percent slopes, eroded	301	0.1
MpB	Milton-Urban land complex, 2 to 6 percent slopes	468	0.1
MpC	Milton-Urban land complex, 6 to 12 percent slopes	317	0.1
MrB	Mitiwanga silt loam, 2 to 6 percent slopes	625	0.2
Ms	Montgomery silty clay loam	1,186	0.3
OcA	Ockley silt loam, 0 to 2 percent slopes	870	0.3
OcB	Ockley silt loam, 2 to 6 percent slopes	2,502	0.7
OcC2	Ockley silt loam, 6 to 12 percent slopes, eroded	441	0.1
Pm	Pewamo silty clay loam	8,943	2.6
Pn	Pewamo-Urban land complex	1,623	0.5
Pt	Pits, quarry	934	0.3
RhB	Ritchey silt loam, 2 to 6 percent slopes	753	0.2
RhD2	Ritchey silt loam, 12 to 18 percent slopes, eroded	555	0.2
Rs	Ross silt loam, occasionally flooded	3,080	0.9
Sh	Shoals silt loam, occasionally flooded	1,982	0.6
SlA	Sleeth silt loam, 0 to 2 percent slopes	1,197	0.3
SmA	Sleeth-Urban land complex, 0 to 2 percent slopes	381	0.1
So	Sloan silt loam, frequently flooded	2,412	0.7

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
ThA	Thackery silt loam, 0 to 2 percent slopes	371	0.1
ThB	Thackery silt loam, 2 to 6 percent slopes	596	0.2
Up	Udorthents, loamy, rolling	1,768	0.5
Ur	Udorthents, loamy, sloping	754	0.2
Us	Udorthents, loamy, steep	471	0.1
Ut	Udorthents-Urban land complex, gently rolling	7,991	2.3
Uu	Urban land-Bennington complex, 2 to 6 percent slopes	2,541	0.7
Uv	Urban land-Celina complex, 2 to 12 percent slopes	2,773	0.8
Uw	Urban land-Genesee complex, occasionally flooded	1,370	0.4
Ux	Urban land-Ockley complex, 0 to 6 percent slopes	1,461	0.4
WdA	Warsaw silt loam, 0 to 2 percent slopes	696	0.2
WdB	Warsaw silt loam, 2 to 6 percent slopes	886	0.3
WeA	Wea silt loam, 0 to 2 percent slopes	256	0.1
WeB	Wea silt loam, 2 to 6 percent slopes	612	0.2
Wt	Westland silty clay loam	3,114	0.9
	Water	4,538	1.3
	Total	344,064	100.0

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil]

Soil name and map symbol	Corn	Soybeans	Oats	Winter wheat	Grass-legume hay
	Bu	Bu	Bu	Bu	Ton
AdB----------------------- Alexandria	100	33	78	40	4.2
AdC2---------------------- Alexandria	90	29	65	33	3.7
AdD2---------------------- Alexandria	65	---	60	30	3.8
AdE2---------------------- Alexandria	---	---	---	---	3.5
Ag------------------------ Algiers	125	40	80	45	4.5
BeA----------------------- Bennington	110	35	65	40	4.3
BeB----------------------- Bennington	105	33	65	40	4.3
BfA----------------------- Bennington-Urban land	---	---	---	---	---
BfB----------------------- Bennington-Urban land	---	---	---	---	---
BoA----------------------- Blount	110	38	65	45	4.5
BoB----------------------- Blount	105	36	65	45	4.5
CaB----------------------- Cardington	105	33	78	42	4.3
CaB2---------------------- Cardington	90	30	75	40	4.0
CaC2---------------------- Cardington	80	28	73	33	3.6
CbB----------------------- Cardington-Urban land	---	---	---	---	---
CbC----------------------- Cardington-Urban land	---	---	---	---	---
Cc------------------------ Carlisle	---	---	---	---	---
CeA----------------------- Celina	110	40	80	50	4.5
CeB, CeB2----------------- Celina	105	37	75	48	4.5
CeC2---------------------- Celina	85	30	65	40	4.0
CfB----------------------- Celina-Urban land	---	---	---	---	---
Cn------------------------ Condit	80	28	55	30	3.5
CpA----------------------- Crane	120	48	66	50	4.4

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Oats	Winter wheat	Grass-legume hay
	Bu	Bu	Bu	Bu	Ton
CrA------------------------ Crosby	120	40	65	47	4.8
CrB------------------------ Crosby	115	37	65	47	4.8
CsA------------------------ Crosby-Urban land	---	---	---	---	---
CsB------------------------ Crosby-Urban land	---	---	---	---	---
Ee------------------------- Eel	125	42	---	---	4.8
ElA------------------------ Eldean	100	40	75	48	4.0
ElB------------------------ Eldean	95	35	70	48	4.0
ElC2----------------------- Eldean	80	25	60	44	3.5
ElD2----------------------- Eldean	60	20	50	35	3.2
EmA------------------------ Eldean-Urban land	---	---	---	---	---
EmB------------------------ Eldean-Urban land	---	---	---	---	---
Gn------------------------- Genesee	135	45	---	---	5.3
GwB------------------------ Glynwood	95	35	75	46	4.5
GwC2----------------------- Glynwood	80	28	65	38	4.0
HeE2----------------------- Hennepin and Miamian	---	---	---	---	---
HeF2----------------------- Hennepin and Miamian	---	---	---	---	---
KeA------------------------ Kendallville	110	42	80	50	4.8
KeB------------------------ Kendallville	110	40	80	50	4.8
KeC2----------------------- Kendallville	90	30	65	40	4.3
Ko------------------------- Kokomo	135	50	80	50	5.2
Ku------------------------- Kokomo-Urban land	---	---	---	---	---
LeB------------------------ Lewisburg-Crosby	93	34	65	43	3.8
Mh------------------------- Medway	140	45	---	---	5.2

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Oats	Winter wheat	Grass-legume hay
	Bu	Bu	Bu	Bu	Ton
MkB, MlB2 Miamian	105	38	80	50	4.5
MlC2 Miamian	95	32	70	46	3.8
MlD2 Miamian	70	20	60	35	3.0
MmC3 Miamian	65	20	50	35	2.5
MnC Miamian-Urban land	---	---	---	---	---
MoB Milton	90	35	75	40	4.0
MoC2 Milton	70	25	60	35	3.6
MpB Milton-Urban land	---	---	---	---	---
MpC Milton-Urban land	---	---	---	---	---
MrB Mitiwanga	85	30	65	40	4.1
Ms Montgomery	120	42	75	48	4.6
OcA Ockley	125	45	80	52	5.0
OcB Ockley	120	45	80	52	5.0
OcC2 Ockley	95	35	65	46	4.4
Pm Pewamo-Urban land	130	50	80	50	5.0
Pn Pewamo	---	---	---	---	---
Pt*. Pits					
RhB Ritchey	55	23	45	32	2.6
RhD2 Ritchey	---	---	---	---	---
Rs Ross	140	50	---	---	5.5
Sh Shoals	115	38	---	---	4.3
SlA Sleeth	120	42	65	48	4.8
SmA Sleeth-Urban land	---	---	---	---	---

See footnote at end of table.

TABLE 5.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Corn	Soybeans	Oats	Winter wheat	Grass-legume hay
	Bu	Bu	Bu	Bu	Ton
So------------------------ Sloan	120	42	---	---	4.6
ThA----------------------- Thackery	125	45	80	50	4.8
ThB----------------------- Thackery	120	42	80	50	4.8
Up*, Ur*, Us*. Udorthents					
Ut------------------------ Udorthents-Urban land	---	---	---	---	---
Uu------------------------ Urban land-Bennington	---	---	---	---	---
Uv------------------------ Urban land-Celina	---	---	---	---	---
Uw------------------------ Urban land-Genesee	---	---	---	---	---
Ux------------------------ Urban land-Ockley	---	---	---	---	---
WdA----------------------- Warsaw	110	42	80	50	4.4
WdB----------------------- Warsaw	105	38	80	50	4.4
WeA----------------------- Wea	140	50	84	52	5.3
WeB----------------------- Wea	135	50	84	52	5.3
Wt------------------------ Westland	140	49	80	50	5.0

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 6.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas are excluded. Absence of an entry indicates no acreage]

Class	Total acreage	Major management concerns (Subclass)		
		Erosion (e)	Wetness (w)	Soil problem (s)
		Acres	Acres	Acres
I	2,214	---	---	---
II	252,994	119,977	131,551	1,466
III	18,536	13,252	5,284	---
IV	3,620	3,620	---	---
V	200	---	200	---
VI	3,440	3,440	---	---
VII	1,334	1,334	---	---
VIII	---	---	---	---

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
AdB, AdC2 Alexandria	2o	Slight	Slight	Slight	Slight	Northern red oak White oak	80 75	Eastern white pine, black walnut, yellow-poplar.
AdD2, AdE2 Alexandria	2r	Moderate	Moderate	Slight	Slight	Northern red oak White oak	80 75	Eastern white pine, black walnut, yellow-poplar.
Ag Algiers	2o	Slight	Slight	Slight	Slight	Northern red oak Pin oak Eastern cottonwood White ash	76 90 100 ---	Eastern white pine, red maple, white ash.
BeA, BeB Bennington	2o	Slight	Slight	Slight	Slight	Pin oak Northern red oak Black oak Yellow-poplar Sugar maple	86 80 80 90 ---	Eastern white pine, yellow-poplar, Norway spruce.
BfA*, BfB*:								
Bennington	2o	Slight	Slight	Slight	Slight	Pin oak Northern red oak Black oak Yellow-poplar Sugar maple	86 80 80 90 ---	Eastern white pine, yellow-poplar, Norway spruce.
Urban land.								
BoA, BoB Blount	3o	Slight	Slight	Slight	Slight	White oak Northern red oak Green ash Bur oak Pin oak	65 65 --- --- ---	Eastern white pine, Scotch pine, eastern redcedar, red pine, yellow-poplar.
CaB, CaB2, CaC2 Cardington	2o	Slight	Slight	Slight	Slight	Northern red oak White oak Sugar maple Yellow-poplar	80 75 --- ---	Eastern white pine, black walnut, yellow-poplar.
CbB*, CbC*:								
Cardington	2o	Slight	Slight	Slight	Slight	Northern red oak White oak Sugar maple Yellow-poplar	80 75 --- ---	Eastern white pine, black walnut, yellow-poplar.
Urban land.								
CeA, CeB, CeB2, CeC2 Celina	1o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar	90 110	Eastern white pine, black walnut, red pine.
CfB*:								
Celina	1o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar	90 110	Eastern white pine, black walnut, red pine.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
CfB*:								
Urban land.								
Cn: Condit	2w	Slight	Severe	Moderate	Moderate	Pin oak	90	Yellow-poplar, red maple, white spruce.
						Northern red oak	80	
						Black oak	---	
						Red maple	---	
CpA: Crane	---	--------	--------	--------	--------	--------------------	---	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.
CrA, CrB: Crosby	3o	Slight	Slight	Slight	Slight	White oak	75	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.
						Pin oak	85	
						Yellow-poplar	85	
						Sweetgum	80	
						Northern red oak	75	
CsA*, CsB*:								
Crosby	3o	Slight	Slight	Slight	Slight	White oak	75	Eastern white pine, white ash, red maple, yellow-populár, American sycamore.
						Pin oak	85	
						Yellow-poplar	85	
						Sweetgum	80	
						Northern red oak	75	
Urban land.								
Ee: Eel	1o	Slight	Slight	Slight	Slight	Yellow-poplar	100	Eastern white pine, black walnut, yellow-poplar, black locust.
						Eastern cottonwood	---	
						White ash	---	
						Black walnut	---	
ElA, ElB, ElC2: Eldean	2o	Slight	Slight	Slight	Slight	Northern red oak	80	Eastern white pine, black walnut, yellow-poplar.
						Black oak	80	
						White oak	80	
ElD2: Eldean	2r	Moderate	Moderate	Slight	Slight	Northern red oak	80	Eastern white pine, black walnut, yellow-poplar.
						Black oak	80	
						White oak	80	
EmA*, EmB*:								
Eldean	2o	Slight	Slight	Slight	Slight	Northern red oak	80	Eastern white pine, black walnut, yellow-poplar.
						Black oak	80	
						White oak	80	
Urban land.								
Gn: Genesee	1o	Slight	Slight	Slight	Slight	Yellow-poplar	100	Eastern white pine, black walnut, yellow-poplar, black locust.
GwB, GwC2: Glynwood	2o	Slight	Slight	Slight	Slight	Northern red oak	80	Eastern white pine, yellow-poplar.
						Black oak	80	
						White oak	80	

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
HeE2*:								
Hennepin	1r	Moderate	Moderate	Slight	Slight	Northern red oak White oak	86 ---	Northern red oak, white oak, green ash, black walnut, eastern white pine, red pine, eastern redcedar.
Miamian	1r	Severe	Moderate	Slight	Slight	Northern red oak Black walnut White oak Yellow-poplar	87 --- --- ---	Eastern white pine, black walnut, yellow-poplar.
HeF2*:								
Hennepin	1r	Severe	Severe	Slight	Slight	Northern red oak White oak	86 ---	Northern red oak, white oak, green ash, black walnut, eastern white pine, red pine, eastern redcedar.
Miamian	1r	Moderate	Severe	Slight	Slight	Northern red oak Black walnut White oak Yellow-poplar	87 --- --- ---	Eastern white pine, black walnut, yellow-poplar.
KeA, KeB, KeC2 Kendallville	1o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar	87 95	Eastern white pine, black walnut, red pine.
Ko Kokomo	2w	Slight	Severe	Severe	Severe	Pin oak White oak Northern red oak	86 75 76	Norway spruce, red maple, white ash.
Ku*:								
Kokomo	2w	Slight	Severe	Severe	Severe	Pin oak White oak Northern red oak	86 75 76	Norway spruce, red maple, white ash.
Urban land.								
LeB*:								
Lewisburg	2o	Slight	Slight	Slight	Slight	White oak Northern red oak	75 80	Eastern white pine, yellow-poplar.
Crosby	3o	Slight	Slight	Slight	Slight	White oak Pin oak Yellow-poplar Sweetgum Northern red oak	75 85 85 80 75	Eastern white pine, white ash, red maple, yellow-poplar, American sycamore.
Mh Medway	1o	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar Sugar maple Eastern cottonwood	90 100 --- ---	Eastern white pine, yellow-poplar, black walnut, Norway spruce.
MkB Miamian	1o	Slight	Slight	Slight	Slight	Northern red oak Black walnut White oak Yellow-poplar	87 --- --- ---	Eastern white pine, black walnut, yellow-poplar.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Trees to plant
MlB2, MlC2--------- Miamian	1o	Slight	Moderate	Moderate	Slight	Northern red oak---- Black walnut-------- White oak----------- Yellow-poplar-------	87 --- --- ---	Eastern white pine, black walnut, yellow-poplar.
MlD2--------------- Miamian	1r	Moderate	Moderate	Moderate	Slight	Northern red oak---- Black walnut-------- White oak----------- Yellow-poplar-------	87 --- --- ---	Eastern white pine, black walnut, yellow-poplar.
MmC3--------------- Miamian	1o	Slight	Moderate	Moderate	Slight	Northern red oak---- Black walnut-------- White oak----------- Yellow-poplar-------	87 --- --- ---	Eastern white pine, black walnut, yellow-poplar.
MnC*: Miamian-----------	1o	Slight	Slight	Slight	Slight	Northern red oak---- Black walnut-------- White oak----------- Yellow-poplar-------	87 --- --- ---	Eastern white pine, black walnut, yellow-poplar.
Urban land.								
MoB, MoC2---------- Milton	2o	Slight	Slight	Slight	Slight	Northern red oak---- Yellow-poplar------- Black walnut-------- Black cherry--------	80 95 --- ---	Eastern white pine, black walnut, yellow-poplar.
MpB*, MpC*: Milton------------	2o	Slight	Slight	Slight	Slight	Northern red oak---- Yellow-poplar------- Black walnut-------- Black cherry--------	80 95 --- ---	Eastern white pine, black walnut, yellow-poplar.
Urban land.								
MrB---------------- Mitiwanga	3o	Slight	Slight	Slight	Slight	Northern red oak----	70	Eastern white pine, yellow-poplar.
Ms----------------- Montgomery	2w	Slight	Severe	Severe	Severe	Pin oak------------- White oak----------- Sweetgum------------	86 75 90	Norway spruce, red maple, white ash, sweetgum.
OcA, OcB, OcC2----- Ockley	1o	Slight	Slight	Slight	Slight	White oak----------- Northern red oak---- Yellow-poplar-------	90 90 98	Eastern white pine, red pine, white ash, yellow-poplar, black walnut, black locust.
Pm----------------- Pewamo	2w	Slight	Severe	Severe	Severe	Red maple----------- American basswood--- Pin oak------------- Silver maple-------- Bur oak------------- Bitternut hickory--- Black ash----------- Eastern cottonwood--	66 --- 86 --- --- --- --- ---	Eastern cottonwood, black spruce, white ash, white spruce, Norway spruce, sweetgum, red maple.

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
Pn*:								
Pewamo	2w	Slight	Severe	Severe	Severe	Red maple	66	Eastern cottonwood,
						American basswood	---	black spruce,
						Pin oak	86	white ash,
						Silver maple	---	white spruce,
						Bur oak	---	Norway spruce,
						Bitternut hickory	---	sweetgum,
						Black ash	---	red maple.
						Eastern cottonwood	---	
Urban land.								
RhB Ritchey	5d	Slight	Slight	Moderate	Moderate	Northern red oak	50	Shortleaf pine,
						White oak	50	eastern redcedar,
						Eastern redcedar	---	white oak.
						Bur oak	---	
RhD2 Ritchey	5d	Moderate	Moderate	Moderate	Moderate	Northern red oak	50	Shortleaf pine,
						White oak	50	eastern redcedar,
						Eastern redcedar	---	white oak.
						Bur oak	---	
Rs Ross	1o	Slight	Slight	Slight	Slight	Northern red oak	90	Eastern white pine,
						Yellow-poplar	100	black walnut,
						Sugar maple	85	white ash,
								Norway spruce,
								yellow-poplar.
Sh Shoals	2o	Slight	Slight	Slight	Slight	Pin oak	90	Sweetgum,
						Sweetgum	85	red maple,
						Yellow-poplar	90	swamp chestnut oak,
						Virginia pine	90	pin oak,
						Eastern cottonwood	---	yellow-poplar.
						White ash	---	
SlA Sleeth	3o	Slight	Slight	Slight	Slight	Pin oak	85	Eastern white pine,
						Yellow-poplar	85	white ash,
						White oak	75	red maple,
								yellow-poplar,
								American sycamore.
SmA*:								
Sleeth	3o	Slight	Slight	Slight	Slight	Pin oak	85	Eastern white pine,
						Yellow-poplar	85	white ash,
						White oak	75	red maple,
								yellow-poplar,
								American sycamore.
Urban land.								
So Sloan	2w	Slight	Severe	Severe	Severe	Pin oak	87	Norway spruce,
						Swamp white oak	---	red maple,
						Red maple	---	white ash.
ThA, ThB Thackery	1o	Slight	Slight	Slight	Slight	Northern red oak	90	Eastern white pine,
						White oak	90	black walnut,
								yellow-poplar,
								white ash,
								Norway spruce.
Uu*:								
Urban land.								

See footnote at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
Uu*:								
Bennington	2o	Slight	Slight	Slight	Slight	Pin oak	86	Eastern white pine, yellow-poplar, Norway spruce.
						Northern red oak	80	
						Black oak	80	
						Yellow-poplar	90	
						Sugar maple	---	
Uv*:								
Urban land.								
Celina	1o	Slight	Slight	Slight	Slight	Northern red oak	90	Eastern white pine, black walnut, red pine.
						Yellow-poplar	110	
Ux*:								
Urban land.								
Ockley	1o	Slight	Slight	Slight	Slight	White oak	90	Eastern white pine, red pine, white ash, yellow-poplar, black walnut, black locust.
						Northern red oak	90	
						Yellow-poplar	98	
WdA, WdB Warsaw	---	---	---	---	---	---	---	Eastern white pine, Norway spruce, red pine, black walnut, white ash.
WeA, WeB Wea	---	---	---	---	---	---	---	Eastern white pine, red pine, black walnut, black locust, yellow-poplar, white ash.
Wt Westland	2w	Slight	Severe	Severe	Severe	Pin oak	86	Norway spruce, red maple, white ash, sweetgum.
						White oak	75	

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
AdB------ Alexandria	Moderate: percs slowly.	Slight------	Moderate: slope, percs slowly.	Slight------	Slight.
AdC2------ Alexandria	Moderate: slope, percs slowly.	Moderate: slope.	Severe: slope.	Slight------	Moderate: slope.
AdD2, AdE2------ Alexandria	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Ag------ Algiers	Severe: floods, wetness.	Severe: wetness.	Severe: floods, wetness.	Moderate: wetness, floods.	Severe: floods, wetness.
BeA, BeB------ Bennington	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Severe: wetness.
BfA*, BfB*:					
Bennington------	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Severe: wetness.
Urban land.					
BoA, BoB------ Blount	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
CaB, CaB2------ Cardington	Moderate: percs slowly, wetness.	Moderate: wetness.	Moderate: wetness, slope, percs slowly.	Slight------	Slight.
CaC2------ Cardington	Moderate: slope, percs slowly, wetness.	Moderate: slope, wetness.	Severe: slope.	Slight------	Moderate: slope.
CbB*:					
Cardington------	Moderate: percs slowly, wetness.	Moderate: wetness.	Moderate: wetness, slope, percs slowly.	Slight------	Slight.
Urban land.					
CbC*:					
Cardington------	Moderate: slope, percs slowly, wetness.	Moderate: slope, wetness.	Severe: slope.	Slight------	Moderate: slope.
Urban land.					
Cc------ Carlisle	Severe: floods, wetness, excess humus.	Severe: wetness, excess humus.	Severe: excess humus, wetness, floods.	Severe: wetness, excess humus.	Severe: excess humus, wetness, floods.
CeA------ Celina	Moderate: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness, percs slowly.	Slight------	Moderate: wetness.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
CeB, CeB2: Celina	Moderate: wetness, percs slowly.	Moderate: wetness.	Moderate: slope, wetness, percs slowly.	Slight	Moderate: wetness.
CeC2: Celina	Moderate: slope, wetness, percs slowly.	Moderate: slope, wetness.	Severe: slope.	Slight	Moderate: wetness, slope.
CfB*:					
Celina	Moderate: wetness, percs slowly.	Moderate: wetness.	Moderate: slope, wetness, percs slowly.	Slight	Moderate: wetness.
Urban land.					
Cn: Condit	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, percs slowly.
CpA: Crane	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
CrA, CrB: Crosby	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
CsA*, CsB*:					
Crosby	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Urban land.					
Ee: Eel	Severe: floods.	Slight	Moderate: floods.	Slight	Moderate: floods.
ElA: Eldean	Slight	Slight	Moderate: small stones.	Slight	Moderate: small stones.
ElB: Eldean	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: small stones.
ElC2: Eldean	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope, small stones.
ElD2: Eldean	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
EmA*:					
Eldean	Slight	Slight	Moderate: small stones.	Slight	Moderate: small stones.
Urban land.					
EmB*:					
Eldean	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: small stones.
Urban land.					
Gn: Genesee	Severe: floods.	Slight	Moderate: floods.	Slight	Moderate: floods.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
GwB: Glynwood	Moderate: percs slowly, wetness.	Moderate: wetness.	Moderate: wetness, slope.	Slight	Moderate: wetness.
GwC2: Glynwood	Moderate: slope, percs slowly, wetness.	Moderate: slope, wetness.	Severe: slope.	Slight	Moderate: wetness, slope.
HeE2*:					
Hennepin	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Miamian	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
HeF2*:					
Hennepin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Miamian	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
KeA: Kendallville	Moderate: percs slowly.	Slight	Moderate: percs slowly.	Slight	Slight.
KeB: Kendallville	Moderate: percs slowly.	Slight	Moderate: slope, percs slowly.	Slight	Slight.
KeC2: Kendallville	Moderate: slope, percs slowly.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Ko: Kokomo	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Ku*:					
Kokomo	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Urban land.					
LeB*:					
Lewisburg	Moderate: wetness, percs slowly.	Moderate: wetness.	Moderate: slope, wetness.	Slight	Slight.
Crosby	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Mh: Medway	Severe: floods.	Moderate: wetness.	Moderate: wetness, floods.	Slight	Moderate: floods.
MkB: Miamian	Moderate: percs slowly.	Slight	Moderate: slope, percs slowly.	Slight	Slight.
MlB2: Miamian	Moderate: percs slowly.	Moderate: too clayey.	Moderate: slope, too clayey, percs slowly.	Moderate: too clayey.	Moderate: too clayey.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
MlC2------------------ Miamian	Moderate: slope, percs slowly.	Moderate: too clayey, slope.	Severe: slope.	Moderate: too clayey.	Moderate: too clayey, slope.
MlD2------------------ Miamian	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: too clayey, slope.	Severe: slope.
MmC3------------------ Miamian	Moderate: slope, percs slowly.	Moderate: too clayey, slope.	Severe: slope.	Moderate: too clayey.	Moderate: too clayey, slope.
MnC*:					
Miamian--------------	Moderate: slope, percs slowly.	Moderate: slope.	Severe: slope.	Slight------------	Moderate: slope.
Urban land.					
MoB------------------- Milton	Moderate: percs slowly.	Slight----------	Moderate: depth to rock, slope.	Slight------------	Moderate: thin layer.
MoC2------------------ Milton	Moderate: slope, percs slowly.	Moderate: slope.	Severe: slope.	Slight------------	Moderate: slope, thin layer.
MpB*:					
Milton---------------	Moderate: percs slowly.	Slight----------	Moderate: depth to rock, slope.	Slight------------	Moderate: thin layer.
Urban land.					
MpC*:					
Milton---------------	Moderate: slope, percs slowly.	Moderate: slope.	Severe: slope.	Slight------------	Moderate: slope, thin layer.
Urban land.					
MrB------------------- Mitiwanga	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Severe: wetness.
Ms-------------------- Montgomery	Severe: ponding.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.
OcA------------------- Ockley	Slight----------	Slight----------	Slight----------	Slight------------	Slight.
OcB------------------- Ockley	Slight----------	Slight----------	Moderate: slope.	Slight------------	Slight.
OcC2------------------ Ockley	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight------------	Moderate: slope.
Pm-------------------- Pewamo	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Pn*:					
Pewamo---------------	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Urban land.					

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Pt*. Pits					
RhB Ritchey	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Severe: thin layer.
RhD2 Ritchey	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Moderate: slope.	Severe: thin layer, slope.
Rs Ross	Severe: floods.	Slight	Moderate: floods.	Slight	Moderate: floods.
Sh Shoals	Severe: floods, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, floods.
SlA Sleeth	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
SmA*: Sleeth	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Urban land.					
So Sloan	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.	Severe: wetness.	Severe: wetness, floods.
ThA Thackery	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Slight	Moderate: wetness.
ThB Thackery	Moderate: wetness.	Moderate: wetness.	Moderate: slope, wetness.	Slight	Moderate: wetness.
Up*, Ur*, Us*. Udorthents					
Ut*: Udorthents.					
Urban land.					
Uu*: Urban land.					
Bennington	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Severe: wetness.
Uv*: Urban land.					
Celina	Moderate: wetness, percs slowly.	Moderate: wetness.	Severe: slope.	Slight	Moderate: wetness.
Uw*: Urban land.					
Genesee	Severe: floods.	Slight	Moderate: floods.	Slight	Moderate: floods.
Ux*: Urban land.					
Ockley	Slight	Slight	Moderate: slope.	Slight	Slight.
WdA Warsaw	Slight	Slight	Slight	Slight	Slight.

See footnote at end of table.

TABLE 8.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
WdB: Warsaw	Slight	Slight	Moderate: slope.	Slight	Slight.
WeA: Wea	Slight	Slight	Slight	Slight	Slight.
WeB: Wea	Slight	Slight	Moderate: slope.	Slight	Slight.
Wt: Westland	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
AdB: Alexandria	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
AdC2: Alexandria	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
AdD2, AdE2: Alexandria	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Ag: Algiers	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
BeA: Bennington	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
BeB: Bennington	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
BfA*:										
Bennington	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Urban land.										
BfB*:										
Bennington	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Urban land.										
BoA: Blount	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
BoB: Blount	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
CaB, CaB2: Cardington	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
CaC2: Cardington	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
CbB*:										
Cardington	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Urban land.										
gton	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
..nd.										
Cc: Carlisle	Very poor.	Very poor.	Poor	Poor	Poor	Good	Good	Very poor.	Poor	Good.
CeA: Celina	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
CeB, CeB2: Celina	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
CeC2: Celina	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
CfB*:										
Celina	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Urban land.										
Cn: Condit	Poor	Fair	Fair	Fair	Fair	Good	Fair	Fair	Fair	Fair.
CpA: Crane	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
CrA: Crosby	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
CrB: Crosby	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
CsA*:										
Crosby	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Urban land.										
CsB*:										
Crosby	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Urban land.										
Ee: Eel	Good	Good	Fair	Good	Good	Poor	Poor	Good	Good	Poor.
ElA: Eldean	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
ElB: Eldean	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
ElC2: Eldean	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
ElD2: Eldean	Poor	Fair	Good	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
EmA*:										
Eldean	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Urban land.										
EmB*:										
Eldean	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Urban land.										

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Gn: Genesee	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
GwB: Glynwood	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
GwC2: Glynwood	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
HeE2*:										
Hennepin	Poor	Fair	Good	Good	Fair	Very poor.	Very poor.	Fair	Good	Very poor.
Miamian	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
HeF2*:										
Hennepin	Very poor.	Poor	Good	Good	Fair	Very poor.	Very poor.	Poor	Good	Very poor.
Miamian	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
KeA: Kendallville	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
KeB: Kendallville	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
KeC2: Kendallville	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Ko: Kokomo	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Ku*:										
Kokomo	Very poor.	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
Urban land.										
LeB*:										
Lewisburg	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Crosby	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Mh: Medway	Good	Good	Fair	Good	Good	Poor	Poor	Good	Good	Poor.
MkB, MlB2: Miamian	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
MlC2: Miamian	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
MlD2: Miamian	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
MmC3: Miamian	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
MnC*:										
Miamian	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Urban land.										
MoB Milton	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
MoC2 Milton	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
MpB*:										
Milton	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Urban land.										
MpC*:										
Milton	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Urban land.										
MrB Mitiwanga	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Ms Montgomery	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
OcA, OcB Ockley	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
OcC2 Ockley	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Pm Pewamo	Good	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Pn*:										
Pewamo	Good	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Urban land.										
Pt*. Pits										
RhB, RhD2 Ritchey	Poor	Poor	Fair	Poor	Poor	Poor	Very poor.	Poor	Poor	Very poor.
Rs Ross	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Sh Shoals	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
SlA Sleeth	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
SmA*:										
Sleeth	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Urban land.										

See footnote at end of table.

TABLE 9.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
So-----------------Sloan	Poor	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.
ThA----------------Thackery	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
ThB----------------Thackery	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Up*, Ur*, Us*. Udorthents										
Ut*:										
Udorthents.										
Urban land.										
Uu*:										
Urban land.										
Uu*:										
Bennington---------	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Uv*:										
Urban land.										
Celina-------------	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Uw*:										
Urban land.										
Genesee.										
Ux*:										
Urban land.										
Ockley-------------	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
WdA, WdB-----------Warsaw	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
WeA, WeB-----------Wea	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Wt-----------------Westland	Fair	Poor	Poor	Poor	Poor	Good	Good	Poor	Poor	Good.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
AdB-------------- Alexandria	Slight---------	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: slope, low strength, shrink-swell.	Severe: low strength.	Slight.
AdC2------------- Alexandria	Moderate: slope.	Moderate: shrink-swell, low strength, slope.	Moderate: shrink-swell, low strength, slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
AdD2, AdE2-------- Alexandria	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.	Severe: slope.
Ag--------------- Algiers	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, low strength, wetness.	Severe: floods, wetness.
BeA, BeB---------- Bennington	Severe: wetness.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: frost action, wetness, low strength.	Severe: wetness.
BfA*, BfB*:						
Bennington-------	Severe: wetness.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: frost action, wetness, low strength.	Severe: wetness.
Urban land.						
BoA, BoB---------- Blount	Severe: wetness.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: frost action, low strength.	Moderate: wetness.
CaB, CaB2--------- Cardington	Moderate: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: slope, wetness, shrink-swell.	Severe: frost action, low strength.	Slight.
CaC2------------- Cardington	Moderate: wetness, slope.	Moderate: slope, wetness, shrink-swell.	Severe: wetness.	Severe: slope.	Severe: frost action, low strength.	Moderate: slope.
CbB*:						
Cardington-------	Moderate: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: slope, wetness, shrink-swell.	Severe: frost action, low strength.	Slight.
Urban land.						
CbC*:						
Cardington-------	Moderate: wetness, slope.	Moderate: wetness, shrink-swell, slope.	Severe: wetness.	Severe: slope.	Severe: frost action, low strength.	Moderate: slope.
Urban land.						

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Cc----------------- Carlisle	Severe: floods, wetness, excess humus.	Severe: wetness, low strength, floods.	Severe: wetness, low strength, floods.	Severe: wetness, low strength, floods.	Severe: low strength, wetness, floods.	Severe: excess humus, wetness, floods.
CeA---------------- Celina	Severe: wetness.	Moderate: wetness, shrink-swell, low strength.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Moderate: wetness.
CeB, CeB2---------- Celina	Severe: wetness.	Moderate: wetness, shrink-swell, low strength.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength, frost action.	Moderate: wetness.
CeC2--------------- Celina	Severe: wetness.	Moderate: wetness, shrink-swell, low strength.	Severe: wetness.	Severe: slope.	Severe: low strength, frost action.	Moderate: wetness, slope.
CfB*:						
Celina------------	Severe: wetness.	Moderate: wetness, shrink-swell, low strength.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength, frost action.	Moderate: wetness.
Urban land.						
Cn----------------- Condit	Severe: wetness.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, frost action, low strength.	Severe: wetness, percs slowly.
CpA---------------- Crane	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, low strength.	Moderate: wetness.
CrA, CrB----------- Crosby	Severe: wetness.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: frost action, low strength.	Moderate: wetness.
CsA*, CsB*:						
Crosby------------	Severe: wetness.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: frost action, low strength.	Moderate: wetness.
Urban land.						
Ee----------------- Eel	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods, frost action.	Moderate: floods.
ElA---------------- Eldean	Severe: cutbanks cave.	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.	Severe: low strength.	Moderate: small stones.
ElB---------------- Eldean	Severe: cutbanks cave.	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.	Moderate: slope, low strength, shrink-swell.	Severe: low strength,	Moderate: small stones.
ElC2--------------- Eldean	Severe: cutbanks cave.	Moderate: slope, low strength, shrink-swell.	Moderate: slope, low strength, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope, small stones.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
ElD2: Eldean	Severe: slope, cutbanks cave.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.	Severe: slope.
EmA*:						
Eldean	Severe: cutbanks cave.	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.	Severe: low strength.	Moderate: small stones.
Urban land.						
EmB*:						
Eldean	Severe: cutbanks cave.	Moderate: low strength, shrink-swell.	Moderate: low strength, shrink-swell.	Moderate: slope, low strength, shrink-swell.	Severe: low strength.	Moderate: small stones.
Urban land.						
Gn: Genesee	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
GwB: Glynwood	Severe: wetness.	Moderate: wetness, shrink-swell, low strength.	Severe: wetness.	Moderate: slope, shrink-swell, wetness.	Severe: frost action, low strength.	Moderate: wetness.
GwC2: Glynwood	Severe: wetness.	Moderate: slope, shrink-swell, wetness.	Severe: wetness.	Severe: slope.	Severe: frost action, low strength.	Moderate: wetness, slope.
HeE2*, HeF2*:						
Hennepin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.	Severe: slope.
Miamian	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.	Severe: slope.
KeA: Kendallville	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, frost action.	Slight.
KeB: Kendallville	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Moderate: low strength, frost action.	Slight.
KeC2: Kendallville	Moderate: slope.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: low strength, slope, frost action.	Moderate: slope.
Ko: Kokomo	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Ku*:						
Kokomo	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, low strength.	Severe: ponding.
Urban land.						
LeB*:						
Lewisburg	Moderate: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: slope, wetness.	Moderate: low strength, wetness.	Slight.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
LeB*:						
Crosby	Severe: wetness.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: frost action, low strength.	Moderate: wetness.
Mh: Medway	Severe: floods, wetness.	Severe: floods.	Severe: floods, wetness.	Severe: floods.	Severe: low strength, floods, frost action.	Moderate: floods.
MkB: Miamian	Slight	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: slope, shrink-swell, low strength.	Severe: low strength.	Slight.
MlB2: Miamiam	Slight	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: slope, shrink-swell, low strength.	Severe: low strenth.	Moderate: too clayey.
MlC2: Miamian	Moderate: slope.	Moderate: slope, shrink-swell, low strength.	Moderate: slope, shrink-swell, low strength.	Severe: slope.	Severe: low strength.	Moderate: too clayey, slope.
MlD2: Miamian	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, low strength.	Severe: slope.
MmC3: Miamian	Moderate: slope.	Moderate: slope, shrink-swell, low strength.	Moderate: slope, shrink-swell, low strength.	Severe: slope.	Severe: low strength.	Moderate: too clayey, slope.
MnC*:						
Miamian	Moderate: slope.	Moderate: slope, shrink-swell, low strength.	Moderate: slope, shrink-swell, low strength.	Severe: slope.	Severe: low strength.	Moderate: slope.
Urban land.						
MoB: Milton	Severe: depth to rock.	Moderate: depth to rock, shrink-swell.	Severe: depth to rock.	Moderate: slope, depth to rock, shrink-swell.	Severe: low strength.	Moderate: thin layer.
MoC2: Milton	Severe: depth to rock.	Moderate: slope, depth to rock, shrink-swell.	Severe: depth to rock.	Severe: slope.	Severe: low strength.	Moderate: slope, thin layer.
MpB*:						
Milton	Severe: depth to rock.	Moderate: depth to rock, shrink-swell.	Severe: depth to rock.	Moderate: slope, depth to rock, shrink-swell.	Severe: low strength.	Moderate: thin layer.
Urban land.						
MpC*:						
Milton	Severe: depth to rock.	Moderate: slope, depth to rock, shrink-swell.	Severe: depth to rock.	Severe: slope.	Severe: low strength.	Moderate: slope, thin layer.
Urban land.						

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
MrB: Mitiwanga	Severe: depth to rock, wetness.	Severe: wetness.	Severe: depth to rock, wetness.	Severe: wetness.	Severe: frost action, low strength, wetness.	Severe: wetness, thin layer.
Ms: Montgomery	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, shrink-swell.	Severe: ponding.
OcA: Ockley	Severe: cutbanks cave.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Severe: low strength.	Slight.
OcB: Ockley	Severe: cutbanks cave.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, slope, low strength.	Severe: low strength.	Slight.
OcC2: Ockley	Severe: cutbanks cave.	Moderate: shrink-swell, slope, low strength.	Moderate: slope, shrink-swell, low strength.	Severe: slope.	Severe: low strength.	Moderate: slope.
Pm: Pewamo	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Pn*:						
Pewamo	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Urban land.						
Pt*. Pits						
RhB: Ritchey	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: thin layer.
RhD2: Ritchey	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: thin layer, slope.
Rs: Ross	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: low strength, floods.	Moderate: floods.
Sh: Shoals	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, frost action.	Moderate: wetness, floods.
SlA: Sleeth	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, low strength.	Moderate: wetness.
SmA*:						
Sleeth	Severe: wetness, cutbanks cave.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action, low strength.	Moderate: wetness.
Urban land.						
So: Sloan	Severe: wetness, floods.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: wetness, floods, frost action.	Severe: wetness, floods.

See footnote at end of table.

TABLE 10.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
ThA---------------- Thackery	Severe: wetness, cutbanks cave.	Moderate: wetness, shrink-swell, low strength.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength.	Moderate: wetness.
ThB---------------- Thackery	Severe: wetness, cutbanks cave.	Moderate: wetness, shrink-swell, low strength.	Severe: wetness.	Moderate: slope, wetness, shrink-swell.	Severe: low strength.	Moderate: wetness.
Up*, Ur*, Us*. Udorthents						
Ut*: Udorthents.						
Urban land.						
Uu*: Urban land.						
Bennington--------	Severe: wetness.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: wetness, low strength.	Severe: frost action, wetness, low strength.	Severe: wetness.
Uv*: Urban land.						
Celina------------	Severe: wetness.	Moderate: wetness, shrink-swell, low strength.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength, frost action.	Moderate: wetness.
Uw*: Urban land.						
Genesee-----------	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Moderate: floods.
Ux*: Urban land.						
Ockley------------	Severe: cutbanks cave.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Moderate: shrink-swell, low strength.	Severe: low strength.	Slight.
WdA---------------- Warsaw	Severe: cutbanks cave.	Moderate: low strength.	Moderate: low strength.	Moderate: low strength.	Severe: low strength.	Slight.
WdB---------------- Warsaw	Severe: cutbanks cave.	Moderate: low strength.	Moderate: low strength.	Moderate: slope, low strength.	Severe: low strength.	Slight.
WeA---------------- Wea	Severe: cutbanks cave.	Moderate: low strength, shrink-swell.	Moderate: shrink-swell, low strength.	Moderate: low strength, shrink-swell.	Severe: low strength.	Slight.
WeB---------------- Wea	Severe: cutbanks cave.	Moderate: low strength, shrink-swell.	Moderate: shrink-swell, low strength.	Moderate: slope, low strength, shrink-swell.	Severe: low strength.	Slight.
Wt----------------- Westland	Severe: ponding, cutbanks cave.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
AdB: Alexandria	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
AdC2: Alexandria	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Moderate: slope.	Fair: too clayey, slope.
AdD2, AdE2: Alexandria	Severe: slope, percs slowly.	Severe: slope.	Moderate: too clayey, slope.	Severe: slope.	Poor: slope.
Ag: Algiers	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
BeA: Bennington	Severe: percs slowly, wetness.	Slight	Severe: wetness.	Severe: wetness.	Poor: wetness.
BeB: Bennington	Severe: percs slowly, wetness.	Moderate: slope.	Severe: wetness.	Severe: wetness.	Poor: wetness.
BfA*:					
Bennington	Severe: percs slowly, wetness.	Slight	Severe: wetness.	Severe: wetness.	Poor: wetness.
Urban land.					
BfB*:					
Bennington	Severe: percs slowly, wetness.	Moderate: slope.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Urban land.					
BoA: Blount	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Severe: wetness.	Poor: wetness.
BoB: Blount	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Severe: wetness.	Poor: wetness.
CaB, CaB2: Cardington	Severe: percs slowly, wetness.	Severe: wetness.	Moderate: wetness, too clayey.	Moderate: wetness.	Fair: too clayey, wetness.
CaC2: Cardington	Severe: percs slowly, wetness.	Severe: slope, wetness.	Moderate: wetness, too clayey.	Moderate: slope, wetness.	Fair: slope, too clayey, wetness.
CbB*:					
Cardington	Severe: percs slowly, wetness.	Severe: wetness.	Moderate: wetness, too clayey.	Moderate: wetness.	Fair: too clayey, wetness.
Urban land.					

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
CbC*:					
Cardington	Severe: percs slowly, wetness.	Severe: slope, wetness.	Moderate: wetness, too clayey.	Moderate: slope, wetness.	Fair: slope, too clayey, wetness.
Urban land.					
Cc: Carlisle	Severe: floods, wetness.	Severe: wetness, excess humus, seepage.	Severe: floods, wetness, seepage.	Severe: floods, wetness, seepage.	Poor: wetness, excess humus.
CeA, CeB, CeB2: Celina	Severe: percs slowly, wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Fair: too clayey, wetness.
CeC2: Celina	Severe: percs slowly, wetness.	Severe: slope, wetness.	Severe: wetness.	Moderate: wetness, slope.	Fair: too clayey, wetness, slope.
CfB*:					
Celina	Severe: percs slowly, wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Fair: too clayey, wetness.
Urban land.					
Cn: Condit	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
CpA: Crane	Severe: wetness, percs slowly.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness, seepage.	Poor: wetness.
CrA, CrB: Crosby	Severe: percs slowly, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
CsA*, CsB*:					
Crosby	Severe: percs slowly, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Urban land.					
Ee: Eel	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Good.
ElA, ElB: Eldean	Slight	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: small stones, seepage.
ElC2: Eldean	Moderate: slope.	Severe: slope, seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: small stones, seepage.
ElD2: Eldean	Severe: slope.	Severe: slope, seepage.	Severe: seepage, too sandy.	Severe: slope, seepage.	Poor: slope, small stones, seepage.
EmA*, EmB*:					
Eldean	Slight	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: small stones, seepage.
Urban land.					

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Gn: Genesee	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Good.
GwB: Glynwood	Severe: percs slowly, wetness.	Moderate: slope.	Severe: wetness.	Moderate: wetness.	Fair: too clayey, wetness.
GwC2: Glynwood	Severe: percs slowly, wetness.	Severe: slope.	Severe: wetness.	Moderate: slope, wetness.	Fair: slope, too clayey, wetness.
HeE2*:					
Hennepin	Severe: slope, percs slowly.	Severe: slope.	Moderate: slope.	Severe: slope.	Poor: slope.
Miamian	Severe: slope, percs slowly.	Severe: slope.	Moderate: slope.	Severe: slope.	Poor: slope.
HeF2*:					
Hennepin	Severe: slope, percs slowly.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Miamian	Severe: slope, percs slowly.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
KeA: Kendallville	Severe: percs slowly.	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
KeB: Kendallville	Severe: percs slowly.	Moderate: slope, seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
KeC2: Kendallville	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Moderate: slope.	Fair: slope, too clayey.
Ko: Kokomo	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding, hard to pack.
Ku*:					
Kokomo	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding, hard to pack.
Urban land.					
LeB*:					
Lewisburg	Severe: percs slowly, wetness.	Moderate: slope.	Moderate: wetness.	Moderate: wetness.	Fair: wetness.
Crosby	Severe: percs slowly, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Mh: Medway	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Fair: wetness.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
MkB, MlB2: Miamian	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
MlC2: Miamian	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Moderate: slope.	Fair: slope, too clayey.
MlD2: Miamian	Severe: slope, percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Severe: slope.	Poor: slope.
MmC3: Miamian	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Moderate: slope.	Fair: slope, too clayey.
MnC*:					
Miamian	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Moderate: slope.	Fair: slope, too clayey.
Urban land.					
MoB: Milton	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Moderate: depth to rock.	Poor: area reclaim, thin layer.
MoC2: Milton	Severe: depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: area reclaim, thin layer.
MpB*:					
Milton	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Moderate: depth to rock.	Poor: area reclaim, thin layer.
Urban land.					
MpC*:					
Milton	Severe: depth to rock, percs slowly.	Severe: slope, depth to rock.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: area reclaim, thin layer.
Urban land.					
MrB: Mitiwanga	Severe: depth to rock, wetness.	Severe: depth to rock, wetness.	Severe: depth to rock, wetness.	Severe: wetness.	Poor: wetness, area reclaim.
Ms: Montgomery	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey hard to pack, ponding.
OcA, OcB: Ockley	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: too clayey.
OcC2: Ockley	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Fair: slope, too clayey.
Pm: Pewamo	Severe: percs slowly, ponding.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Pn*:					
Pewamo	Severe: percs slowly, ponding.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
Urban land.					
Pt*. Pits					
RhB Ritchey	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
RhD2 Ritchey	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: slope, depth to rock.	Poor: area reclaim, slope.
Rs Ross	Severe: floods.	Severe: floods, seepage.	Severe: floods, wetness, seepage.	Severe: floods, seepage.	Good.
Sh Shoals	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
SlA Sleeth	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: wetness.
SmA*:					
Sleeth	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Poor: wetness.
Urban land.					
So Sloan	Severe: wetness, floods, percs slowly.	Severe: floods, wetness.	Severe: floods, wetness.	Severe: floods, wetness.	Poor: wetness.
ThA, ThB Thackery	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Fair: too clayey, wetness.
Up*, Ur*, Us*. Udorthents					
Ut*:					
Udorthents.					
Urban land.					
Uu*:					
Urban land.					
Bennington	Severe: percs slowly, wetness.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: wetness, too clayey.
Uv*:					
Urban land.					

See footnote at end of table.

TABLE 11.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Uv*:					
Celina	Severe: percs slowly, wetness.	Severe: slope, wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
Uw*:					
Urban land.					
Genesee	Severe: floods.	Severe: floods.	Severe: floods.	Severe: floods.	Good.
Ux*:					
Urban land.					
Ockley	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: too clayey.
WdA, WdB Warsaw	Slight	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: small stones.
WeA, WeB Wea	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: too clayey.
Wt Westland	Severe: ponding, percs slowly.	Severe: seepage, ponding.	Severe: seepage, ponding.	Severe: ponding.	Poor: ponding.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and "poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
AdB-------------------- Alexandria	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
AdC2------------------ Alexandria	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer, slope.
AdD2, AdE2------------ Alexandria	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Ag-------------------- Algiers	Poor: wetness, low strength.	Poor: excess fines.	Poor: excess fines.	Poor: wetness.
BeA, BeB-------------- Bennington	Poor: wetness, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
BfA*, BfB*:				
Bennington-----------	Poor: wetness, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
Urban land.				
BoA, BoB-------------- Blount	Poor: low strength, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
CaB, CaB2------------- Cardington	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
CaC2------------------ Cardington	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer, slope.
CbB*:				
Cardington-----------	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Urban land.				
CbC*:				
Cardington-----------	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer, slope.
Urban land.				
Cc-------------------- Carlisle	Poor: low strength, wetness.	Unsuited: excess humus.	Unsuited: excess humus.	Poor: wetness, excess humus.
CeA, CeB, CeB2-------- Celina	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
CeC2------------------ Celina	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer, slope.
CfB*:				
Celina---------------	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Urban land.				

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Cn: Condit	Poor: wetness, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
CpA: Crane	Poor: wetness.	Good	Good	Fair: thin layer.
CrA, CrB: Crosby	Poor: wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
CsA*, CsB*:				
Crosby	Poor: wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Urban land.				
Ee: Eel	Fair: low strength, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
ElA, ElB: Eldean	Good	Good	Good	Fair: small stones, thin layer.
ElC2: Eldean	Good	Good	Good	Fair: small stones, thin layer, slope.
ElD2: Eldean	Fair: slope.	Good	Good	Poor: slope.
EmA*, EmB*:				
Eldean	Good	Good	Good	Fair: small stones, thin layer.
Urban land.				
Gn: Genesee	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
GwB: Glynwood	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
GwC2: Glynwood	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, thin layer.
HeE2*:				
Hennepin	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Miamian	Fair: slope, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
HeF2*:				
Hennepin	Poor: low strength, slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
Miamian	Poor: slope.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
KeA, KeB: Kendallville	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
KeC2------------------ Kendallville	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, thin layer.
Ko-------------------- Kokomo	Poor: wetness, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
Ku*:				
Kokomo---------------	Poor: wetness, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
Urban land.				
LeB*:				
Lewisburg------------	Fair: low strength, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: thin layer.
Crosby---------------	Poor: wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Mh-------------------- Medway	Fair: wetness, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
MkB------------------- Miamian	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
MlB2------------------ Miamian	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: too clayey, thin layer.
MlC2------------------ Miamian	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, too clayey, thin layer.
MlD2------------------ Miamian	Fair: slope, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: slope.
MmC3------------------ Miamian	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, too clayey, thin layer.
MnC*:				
Miamian--------------	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, too clayey, thin layer.
Urban land.				
MoB------------------- Milton	Poor: low strength, area reclaim, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
MoC2------------------ Milton	Poor: low strength, area reclaim, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, thin layer.

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
MpB*:				
Milton	Poor: low strength, area reclaim, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Urban land.				
MpC*:				
Milton	Poor: low strength, area reclaim, thin layer.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: slope, thin layer.
Urban land.				
MrB Mitiwanga	Poor: wetness, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
Ms Montgomery	Poor: wetness, shrink-swell, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
OcA, OcB Ockley	Poor: low strength.	Good	Good	Fair: thin layer.
OcC2 Ockley	Poor: low strength.	Good	Good	Fair: slope, thin layer.
Pm Pewamo	Poor: low strength, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
Pn*:				
Pewamo	Poor: low strength, wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
Urban land.				
Pt*. Pits				
RhB Ritchey	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: area reclaim.
RhD2 Ritchey	Poor: thin layer, area reclaim.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: area reclaim, slope.
Rs Ross	Fair: low strength.	Poor: excess fines.	Poor: excess fines.	Good.
Sh Shoals	Poor: wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
SlA Sleeth	Poor: low strength, wetness.	Good	Good	Fair: thin layer.
SmA*:				
Sleeth	Poor: low strength, wetness.	Good	Good	Fair: thin layer.
Urban land.				

See footnote at end of table.

TABLE 12.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
So------------------- Sloan	Poor: wetness.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
ThA, ThB-------------- Thackery	Poor: low strength.	Good-----------------	Good-----------------	Good.
Up*, Ur*, Us*. Udorthents				
Ut*:				
Udorthents.				
Urban land.				
Uu*:				
Urban land.				
Bennington-----------	Poor: wetness, low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Poor: wetness.
Uv*:				
Urban land.				
Celina---------------	Poor: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Fair: thin layer.
Uw*:				
Urban land.				
Genesee--------------	Fair: low strength.	Unsuited: excess fines.	Unsuited: excess fines.	Good.
Ux*:				
Urban land.				
Ockley---------------	Poor: low strength.	Good-----------------	Good-----------------	Fair: thin layer.
WdA, WdB-------------- Warsaw	Fair: low strength.	Good-----------------	Good-----------------	Fair: thin layer.
WeA, WeB-------------- Wea	Poor: low strength.	Good-----------------	Good-----------------	Fair: thin layer.
Wt-------------------- Westland	Poor: wetness, low strength.	Good-----------------	Good-----------------	Poor: wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
AdB------------------ Alexandria	Favorable------	Favorable------	No water-------	Not needed-----	Favorable------	Erodes easily.
AdC2----------------- Alexandria	Slope----------	Favorable------	No water-------	Not needed-----	Favorable------	Slope, erodes easily.
AdD2, AdE2--------- Alexandria	Slope----------	Favorable------	No water-------	Not needed-----	Slope----------	Slope, erodes easily.
Ag------------------- Algiers	Seepage--------	Wetness--------	Slow refill----	Floods, frost action.	Not needed-----	Wetness, erodes easily.
BeA------------------ Bennington	Favorable------	Wetness, hard to pack.	Slow refill----	Percs slowly, frost action.	Not needed-----	Wetness, percs slowly, erodes easily.
BeB------------------ Bennington	Favorable------	Wetness, hard to pack.	Slow refill----	Percs slowly, frost action.	Wetness, erodes easily, percs slowly.	Wetness, percs slowly, erodes easily.
BfA*:						
Bennington---------	Favorable------	Wetness, hard to pack.	Slow refill----	Percs slowly, frost action.	Not needed-----	Wetness, percs slowly, erodes easily.
Urban land.						
BfB*:						
Bennington---------	Favorable------	Wetness, hard to pack.	Slow refill----	Percs slowly, frost action.	Wetness, erodes easily, percs slowly.	Wetness, percs slowly, erodes easily.
Urban land.						
BoA------------------ Blount	Favorable------	Wetness--------	Deep to water, slow refill.	Percs slowly, frost action.	Not needed-----	Erodes easily, wetness, percs slowly.
BoB------------------ Blount	Favorable------	Wetness--------	Deep to water, slow refill.	Percs slowly, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.
CaB, CaB2---------- Cardington	Favorable------	Wetness--------	Deep to water, slow refill.	Frost action---	Favorable------	Erodes easily.
CaC2----------------- Cardington	Slope----------	Wetness--------	Deep to water, slow refill.	Slope, frost action.	Favorable------	Slope, erodes easily.
CbB*:						
Cardington---------	Favorable------	Wetness--------	Deep to water, slow refill.	Frost action---	Favorable------	Erodes easily.
Urban land.						
CbC*:						
Cardington---------	Slope----------	Wetness--------	Deep to water, slow refill.	Slope, frost action.	Favorabe--------	Slope, erodes easily.
Urban land.						
Cc------------------- Carlisle	Seepage--------	Excess humus, wetness.	Favorable------	Excess humus, floods, frost action.	Not needed-----	Wetness.
CeA------------------ Celina	Favorable------	Wetness--------	Deep to water, slow refill.	Frost action---	Not needed-----	Erodes easily.
CeB, CeB2---------- Celina	Favorable------	Wetness--------	Deep to water, slow refill.	Frost action---	Wetness--------	Erodes easily.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
CeC2: Celina	Slope	Wetness	Deep to water, slow refill.	Slope, frost action.	Wetness	Slope, erodes easily.
CfB*:						
Celina	Favorable	Wetness	Deep to water, slow refill.	Frost action	Wetness	Erodes easily.
Urban land.						
Cn: Condit	Favorable	Wetness	Slow refill	Percs slowly, frost action.	Not needed	Wetness, percs slowly, erodes easily.
CpA: Crane	Seepage	Wetness	Deep to water, slow refill.	Frost action	Not needed	Wetness.
CrA: Crosby	Favorable	Wetness	Slow refill	Percs slowly, frost action.	Not needed	Wetness, percs slowly, erodes easily.
CrB: Crosby	Favorable	Wetness	Slow refill	Percs slowly, frost action.	Wetness, percs slowly, erodes easily.	Wetness, percs slowly, erodes easily.
CsA*:						
Crosby	Favorable	Wetness	Slow refill	Percs slowly, frost action.	Not needed	Wetness, percs slowly, erodes easily.
Urban land.						
CsB*:						
Crosby	Favorable	Wetness	Slow refill	Percs slowly, frost action.	Wetness, percs slowly, erodes easily.	Wetness, percs slowly, erodes easily.
Urban land.						
Ee: Eel	Seepage	Piping	Deep to water, slow refill.	Not needed	Not needed	Erodes easily.
ElA: Eldean	Seepage	Seepage	No water	Not needed	Not needed	Erodes easily.
ElB: Eldean	Seepage	Seepage	No water	Not needed	Too sandy	Erodes easily.
ElC2: Eldean	Slope, seepage.	Seepage	No water	Not needed	Too sandy	Slope, erodes easily.
ElD2: Eldean	Slope, seepage.	Seepage	No water	Not needed	Slope, too sandy.	Slope, erodes easily.
EmA*:						
Eldean	Seepage	Seepage	No water	Not needed	Not needed	Erodes easily.
Urban land.						
EmB*:						
Eldean	Seepage	Seepage	No water	Not needed	Too sandy	Erodes easily.
Urban land.						
Gn: Genesee	Seepage	Piping	No water	Not needed	Not needed	Erodes easily.
GwB: Glynwood	Favorable	Wetness	Deep to water, slow refill.	Percs slowly, frost action.	Erodes easily, wetness, percs slowly.	Percs slowly, erodes easily.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
GwC2----------- Glynwood	Slope----------	Wetness--------	Deep to water, slow refill.	Slope, percs slowly, frost action.	Erodes easily, wetness, percs slowly.	Slope, percs slowly, erodes easily.
HeE2*, HeF2*:						
Hennepin---------	Slope----------	Favorable------	No water-------	Not needed-----	Slope, percs slowly.	Slope, percs slowly.
Miamian----------	Slope----------	Favorable------	No water-------	Not needed-----	Slope----------	Slope, erodes easily.
KeA-------------- Kendallville	Seepage--------	Favorable------	No water-------	Not needed-----	Not needed-----	Erodes easily.
KeB-------------- Kendallville	Seepage--------	Favorable------	No water-------	Not needed-----	Favorable------	Erodes easily.
KeC2------------- Kendallville	Slope, seepage.	Favorable------	No water-------	Not needed-----	Favorable------	Slope, erodes easily.
Ko--------------- Kokomo	Favorable------	Ponding.	Slow refill----	Ponding, percs slowly, frost action.	Not needed-----	Wetness, percs slowly.
Ku*:						
Kokomo-----------	Favorable------	Ponding.	Slow refill----	Ponding, percs slowly, frost action.	Not needed-----	Wetness, percs slowly.
Urban land.						
LeB*:						
Lewisburg--------	Favorable------	Wetness--------	Deep to water, slow refill.	Percs slowly---	Wetness, erodes easily.	Erodes easily, percs slowly.
Crosby-----------	Favorable------	Wetness--------	Slow refill----	Percs slowly, frost action.	Wetness, percs slowly, erodes easily.	Wetness, percs slowly, erodes easily.
Mh--------------- Medway	Seepage--------	Piping, wetness.	Deep to water, slow refill.	Frost action, floods.	Not needed-----	Favorable.
MkB, MlB2-------- Miamian	Favorable------	Favorable------	No water-------	Not needed-----	Favorable------	Erodes easily.
MlC2------------- Miamian	Slope----------	Favorable------	No water-------	Not needed-----	Favorable------	Slope, erodes easily.
MlD2------------- Miamian	Slope----------	Favorable------	No water-------	Not needed-----	Slope----------	Slope, erodes easily.
MmC3------------- Miamian	Slope----------	Favorable------	No water-------	Not needed-----	Favorable------	Slope, erodes easily.
MnC*:						
Miamian----------	Slope----------	Favorable------	No water-------	Not needed-----	Favorable------	Slope, erodes easily.
Urban land.						
MoB-------------- Milton	Depth to rock, seepage.	Thin layer-----	No water-------	Not needed-----	Depth to rock	Depth to rock, erodes easily.
MoC2------------- Milton	Slope, depth to rock, seepage.	Thin layer-----	No water-------	Not needed-----	Depth to rock	Slope, erodes easily, depth to rock.
MpB*:						
Milton-----------	Depth to rock, seepage.	Thin layer-----	No water-------	Not needed-----	Depth to rock	Depth to rock, erodes easily.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
MpB*:						
Urban land.						
MpC*:						
Milton	Slope, depth to rock, seepage.	Thin layer	No water	Not needed	Depth to rock	Slope, erodes easily, depth to rock.
Urban land.						
MrB Mitiwanga	Depth to rock, seepage.	Thin layer, piping.	Slow refill	Depth to rock, frost action.	Wetness, depth to rock.	Wetness, depth to rock.
Ms Montgomery	Favorable	Hard to pack, ponding.	Slow refill	Ponding.	Not needed	Wetness, erodes easily, percs slowly.
OcA Ockley	Seepage	Favorable	No water	Not needed	Not needed	Erodes easily.
OcB Ockley	Seepage	Favorable	No water	Not needed	Favorable	Erodes easily.
OcC2 Ockley	Slope, seepage.	Favorable	No water	Not needed	Favorable	Erodes easily, slope.
Pm Pewamo	Favorable	Ponding.	Slow refill	Ponding. frost action.	Not needed	Wetness.
Pn*:						
Pewamo	Favorable	Ponding.	Slow refill	Ponding, frost action.	Not needed	Wetness.
Urban land.						
Pt*. Pits						
RhB Ritchey	Depth to rock	Thin layer	No water	Not needed	Depth to rock	Rooting depth, erodes easily.
RhD2 Ritchey	Slope, depth to rock.	Thin layer	No water	Not needed	Slope, depth to rock.	Rooting depth, erodes easily, slope.
Rs Ross	Seepage	Piping	Deep to water, slow refill.	Not needed	Not needed	Favorable.
Sh Shoals	Seepage	Wetness	Slow refill, deep to water.	Floods, frost action.	Not needed	Wetness, erodes easily.
SlA Sleeth	Seepage	Wetness	Deep to water, slow refill.	Frost action	Not needed	Wetness.
SmA*:						
Sleeth	Seepage	Wetness	Deep to water, slow refill.	Frost action	Not needed	Wetness.
Urban land.						
So Sloan	Favorable	Piping, wetness.	Slow refill	Floods, frost action.	Not needed	Wetness, erodes easily.
ThA Thackery	Seepage	Seepage, wetness.	Slow refill	Favorable	Not needed	Erodes easily.
ThB Thackery	Seepage	Seepage, wetness.	Slow refill	Favorable	Wetness	Erodes easily.

See footnote at end of table.

TABLE 13.--WATER MANAGEMENT--Continued

Soil name and map symbol	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
Up*, Ur*, Us*. Udorthents						
Ut*: Udorthents.						
Urban land.						
Uu*: Urban land.						
Bennington	Favorable	Wetness, hard to pack.	Slow refill	Percs slowly, frost action.	Wetness, erodes easily, percs slowly.	Wetness, percs slowly, erodes easily.
Uv*: Urban land.						
Celina	Slope	Wetness	Deep to water, slow refill.	Slope, frost action.	Wetness	Erodes easily.
Uw*: Urban land.						
Genesee	Seepage	Piping	No water	Not needed	Not needed	Erodes easily.
Ux*: Urban land.						
Ockley	Seepage	Favorable	No water	Not needed	Favorable	Erodes easily.
WdA Warsaw	Seepage	Seepage	No water	Not needed	Not needed	Favorable.
WdB Warsaw	Seepage	Seepage	No water	Not needed	Too sandy	Favorable.
WeA Wea	Seepage	Favorable	No water	Not needed	Not needed	Favorable.
WeB Wea	Seepage	Favorable	No water	Not needed	Favorable	Favorable.
Wt Westland	Seepage	Ponding	Slow refill	Ponding, percs slowly, frost action.	Not needed	Wetness, percs slowly.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
AdB, AdC2, AdD2, AdE2---------------- Alexandria	0-8	Silt loam--------	CL-ML, ML	A-4	0-2	95-100	90-100	90-100	75-90	25-35	4-10
	8-42	Silty clay loam, clay loam, silty clay.	CL, ML	A-6, A-7	0-2	90-100	80-100	75-100	70-90	35-50	10-25
	42-70	Clay loam, loam, silty clay loam.	CL, CL-ML	A-6, A-4	0-5	80-100	75-100	70-95	65-85	25-40	4-15
Ag------------------ Algiers	0-23	Silt loam, loam	ML, CL	A-4, A-6	0	100	90-100	80-100	70-95	30-40	6-15
	23-70	Silty clay loam, loam, clay loam.	CL, ML, CH	A-6, A-7, A-4	0	100	90-100	80-100	70-95	30-52	7-28
BeA, BeB----------- Bennington	0-9	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0-2	95-100	90-100	85-100	65-95	22-38	3-14
	9-35	Silty clay loam, silty clay, clay loam.	CL, CH	A-6, A-7	0-2	85-100	80-100	75-100	70-100	30-52	12-30
	35-70	Clay loam, loam, silty clay loam.	CL, CL-ML	A-6, A-4	0-2	80-100	75-100	70-100	60-90	25-40	6-18
BfA*, BfB*: Bennington---------	0-9	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0-2	95-100	90-100	85-100	65-95	22-38	3-14
	9-35	Silty clay loam, silty clay, clay loam.	CL, CH	A-6, A-7	0-2	85-100	80-100	75-100	70-100	30-52	12-30
	35-70	Clay loam, loam, silty clay loam.	CL, CL-ML	A-6, A-4	0-2	80-100	75-100	70-100	60-90	25-40	6-18
Urban land.											
BoA, BoB----------- Blount	0-10	Silt loam--------	ML, CL	A-6, A-4	0-5	95-100	95-100	90-100	80-95	25-40	3-15
	10-35	Silty clay loam, silty clay, clay loam.	CH, CL	A-7, A-6	0-5	95-100	90-100	90-100	80-95	35-60	15-35
	35-70	Silty clay loam, clay loam.	CL	A-6	0-10	90-100	90-100	80-100	70-90	25-40	10-25
CaB, CaB2, CaC2---- Cardington	0-6	Silt loam--------	ML, CL-ML	A-4	0-2	95-100	90-100	80-100	50-90	25-35	4-10
	6-34	Silty clay loam, clay loam, silty clay.	CL	A-6, A-7	0-2	85-100	80-100	75-100	70-90	30-50	10-30
	34-70	Clay loam, silty clay loam, loam.	CL, ML	A-6, A-4	0-5	80-100	75-100	70-95	65-85	22-40	3-18
CbB*, CbC*: Cardington---------	0-6	Silt loam--------	ML, CL-ML	A-4	0-2	95-100	90-100	80-100	50-90	25-35	4-10
	6-34	Silty clay loam, clay loam, silty clay.	CL	A-6, A-7	0-2	85-100	80-100	75-100	70-90	30-50	10-30
	34-70	Clay loam, silty clay loam, loam.	CL, ML	A-6, A-4	0-5	80-100	75-100	70-95	65-85	22-40	3-18
Urban land.											
Cc------------------ Carlisle	0-58	Sapric and hemic material.	PT	A-8	---	---	---	---	---	---	---
	58-70	Coprogenous earth.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
CeA, CeB, CeB2, CeC2 Celina	0-7	Silt loam	ML, CL	A-4	0	100	90-100	90-100	70-85	26-40	3-10
	7-25	Clay, clay loam, silty clay loam.	CL	A-6, A-7	0	100	90-100	80-100	70-90	32-48	12-28
	25-70	Loam, silt loam, clay loam.	CL, CL-ML	A-4, A-6	0	75-95	70-90	60-80	50-65	20-36	4-16
CfB*: Celina	0-7	Silt loam	ML, CL	A-4	0	100	90-100	90-100	70-85	26-40	3-10
	7-28	Clay, clay loam, silty clay loam.	CL	A-6, A-7	0	100	90-100	80-100	70-90	32-48	12-28
	28-70	Loam, silt loam, clay loam.	CL, CL-ML	A-4, A-6	0	75-95	70-90	60-80	50-65	20-36	4-16
Urban land.											
Cn Condit	0-11	Silt loam	ML	A-4, A-6	0-2	95-100	95-100	90-100	80-90	25-40	3-14
	11-53	Silty clay loam, silty clay, clay loam.	CL, CH	A-6, A-7	0-2	95-100	95-100	90-100	80-90	35-55	12-28
	53-70	Clay loam, loam, silty clay loam.	CL, CL-ML	A-6, A-4	0-2	90-100	90-100	80-95	70-85	25-40	6-20
CpA Crane	0-9	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
	9-21	Silty clay loam	CL	A-6, A-7	0	95-100	90-95	80-90	60-85	35-50	20-30
	21-43	Clay loam	CL	A-6, A-7	0	95-100	90-95	75-85	55-70	30-45	14-24
	43-52	Gravelly loam	CL, SC	A-6, A-7	0-3	65-75	60-70	50-65	45-60	30-45	14-24
	52-70	Stratified sand to gravelly sand.	SP, SP-SM, GP, GP-GM	A-1	1-5	30-70	20-55	5-20	0-10	---	NP
CrA, CrB Crosby	0-9	Silt loam	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	65-90	22-34	6-15
	9-36	Clay loam, silty clay loam.	CL, CH	A-6, A-7	0-3	92-99	89-97	78-93	64-76	37-55	17-31
	36-70	Loam, clay loam, sandy loam.	CL, ML, CL-ML	A-4, A-6	0-3	88-94	83-89	74-87	50-64	17-30	2-14
CsA*, CsB*: Crosby	0-9	Silt loam	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	65-90	22-34	6-15
	9-36	Clay loam, silty clay loam.	CL, CH	A-6, A-7	0-3	92-99	89-97	78-93	64-76	37-55	17-31
	36-70	Loam, clay loam, sandy loam.	CL, ML, CL-ML	A-4, A-6	0-3	88-94	83-89	74-87	50-64	17-30	2-14
Urban land.											
Ee Eel	0-8	Silt loam	ML, CL	A-4, A-6	0	100	100	90-100	75-85	26-40	3-15
	8-42	Silt loam, loam	ML, CL	A-4, A-6	0	100	100	90-100	75-85	26-40	3-15
	42-70	Stratified sandy loam to silty clay loam.	ML, CL	A-4, A-6	0	100	90-100	70-80	55-70	26-40	3-15
ElA, ElB, ElC2, ElD2 Eldean	0-7	Silt loam	ML, CL-ML, CL	A-4, A-6	0	85-100	80-100	70-100	55-90	20-40	4-14
	7-35	Clay loam, gravelly clay, gravelly sandy clay loam.	CL	A-7, A-6	0-5	75-100	65-100	55-95	50-80	35-50	14-25
	35-70	Stratified sand to gravel.	GM, SM, GP-GM, SP-SM	A-1, A-2	0-15	25-70	20-50	10-40	5-35	---	NP

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct					Pct	
EmA*, EmB*:											
Eldean	0-7	Silt loam	ML, CL-ML, CL	A-4, A-6	0	85-100	80-100	70-100	55-90	20-40	4-14
	7-35	Clay loam, gravelly clay, gravelly sandy clay loam.	CL	A-7, A-6	0-5	75-100	65-100	55-95	50-80	35-50	14-25
	35-70	Stratified sand to gravel.	GM, SM, GP-GM, SP-SM	A-1, A-2	0-15	25-70	20-50	10-40	5-35	---	NP
Urban land.											
Gn: Genesee	0-9	Silt loam	ML, CL	A-4, A-6	0	100	100	90-100	75-85	26-40	3-15
	9-37	Silt loam, loam, clay loam.	ML, CL	A-4, A-6	0	100	100	90-100	75-85	26-40	3-15
	37-70	Stratified sandy loam to silt loam.	ML, CL	A-4, A-6	0	90-100	85-100	60-80	50-70	26-40	3-15
GwB, GwC2: Glynwood	0-7	Silt loam	CL-ML, CL	A-4, A-6	0	95-100	95-100	85-100	55-90	23-40	4-15
	7-26	Clay, clay loam, silty clay loam.	CL, CH	A-7, A-6	0-5	95-100	90-100	85-100	80-95	35-55	15-30
	26-70	Clay loam, silty clay loam.	CL	A-6, A-4	0-5	95-100	85-100	80-95	65-85	25-40	7-18
HeE2*, HeF2*:											
Hennepin	0-6	Loam	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	70-100	60-95	25-40	5-20
	6-18	Loam, clay loam, gravelly clay loam.	SC, SM-SC, CL, CL-ML	A-4, A-6, A-7	0-5	85-100	80-100	65-100	35-95	20-50	5-25
	18-70	Loam, gravelly loam, clay loam.	SC, SM-SC, CL, CL-ML	A-4, A-6, A-7	0-5	85-100	70-100	60-100	35-95	20-50	5-25
Miamian	0-6	Loam	ML	A-4, A-6	0	95-100	95-100	90-100	70-95	26-40	4-12
	6-24	Silty clay loam, clay loam, clay.	CL	A-6, A-7	0-5	85-100	80-100	75-95	70-85	32-50	15-30
	24-70	Loam, silt loam	CL, ML, CL-ML	A-4, A-6	0-5	75-95	75-90	65-85	50-75	20-35	3-13
KeA, KeB, KeC2: Kendallville	0-14	Silt loam	ML	A-4, A-6	0-2	90-100	85-100	80-95	70-90	26-40	4-12
	14-38	Clay loam, gravelly clay loam, sandy clay loam.	CL, SC, GC, CL-ML	A-4, A-6	0-5	70-90	55-85	50-70	45-65	25-40	6-15
	38-70	Loam, clay loam	CL, CL-ML, ML	A-4, A-6	0-3	85-100	80-95	60-80	55-70	16-35	3-14
Ko: Kokomo	0-9	Silty clay loam	CL, ML	A-6, A-7	0	100	98-100	85-100	75-90	35-48	15-25
	9-43	Silty clay loam, clay loam, silty clay.	CL, CH, ML	A-6, A-7	0-1	95-100	90-100	85-100	75-95	35-55	15-30
	43-70	Loam, clay loam	CL	A-6, A-4	0-3	90-100	85-95	75-90	55-70	25-35	7-20

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
Ku*:											
Kokomo-------------	0-9	Silty clay loam	CL, ML	A-6, A-7	0	100	98-100	85-100	75-90	35-48	15-25
	9-43	Silty clay loam, clay loam, silty clay.	CL, CH, ML	A-6, A-7	0-1	95-100	90-100	85-100	75-95	35-55	15-30
	43-70	Loam, clay loam	CL	A-6, A-4	0-3	90-100	85-95	75-90	55-70	25-35	7-20
Urban land.											
LeB*:											
Lewisburg----------	0-6	Silt loam-------	ML, CL-ML, CL	A-4, A-6	0-2	95-100	90-100	85-100	75-90	24-40	4-14
	6-16	Clay loam, clay, silty clay loam.	CL	A-6, A-7	0-2	90-100	85-100	80-100	65-90	32-48	14-30
	16-70	Loam, silt loam	CL, ML, CL-ML	A-6, A-4	0-5	85-100	80-95	65-90	50-75	20-35	3-13
Crosby-------------	0-9	Silt loam-------	CL, CL-ML	A-4, A-6	0	100	95-100	80-100	50-90	22-34	6-15
	9-31	Clay loam, silty clay loam.	CL, CH	A-6, A-7	0-3	92-99	89-97	78-93	64-76	37-55	17-31
	31-70	Loam, clay loam, sandy loam.	CL, ML, CL-ML	A-4, A-6	0-3	88-94	83-89	74-87	50-64	17-30	2-14
Mh----------------- Medway	0-15	Silt loam-------	ML, CL, CL-ML	A-4, A-6	0	100	100	90-100	70-80	20-40	3-15
	15-30	Loam, silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	95-100	80-95	75-90	70-90	20-48	4-20
	30-70	Loam, sandy loam, gravelly sandy loam.	ML, CL, SM, SC	A-4, A-2	0	80-95	70-90	40-70	30-60	15-30	NP-10
MkB---------------- Miamian	0-9	Silt loam-------	ML	A-4, A-6	0	95-100	95-100	90-100	70-95	26-40	4-12
	9-36	Silty clay loam, clay loam, clay.	CL	A-6, A-7	0-5	85-100	80-100	75-95	70-85	32-50	15-30
	36-70	Loam, silt loam	CL, ML, CL-ML	A-4, A-6	0-5	75-95	75-90	65-85	50-75	20-35	3-13
MlB2, MlC2, MlD2--- Miamian	0-9	Silty clay loam	CL	A-6, A-7	0	90-100	85-100	75-95	70-90	30-45	15-25
	9-36	Silty clay loam, clay loam, clay.	CL	A-6, A-7	0-5	85-100	80-100	75-95	70-85	32-50	15-30
	36-70	Loam, silt loam	CL, ML, CL-ML	A-4, A-6	0-5	75-95	75-90	65-85	50-75	20-35	3-13
MmC3--------------- Miamian	0-9	Clay loam-------	CL	A-6, A-7	0	90-100	85-100	75-95	70-90	30-45	15-25
	9-19	Silty clay loam, clay loam, clay.	CL	A-6, A-7	0-5	85-100	80-100	75-95	70-85	32-50	15-30
	19-70	Loam, silt loam	CL, ML, CL-ML	A-4, A-6	0-5	75-95	75-90	65-85	50-75	20-35	3-13
MnC*:											
Miamian-----------	0-9	Silt loam-------	ML	A-4, A-6	0	95-100	95-100	90-100	70-95	26-40	4-12
	9-36	Silty clay loam, clay loam, clay.	CL	A-6, A-7	0-5	85-100	80-100	75-95	70-85	32-50	15-30
	36-70	Loam, silt loam	CL, ML, CL-ML	A-4, A-6	0-5	75-95	75-90	65-85	50-75	20-35	3-13
Urban land.											

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
MoB, MoC2----------- Milton	0-9	Silt loam-------	ML, CL	A-4, A-6	0	95-100	90-100	85-100	70-95	26-36	4-12
	9-27	Silty clay loam, clay loam, clay.	CL	A-6, A-7	0	95-100	80-100	75-100	70-95	32-48	12-28
	27-31	Clay, sandy clay loam, channery clay.	CH, CL	A-7	0-5	85-100	75-100	65-95	50-90	40-62	24-40
	31	Weathered bedrock.	---	---	---	---	---	---	---	---	---
MpB*, MpC*:											
Milton------------	0-8	Silt loam-------	ML, CL	A-4, A-6	0	95-100	90-100	85-100	70-95	26-36	4-12
	8-25	Silty clay loam, clay loam, clay.	CL	A-6, A-7	0	95-100	80-100	75-100	70-95	32-48	12-28
	25-29	Clay, sandy clay loam, channery clay.	CH, CL	A-7	0-5	85-100	75-100	65-95	50-90	40-62	24-40
	29	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Urban land.											
MrB---------------- Mitiwanga	0-7	Silt loam-------	ML, CL-ML	A-4	0-2	90-100	85-95	75-90	60-80	25-35	4-10
	7-26	Silt loam, silty clay loam, clay loam.	CL, ML, CL-ML	A-6, A-4	0-4	80-90	75-90	65-85	55-80	20-40	3-18
	26-35	Loam, clay loam, channery clay loam.	CL, ML, SM, SC	A-4, A-6	1-8	85-95	65-85	55-75	40-60	20-35	3-15
	35	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Ms----------------- Montgomery	0-8	Silty clay loam	CL	A-7	0	100	100	100	85-100	40-50	20-30
	8-43	Silty clay loam, silty clay.	CH	A-7	0	100	100	95-100	90-100	50-65	30-42
	43-70	Stratified clay to silty clay loam.	CL, CH	A-7	0	100	100	90-100	85-95	40-55	20-32
OcA, OcB, OcC2----- Ockley	0-14	Silt loam-------	CL, ML, CL-ML	A-4, A-6	0	100	95-100	80-100	60-90	22-33	3-12
	14-41	Silty clay loam, clay loam.	CL	A-6, A-7	0	100	75-100	65-90	50-90	35-50	15-30
	41-52	Gravelly clay loam, gravelly sandy clay loam.	CL, SC, GC	A-6, A-7	0-2	70-85	45-75	40-70	35-55	30-50	15-30
	52-70	Stratified sand to gravelly sand.	SP, SP-SM, GP, GP-GM	A-1	1-5	30-70	20-55	5-20	2-10	---	NP
Pm----------------- Pewamo	0-13	Silty clay loam	CL, ML	A-6, A-7	0-5	95-100	90-100	90-100	70-90	25-45	10-24
	13-50	Clay loam, clay, silty clay.	CL, CH	A-6, A-7	0-5	95-100	90-100	90-100	75-95	35-55	15-30
	50-70	Clay loam, silty clay loam, loam.	CL	A-6, A-7	0-5	90-100	85-100	75-100	65-90	25-45	10-25

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag-ments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas-ticity index
	In				Pct					Pct	
Pn*:											
Pewamo------------	0-13	Silty clay loam	CL, ML	A-6, A-7	0-5	95-100	90-100	90-100	70-90	25-45	10-24
	13-50	Clay loam, clay, silty clay.	CL, CH	A-6, A-7	0-5	95-100	90-100	90-100	75-95	35-55	15-30
	50-70	Clay loam, silty clay loam, loam.	CL	A-6, A-7	0-5	90-100	85-100	75-100	65-90	25-45	10-25
Urban land.											
Pt*. Pits											
RhB, RhD2---------- Ritchey	0-11	Silt loam-------	CL, ML, CL-ML	A-4, A-6	0	95-100	95-100	90-100	70-95	25-35	1-15
	11-17	Clay loam-------	CL	A-6	0-35	95-100	95-100	90-100	65-90	33-50	10-20
	17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rs---------------- Ross	0-16	Silt loam-------	ML, CL-ML, CL	A-4, A-6	0	90-100	90-100	80-100	65-95	20-35	NP-12
	16-40	Loam, silt loam, silty clay loam.	ML, CL	A-6, A-4, A-7	0	90-100	85-100	70-100	55-95	30-45	3-18
	40-70	Stratified gravel to silt loam.	CL, ML, SM, GM	A-6, A-1, A-2	0-5	50-100	40-100	30-100	10-80	<30	NP-12
Sh---------------- Shoals	0-13	Silt loam-------	CL, CL-ML	A-4, A-6	0	100	100	90-100	65-90	22-36	6-15
	13-35	Silt loam, loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	75-85	25-40	4-15
	35-70	Stratified silt loam to sandy loam.	ML	A-4	0-3	90-100	85-100	60-80	50-70	32-40	3-8
SlA--------------- Sleeth	0-14	Silt loam-------	CL, ML, CL-ML	A-4, A-6	0	100	90-100	75-95	50-85	20-35	3-15
	14-36	Clay loam, silty clay loam, sandy clay loam.	CL	A-6	0	85-95	85-95	80-90	65-75	30-40	15-25
	36-55	Gravelly clay loam, sandy clay loam, loam.	CL	A-6	0-3	65-95	60-85	55-70	50-70	30-40	15-25
	55-70	Stratified sand to gravelly sand.	SP, GP, SP-SM, GP-GM	A-1	1-5	30-70	22-55	7-20	2-10	---	NP
SmA*:											
Sleeth------------	0-14	Silt loam-------	CL, ML, CL-ML	A-4, A-6	0	100	90-100	75-95	50-85	20-35	3-15
	14-36	Clay loam, silty clay loam, sandy clay loam.	CL	A-6	0	85-95	85-95	80-90	65-75	30-40	15-25
	36-55	Gravelly clay loam, sandy clay loam, loam.	CL	A-6	0-3	65-95	60-85	55-70	50-70	30-40	15-25
	55-70	Stratified sand to gravelly sand.	SP, GP, SP-SM, GP-GM	A-1	1-5	30-70	22-55	7-20	2-10	---	NP
Urban land.											

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
So----------------- Sloan	0-11	Silt loam--------	CL, ML, CL-ML	A-6, A-4	0	100	95-100	85-100	70-95	20-40	3-15
	11-34	Silty clay loam, clay loam, silt loam.	CL, ML	A-6, A-7, A-4	0	100	90-100	85-100	75-95	30-45	8-18
	34-70	Stratified gravelly loam to silty clay loam.	ML, CL	A-4, A-6	0	95-100	80-100	70-95	55-90	25-40	3-15
ThA, ThB----------- Thackery	0-10	Silt loam--------	ML, CL-ML, CL	A-4, A-6	0	100	90-100	85-100	70-90	22-36	3-14
	10-21	Silt loam, loam, silty clay loam.	CL, ML, CL-ML	A-6, A-4	0	100	90-100	80-95	65-90	25-40	6-14
	21-49	Clay loam, sandy clay loam, gravelly clay loam.	CL	A-6, A-4	0-2	80-100	75-95	70-85	60-75	25-40	8-18
	49-54	Very gravelly loam, gravelly sandy clay loam, gravelly sandy loam.	GM, SM, SC, GC	A-2, A-4, A-6	0-5	50-80	40-70	30-60	25-50	<35	NP-12
	54-70	Very gravelly loamy sand, gravelly sand.	SP, SP-SM, GP, GP-GM	A-1	0-5	25-55	15-45	10-35	2-25	---	NP
Up*, Ur*, Us*. Udorthents											
Ut*: Udorthents.											
Urban land.											
Uu*: Urban land.											
Bennington---------	0-9	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0-2	95-100	90-100	85-100	65-95	22-38	3-14
	9-35	Silty clay loam, silty clay, clay loam.	CL, CH	A-6, A-7	0-2	85-100	80-100	75-100	70-100	30-52	12-30
	35-70	Clay loam, loam, silty clay loam.	CL, CL-ML	A-6, A-4	0-2	80-100	75-100	70-100	60-90	25-40	6-18
Uv*: Urban land.											
Celina-------------	0-7	Silt loam--------	ML, CL	A-4	0	100	90-100	90-100	70-85	26-40	3-10
	7-25	Clay, clay loam, silty clay loam.	CL	A-6, A-7	0	100	90-100	80-100	70-90	32-48	12-28
	25-70	Loam, silt loam, clay loam.	CL, CL-ML	A-4, A-6	0	75-95	70-90	60-80	50-65	20-36	4-16
Uw*: Urban land.											
Genesee-----------	0-9	Silt loam--------	ML, CL	A-4, A-6	0	100	100	90-100	75-85	26-40	3-15
	9-37	Silt loam, loam	ML, CL	A-4, A-6	0	100	100	90-100	75-85	26-40	3-15
	37-70	Stratified sandy loam to silt loam.	ML, CL	A-4, A-6	0	90-100	85-100	60-80	50-70	26-40	3-15

See footnote at end of table.

TABLE 14.--ENGINEERING PROPERTIES AND CLASSIFICATIONS--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Ux*: Urban land.											
Ockley	0-14	Silt loam	CL, ML, CL-ML	A-4, A-6	0	100	95-100	80-100	60-90	22-33	3-12
	14-41	Silty clay loam, clay loam.	CL	A-6, A-7	0	100	75-100	65-90	50-90	35-50	15-30
	41-52	Gravelly clay loam, gravelly sandy clay loam.	CL, SC, GC	A-6, A-7	0-2	70-85	45-75	40-70	35-55	30-50	15-30
	52-70	Stratified sand to gravelly sand.	SP, SP-SM, GP, GP-GM	A-1	1-5	30-70	20-55	5-20	2-10	---	NP
WdA, WdB Warsaw	0-9	Silt loam	CL, CL-ML	A-4, A-6	0	80-100	75-100	70-100	50-90	25-35	4-12
	9-34	Clay loam, silty clay loam, gravelly clay loam.	SC, CL	A-6, A-2-6	0-3	90-95	70-95	60-90	30-70	25-35	10-20
	34-70	Stratified sand to very gravelly sand.	SP, GP, SP-SM, GP-GM	A-1	1-5	30-70	22-55	7-20	2-10	<20	NP
WeA, WeB Wea	0-14	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
	14-56	Silty clay loam, clay loam, silt loam.	CL	A-6, A-7	0	95-100	90-95	85-95	65-90	35-50	15-30
	56-70	Stratified sand to gravelly sand.	SP, SP-SM, GP, GP-GM	A-1	1-5	30-70	20-55	5-20	0-10	---	NP
Wt Westland	0-9	Silty clay loam	CL	A-6, A-7	0	100	95-100	90-100	75-90	30-45	10-25
	9-43	Clay loam, silty clay loam, sandy clay loam.	CL	A-6, A-7	0	95-100	90-100	80-90	65-75	35-50	15-30
	43-70	Stratified sand to gravelly sand.	SP, GP, SP-SM, GP-GM	A-1	1-5	30-70	22-55	7-20	2-10	---	NP

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Permea- bility	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group
						K	T	
	In	In/hr	In/in	pH				
AdB, AdC2, AdD2, AdE2------------ Alexandria	0-8	0.6-2.0	0.17-0.22	4.5-7.3	Low-----------	0.37	5	6
	8-42	0.2-0.6	0.11-0.17	4.5-7.8	Moderate------	0.37		
	42-70	0.2-0.6	0.07-0.12	7.4-8.4	Low-----------	0.37		
Ag--------------- Algiers	0-23	0.6-2.0	0.16-0.20	6.1-7.3	Low-----------	0.37	5	6
	23-70	0.6-2.0	0.16-0.20	6.1-7.8	Low-----------	0.37		
BeA, BeB--------- Bennington	0-9	0.6-2.0	0.17-0.21	5.1-6.5	Low-----------	0.43	3	6
	9-35	0.06-0.6	0.10-0.17	4.5-7.8	Moderate------	0.32		
	35-70	0.06-0.2	0.07-0.12	7.4-8.4	Low-----------	0.32		
BfA*, BfB*:								
Bennington------	0-9	0.6-2.0	0.17-0.21	5.1-6.5	Low-----------	0.43	3	6
	9-35	0.06-0.6	0.10-0.17	4.5-7.8	Moderate------	0.32		
	35-70	0.06-0.2	0.07-0.12	7.4-8.4	Low-----------	0.32		
Urban land.								
BoA, BoB--------- Blount	0-10	0.6-2.0	0.20-0.24	5.1-6.5	Low-----------	0.43	3	6
	10-35	0.06-0.2	0.11-0.18	4.5-7.8	Moderate------	0.43		
	35-70	0.06-0.2	0.07-0.10	7.4-8.4	Moderate------	0.43		
CaB, CaB2, CaC2-- Cardington	0-6	0.6-2.0	0.17-0.22	4.5-7.3	Low-----------	0.37	5	6
	6-34	0.2-0.6	0.10-0.17	4.5-7.8	Moderate------	0.37		
	34-70	0.2-0.6	0.07-0.12	7.4-8.4	Low-----------	0.37		
CbB*, CbC*:								
Cardington------	0-6	0.6-2.0	0.17-0.22	4.5-7.3	Low-----------	0.37	5	6
	6-34	0.2-0.6	0.10-0.17	4.5-7.8	Moderate------	0.37		
	34-70	0.2-0.6	0.07-0.12	7.4-8.4	Low-----------	0.37		
Urban land.								
Cc--------------- Carlisle	0-58	2.0-6.0	0.35-0.45	5.6-7.8	--------------	---	---	3
	58-70	2.0-6.0	---	6.6-8.4	--------------	---		
CeA, CeB, CeB2, CeC2------------ Celina	0-7	0.6-2.0	0.17-0.20	5.6-7.3	Low-----------	0.37	5	6
	7-25	0.2-0.6	0.16-0.19	4.5-7.8	Moderate------	0.37		
	25-70	0.2-0.6	0.06-0.10	7.4-8.4	Low-----------	0.37		
CfB*:								
Celina----------	0-7	0.6-2.0	0.17-0.20	5.6-7.3	Low-----------	0.37	5	6
	7-28	0.2-0.6	0.16-0.19	4.5-7.8	Moderate------	0.37		
	28-70	0.2-0.6	0.06-0.10	7.4-8.4	Low-----------	0.37		
Urban land.								
Cn--------------- Condit	0-11	0.6-2.0	0.17-0.21	4.5-7.3	Low-----------	0.37	5	6
	11-53	0.06-0.2	0.08-0.16	4.5-7.8	Moderate------	0.37		
	53-70	0.06-0.6	0.07-0.12	7.4-8.4	Moderate------	0.37		
CpA-------------- Crane	0-9	0.6-2.0	0.20-0.24	5.6-7.3	Low-----------	0.28	5	5
	9-21	0.2-0.6	0.18-0.20	5.1-7.3	Moderate------	0.28		
	21-43	0.2-0.6	0.15-0.19	5.1-7.8	Moderate------	0.28		
	43-52	0.2-0.6	0.14-0.16	6.1-7.8	Moderate------	0.28		
	52-70	>20	0.02-0.04	7.9-8.4	Low-----------	0.10		
CrA, CrB--------- Crosby	0-9	0.6-2.0	0.20-0.24	5.1-7.3	Low-----------	0.43	3	5
	9-36	0.06-0.2	0.15-0.20	5.1-7.8	Moderate------	0.43		
	36-70	0.06-0.6	0.05-0.10	7.9-8.4	Low-----------	0.43		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permea- bility	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group
	In	In/hr	In/in	pH				
CsA*, CsB*:								
Crosby----------	0-9	0.6-2.0	0.20-0.24	5.1-7.3	Low-----------	0.43	3	5
	9-36	0.06-0.2	0.15-0.20	5.1-7.8	Moderate------	0.43		
	36-70	0.06-0.6	0.05-0.10	7.9-8.4	Low-----------	0.43		
Urban land.								
Ee--------------- Eel	0-8	0.6-2.0	0.20-0.24	6.1-7.8	Low-----------	0.37	5	5
	8-42	0.6-2.0	0.17-0.22	6.1-8.4	Low-----------	0.37		
	42-70	0.6-2.0	0.19-0.21	7.4-8.4	Low-----------	0.37		
ElA, ElB, ElC2, ElD2------------ Eldean	0-7	0.6-2.0	0.18-0.22	5.6-7.3	Low-----------	0.37	4	5
	7-35	0.2-2.0	0.13-0.16	5.6-7.8	Moderate------	0.37		
	35-70	>6.0	0.01-0.04	6.6-8.4	Low-----------	0.10		
EmA*, EmB*:								
Eldean----------	0-7	0.6-2.0	0.18-0.22	5.6-7.3	Low-----------	0.37	4	5
	7-35	0.2-2.0	0.13-0.16	5.6-7.8	Moderate------	0.37		
	35-70	>6.0	0.01-0.04	6.6-8.4	Low-----------	0.10		
Urban land.								
Gn--------------- Genesee	0-9	0.6-2.0	0.20-0.24	6.1-7.8	Low-----------	0.37	5	5
	9-37	0.6-2.0	0.17-0.22	6.1-8.4	Low-----------	0.37		
	37-70	0.6-2.0	0.19-0.21	7.4-8.4	Low-----------	0.37		
GwB, GwC2-------- Glynwood	0-7	0.6-2.0	0.20-0.24	5.6-7.3	Low-----------	0.43	3	6
	7-26	0.06-0.2	0.11-0.18	4.5-8.4	Moderate------	0.32		
	26-70	0.06-0.2	0.12-0.16	7.4-8.4	Moderate------	0.32		
HeE2*, HeF2*:								
Hennepin--------	0-6	0.6-2.0	0.18-0.24	6.1-7.8	Low-----------	0.32	5	5
	6-18	0.2-2.0	0.14-0.22	6.1-7.8	Low-----------	0.32		
	18-70	0.06-0.6	0.07-0.11	6.1-8.4	Low-----------	0.32		
Miamian---------	0-6	0.6-2.0	0.17-0.20	5.6-7.3	Low-----------	0.37	5	6
	6-24	0.2-0.6	0.12-0.18	4.5-7.8	Moderate------	0.37		
	24-70	0.2-0.6	0.06-0.10	7.4-8.4	Low-----------	0.37		
KeA, KeB, KeC2--- Kendallville	0-14	0.6-2.0	0.18-0.24	5.6-7.3	Low-----------	0.37	3	6
	14-38	0.6-2.0	0.12-0.16	4.5-7.8	Moderate------	0.37		
	38-70	0.2-0.6	0.08-0.12	7.4-8.4	Low-----------	0.37		
Ko--------------- Kokomo	0-9	0.6-2.0	0.17-0.19	6.1-7.3	Moderate------	0.32	3	6
	9-43	0.6-2.0	0.18-0.20	6.1-7.3	Moderate------	0.32		
	43-70	0.2-0.6	0.05-0.10	7.4-8.4	Low-----------	0.32		
Ku*:								
Kokomo----------	0-9	0.6-2.0	0.17-0.19	6.1-7.3	Moderate------	0.32	3	6
	9-43	0.6-2.0	0.18-0.20	6.1-7.3	Moderate------	0.32		
	43-70	0.2-0.6	0.05-0.10	7.4-8.4	Low-----------	0.32		
Urban land.								
LeB*:								
Lewisburg-------	0-6	0.6-2.0	0.18-0.24	5.6-7.3	Low-----------	0.43	3	6
	6-16	0.2-2.0	0.11-0.18	5.6-7.8	Moderate------	0.32		
	16-70	0.06-0.2	0.08-0.12	7.4-8.4	Low-----------	0.32		
Crosby----------	0-9	0.6-2.0	0.20-0.24	5.1-6.5	Low-----------	0.43	3	5
	9-31	0.06-0.2	0.15-0.20	5.1-7.3	Moderate------	0.43		
	31-70	0.06-0.6	0.05-0.19	7.9-8.4	Low-----------	0.43		
Mh--------------- Medway	0-15	0.6-2.0	0.17-0.22	6.1-8.4	Low-----------	0.32	5	6
	15-30	0.6-2.0	0.14-0.18	6.1-8.4	Low-----------	0.32		
	30-70	0.6-2.0	0.08-0.15	6.6-8.4	Low-----------	0.32		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permea- bility	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group
	In	In/hr	In/in	pH				
MkB-------------- Miamian	0-9	0.6-2.0	0.17-0.20	5.6-7.3	Low-----------	0.37	5	6
	9-36	0.2-0.6	0.12-0.18	4.5-7.8	Moderate------	0.37		
	36-70	0.2-0.6	0.06-0.10	7.4-8.4	Low-----------	0.37		
MlB2, MlC2, MlD2- Miamian	0-9	0.2-0.6	0.14-0.19	5.6-7.3	Moderate------	0.37	4	6
	9-36	0.2-0.6	0.12-0.18	4.5-7.8	Moderate------	0.37		
	36-70	0.2-0.6	0.06-0.10	7.4-8.4	Low-----------	0.37		
MmC3------------- Miamian	0-9	0.2-0.6	0.14-0.19	5.6-7.3	Moderate------	0.37	4	6
	9-19	0.2-0.6	0.12-0.18	4.5-7.8	Moderate------	0.37		
	19-70	0.2-0.6	0.06-0.10	7.4-8.4	Low-----------	0.37		
MnC*:								
Miamian---------	0-9	0.6-2.0	0.17-0.20	5.6-7.3	Low-----------	0.37	5	6
	9-36	0.2-0.6	0.12-0.18	4.5-7.8	Moderate------	0.37		
	36-70	0.2-0.6	0.06-0.10	7.4-8.4	Low-----------	0.37		
Urban land.								
MoB, MoC2-------- Milton	0-9	0.6-2.0	0.17-0.20	5.6-7.3	Low-----------	0.37	4	6
	9-27	0.2-2.0	0.16-0.19	4.5-7.8	Moderate------	0.37		
	27-31	0.2-2.0	0.13-0.16	6.1-7.8	Moderate------	0.37		
	31	---	---	---	--------------	---		
MpB*:								
Milton----------	0-8	0.6-2.0	0.17-0.20	5.6-7.3	Low-----------	0.37	4	6
	8-25	0.2-2.0	0.16-0.19	4.5-7.8	Moderate------	0.37		
	25-29	0.2-2.0	0.13-0.16	6.1-7.8	Moderate------	0.37		
	29	---	---	---	--------------	---		
Urban land.								
MpC*:								
Milton----------	0-9	0.6-2.0	0.17-0.20	5.6-7.3	Low-----------	0.37	4	6
	9-27	0.2-2.0	0.16-0.19	4.5-7.8	Moderate------	0.37		
	27-31	0.2-2.0	0.13-0.16	6.1-7.8	Moderate------	0.37		
	31	---	---	---	--------------	---		
Urban land.								
MrB-------------- Mitiwanga	0-7	0.6-2.0	0.17-0.21	4.5-7.3	Low-----------	0.32	4	6
	7-26	0.6-2.0	0.13-0.17	4.5-6.0	Moderate------	0.32		
	26-35	0.6-6.0	0.12-0.15	5.1-6.5	Low-----------	0.32		
	35	---	---	---	--------------	---		
Ms--------------- Montgomery	0-8	0.2-0.6	0.20-0.23	6.1-7.8	High----------	0.37	5	7
	8-43	<0.2	0.11-0.18	6.6-7.8	High----------	0.37		
	43-70	<0.2	0.18-0.20	7.4-8.4	Moderate------	0.37		
OcA, OcB, OcC2--- Ockley	0-14	0.6-2.0	0.20-0.24	5.6-6.5	Low-----------	0.37	5	5
	14-41	0.6-2.0	0.15-0.20	4.5-6.0	Moderate------	0.37		
	41-52	0.6-2.0	0.12-0.14	5.6-7.3	Moderate------	0.24		
	52-70	>20	0.02-0.04	7.4-8.4	Low-----------	0.10		
Pm--------------- Pewamo	0-13	0.6-2.0	0.17-0.22	6.1-7.3	Moderate------	0.24	5	6
	13-50	0.2-0.6	0.12-0.20	6.1-7.8	Moderate------	0.24		
	50-70	0.2-0.6	0.14-0.18	7.4-8.4	Moderate------	0.24		
Pn*:								
Pewamo----------	0-13	0.6-2.0	0.17-0.22	6.1-7.3	Moderate------	0.24	5	6
	13-50	0.2-0.6	0.12-0.20	6.1-7.8	Moderate------	0.24		
	50-70	0.2-0.6	0.14-0.18	7.4-8.4	Moderate------	0.24		
Urban land.								

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group
	In	In/hr	In/in	pH				
Pt*. Pits								
RhB, RhD2-------- Ritchey	0-11	0.6-2.0	0.17-0.20	5.6-7.8	Low-----------	0.37	2	6
	11-17	0.6-2.0	0.15-0.18	6.6-8.4	Moderate------	0.37		
	17	---	---	---	--------------	---		
Rs--------------- Ross	0-16	0.6-2.0	0.19-0.24	6.1-7.8	Low-----------	0.32	5	5
	16-40	0.6-2.0	0.16-0.22	6.1-7.8	Low-----------	0.32		
	40-70	0.6-6.0	0.05-0.18	6.1-8.4	Low-----------	0.32		
Sh--------------- Shoals	0-13	0.6-2.0	0.22-0.24	6.1-7.8	Low-----------	0.37	5	5
	13-35	0.6-2.0	0.17-0.22	6.1-7.8	Low-----------	0.37		
	35-70	0.6-2.0	0.12-0.21	6.6-8.4	Low-----------	0.37		
SlA-------------- Sleeth	0-14	0.6-2.0	0.20-0.24	5.6-7.3	Low-----------	0.32	5	5
	14-36	0.6-2.0	0.15-0.19	5.1-6.5	Moderate------	0.32		
	36-55	0.6-2.0	0.14-0.16	6.6-8.4	Moderate------	0.32		
	55-70	>20	0.02-0.04	7.4-8.4	Low-----------	0.10		
SmA*:								
Sleeth----------	0-14	0.6-2.0	0.20-0.24	5.6-7.3	Low-----------	0.32	5	5
	14-36	0.6-2.0	0.15-0.19	5.1-6.5	Moderate------	0.32		
	36-55	0.6-2.0	0.14-0.16	6.6-8.4	Moderate------	0.32		
	55-70	>20	0.02-0.04	7.4-8.4	Low-----------	0.10		
Urban land.								
So--------------- Sloan	0-11	0.6-2.0	0.20-0.24	6.1-7.8	Low-----------	0.37	5	6
	11-34	0.2-2.0	0.15-0.19	6.1-8.4	Moderate------	0.37		
	34-70	0.2-2.0	0.13-0.18	6.6-8.4	Low-----------	0.37		
ThA, ThB--------- Thackery	0-10	0.6-2.0	0.20-0.24	5.6-7.3	Low-----------	0.37	4	5
	10-21	0.6-2.0	0.17-0.22	5.1-6.5	Low-----------	0.37		
	21-49	0.6-2.0	0.13-0.18	5.1-7.8	Moderate------	0.37		
	49-54	2.0-6.0	0.04-0.10	6.1-7.8	Low-----------	0.10		
	54-70	>6.0	0.02-0.06	7.4-8.4	Low-----------	0.10		
Up*, Ur*, Us*. Udorthents								
Ut*:								
Udorthents.								
Urban land.								
Uu*:								
Urban land.								
Bennington------	0-9	0.6-2.0	0.17-0.21	5.1-6.5	Low-----------	0.43	3	6
	9-35	0.06-0.6	0.10-0.17	4.5-7.8	Moderate------	0.32		
	35-70	0.06-0.2	0.07-0.12	7.4-8.4	Low-----------	0.32		
Uv*:								
Urban land.								
Celina----------	0-7	0.6-2.0	0.17-0.20	5.6-7.3	Low-----------	0.37	5	6
	7-25	0.2-0.6	0.16-0.19	4.5-7.8	Moderate------	0.37		
	25-70	0.2-0.6	0.06-0.10	7.4-8.4	Low-----------	0.37		
Uw*:								
Urban land.								
Genesee---------	0-9	0.6-2.0	0.20-0.24	6.1-7.8	Low-----------	0.37	5	5
	9-37	0.6-2.0	0.17-0.22	6.1-8.4	Low-----------	0.37		
	37-70	0.6-2.0	0.19-0.21	7.4-8.4	Low-----------	0.37		

See footnote at end of table.

TABLE 15.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Permea-bility	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group
	In	In/hr	In/in	pH				
Ux*:								
Urban land.								
Ockley----------	0-14	0.6-2.0	0.20-0.24	5.6-6.5	Low-----------	0.37	5	5
	14-41	0.6-2.0	0.15-0.20	4.5-6.0	Moderate------	0.37		
	41-52	0.6-2.0	0.12-0.14	5.6-6.5	Moderate------	0.24		
	52-70	>20	0.02-0.04	7.4-8.4	Low-----------	0.10		
WdA, WdB--------- Warsaw	0-9	0.6-2.0	0.20-0.24	5.6-7.3	Low-----------	0.28	4	5
	9-34	0.6-2.0	0.16-0.19	5.1-8.4	Low-----------	0.28		
	34-70	>20	0.02-0.04	7.9-8.4	Low-----------	0.10		
WeA, WeB--------- Wea	0-14	0.6-2.0	0.20-0.24	5.1-7.3	Low-----------	0.32	5	5
	14-56	0.6-2.0	0.15-0.20	5.1-7.8	Moderate------	0.43		
	56-70	>20	0.02-0.04	7.4-8.4	Low-----------	0.10		
Wt--------------- Westland	0-9	0.6-2.0	0.22-0.24	5.6-7.3	Moderate------	0.28	5	7
	9-43	0.2-0.6	0.15-0.19	5.6-7.8	Moderate------	0.28		
	43-70	>20	0.02-0.04	7.4-8.4	Low-----------	0.10		

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--SOIL AND WATER FEATURES

[See text for definition of terms. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydro- logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
AdB, AdC2, AdD2, AdE2 Alexandria	C	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Ag Algiers	C/D	Frequent	Very brief	Dec-Jun	0.5-1.5	Apparent	Jan-Jun	>60	---	High	High	Low.
BeA, BeB Bennington	C	None	---	---	0.5-1.5	Perched	Nov-May	>60	---	High	High	Moderate.
BfA*, BfB*:												
Bennington	C	None	---	---	0.5-1.5	Perched	Nov-May	>60	---	High	High	Moderate.
Urban land.												
BoA, BoB Blount	C	None	---	---	1.0-3.0	Perched	Jan-May	>60	---	High	High	High.
CaB, CaB2, CaC2 Cardington	C	None	---	---	2.0-3.0	Perched	Nov-Apr	>60	---	High	High	Moderate.
CbB*, CbC*:												
Cardington	C	None	---	---	2.0-3.0	Perched	Nov-Apr	>60	---	High	High	Moderate.
Urban land.												
Cc Carlisle	A/D	Frequent	Long	Nov-May	0-1.0	Apparent	Sep-Jun	>60	---	High	High	Low.
CeA, CeB, CeB2, CeC2 Celina	C	None	---	---	1.5-3.0	Perched	Jan-Apr	>60	---	High	High	Moderate.
CfB*:												
Celina	C	None	---	---	1.5-3.0	Perched	Jan-Apr	>60	---	High	High	Moderate.
Urban land.												
Cn Condit	D	None	---	---	0-0.5	Perched	Nov-Jul	>60	---	High	High	Moderate.
CpA Crane	B	None	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High	High	Moderate.
CrA, CrB Crosby	C	None	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High	High	Moderate.
CsA*, CsB*:												
Crosby	C	None	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High	High	Moderate.

See footnote at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
CsA*, CsB*: Urban land.												
Ee----------------- Eel	C	Occasional	Brief-----	Oct-Jun	3.0-6.0	Apparent	Jan-Apr	>60	---	High-----	Moderate	Low.
ElA, ElB, ElC2, ElD2--------------- Eldean	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Moderate.
EmA*, EmB*: Eldean------------	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Moderate.
Urban land.												
Gn----------------- Genesee	B	Occasional	Brief-----	Oct-Jun	>6.0	---	---	>60	---	Moderate	Low------	Low.
GwB, GwC2---------- Glynwood	C	None---------	---	---	1.5-3.0	Perched	Jan-Apr	>60	---	High-----	High-----	Moderate.
HeE2*, HeF2*: Hennepin----------	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Low.
Miamian-----------	C	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
KeA, KeB, KeC2---- Kendallville	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Ko**--------------- Kokomo	B/D	None---------	---	---	+.5-1.0	Apparent	Dec-May	>60	---	High-----	High-----	Low.
Ku*: Kokomo**----------	B/D	None---------	---	---	+.5-1.0	Apparent	Dec-May	>60	---	High-----	High-----	Low.
Urban land.												
LeB*: Lewisburg---------	C	None---------	---	---	2.0-4.0	Perched	Jan-Apr	>60	---	Moderate	Moderate	Moderate.
Crosby------------	C	None---------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Moderate.
Mh----------------- Medway	B	Occasional	Very brief	Nov-Jun	1.5-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Low.
MkB, MlB2, MlC2, MlD2, MmC3-------- Miamian	C	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
MnC*: Miamian-----------	C	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Urban land.												

See footnotes at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
MoB, MoC2: Milton	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	High	Moderate.
MpB*, MpC*:												
Milton	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	High	Moderate.
Urban land.												
MrB: Mitiwanga	C	None	---	---	0.5-1.5	Perched	Nov-Jun	20-40	Hard	High	High	Moderate.
Ms**: Montgomery	D	None	---	---	+1-1.0	Apparent	Dec-May	>60	---	Moderate	High	Low.
OcA, OcB, OcC2: Ockley	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Pm**: Pewamo	B/D	None	---	---	+1-1.0	Apparent	Dec-May	>60	---	High	High	Low.
Pn*:												
Pewamo**	B/D	None	---	---	+1-1.0	Apparent	Dec-May	>60	---	High	High	Low.
Urban land.												
Pt*. Pits												
RhB, RhD2: Ritchey	D	None	---	---	>6.0	---	---	10-20	Hard	Moderate	Moderate	Low.
Rs: Ross	B	Occasional	Very brief	Nov-Jun	4.0-6.0	Apparent	Feb-Apr	>60	---	Moderate	Low	Low.
Sh: Shoals	C	Occasional	Brief	Oct-Jun	1.0-3.0	Apparent	Jan-Apr	>60	---	High	High	Low.
SlA: Sleeth	C	None	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High	High	Low.
SmA*:												
Sleeth	C	None	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High	High	Low.
Urban land.												
So: Sloan	B/D	Frequent	Brief	Nov-Jun	0-0.5	Apparent	Nov-Jun	>60	---	High	High	Low.
ThA, ThB: Thackery	B	None	---	---	1.5-3.0	Apparent	Jan-Apr	>60	---	Moderate	Moderate	Moderate.
Up*, Ur*, Us*. Udorthents												

See footnotes at end of table.

TABLE 16.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
Ut*:												
Udorthents.												
Urban land.												
Uu*:												
Urban land.												
Bennington	C	None	---	---	0.5-1.5	Perched	Nov-May	>60	---	High	High	Moderate.
Uv*:												
Urban land.												
Celina	C	None	---	---	1.5-3.0	Perched	Jan-Apr	>60	---	High	High	Moderate.
Uw*:												
Urban land.												
Genesee	B	Rare to common.	Brief	Oct-Jun	>6.0	---	---	>60	---	Moderate	Low	Low.
Ux*:												
Urban land.												
Ockley	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
WdA, WdB Warsaw	B	None	---	---	>6.0	---	---	>60	---	Moderate	Low	Moderate.
WeA, WeB Wea	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Wt** Westland	B/D	None	---	---	+.5-1.0	Apparent	Dec-May	>60	---	High	High	Low.

* See description of the map unit for composition and behavior characteristics of the map unit.

** A plus sign under "Depth to water table" indicates ponding.

TABLE 17.--ENGINEERING TEST DATA

Soil name and location	Parent material	Report No.	Depth	Horizon	Moisture density: Maximum	Moisture density: Optimum	Mechanical analysis: Percentage passing sieve--: No. 4	No. 10	No. 40	No. 200	Percentage smaller than--: 0.02 mm	0.005 mm	0.002 mm	Liquid limit	Plasticity index	Classification: AASHTO	Unified
			In		Pcf	Pct								Pct			
		FR															
Algiers silt loam: Madison Township, T. 10 N., R. 21 W., 3 miles south of Canal Winchester, 115 yards north and 85 yards west of southeast corner of sec. 2	Alluvium over buried soil	85604	0-9	Ap	105	20	100	100	99	93		34		33	9	A-4	ML
		85605	9-16	C1	102	21	100	100	100	94		30		36	12	A-6	CL
		85607	36-44	IIB22t	101	22	100	100	100	96		60		52	28	A-7	CH
Bennington silt loam: Plain Township, T. 2 N., R. 16 W., 2.2 miles northeast of New Albany, 410 yards north and 230 yards east of southwest corner of sec. 10	Glacial till	FR-43															
		73252	0-9	Ap	102	20	100	100	97	91		42		34	11	A-6	CL
		73253	18-23	B23t	110	17	100	100	99	97		59		40	15	A-6	CL
		73254	45-62	C2	118	16	100	100	92	80		44		31	10	A-4	CL
Celina silt loam: Madison Township, T. 11 N., R. 21 W., 2 miles north-northeast of Groveport, 1,030 yards south and 470 yards east of northwest corner of sec. 15	Glacial till	FR-53															
		89692	0-7	Ap	107	18	100	100	96	84		29		29	9	A-4	CL
		89693	11-21	B2t	105	19	100	100	97	87		55		37	13	A-6	CL
		89694	55-90	C4	122	12	90	86	76	61		24		25	9	A-4	CL
Kendallville silt loam: Madison Township, T. 11 N., R. 21 W., 1.8 miles southwest of Brice, 430 yards south and 300 yards east of northwest corner of sec. 11	Glacial outwash over glacial till	FR-51															
		89689	0-9	Ap	107	13	97	96	91	76		23		--	--	A-4	ML
		89690	19-27	IIB2t	115	15	96	89	71	58		28		33	13	A-6	CL
		89691	51-63	IIIC2	124	11	89	81	71	56		23		16	8	A-4	CL

TABLE 17.--ENGINEERING TEST DATA--Continued

Soil name and location	Parent material	Report No.	Depth	Horizon	Moisture density: Maximum	Moisture density: Optimum	Mechanical analysis: Percentage passing sieve-- No. 4	No. 10	No. 40	No. 200	Percentage smaller than-- 0.02 mm	0.005 mm	0.002 mm	Liquid limit	Plasticity index	Classification: AASHTO	Unified
			In		Pcf	Pct								Pct			
Kokomo silty clay loam:	Glacial till	FR-40															
Norwich Township, 3.2 miles south of Hilliard, 230 yards north of Renner Road, 265 yards east of Spindler Road		73243	0-9	Ap	97	23	100	100	98	90		38		42	15	A-6	ML
		73244	16-36	B2tg	105	21	97	91	88	81		51		42	15	A-7	ML
		73245	50-68	C2 & C3	117	13	90	88	79	67		36		26	8	A-4	CL
Lewisburg silt loam:	Glacial till	FR-39															
Norwich Township, 3 miles south of Hilliard, 120 yards north of Renner Road, 300 yards east of Spindler road		72222	0-6	Ap	104	20	100	100	97	87		40		34	13	A-6	CL
		72223	6-11	B2t	103	21	100	95	92	85		56		42	17	A-6	CL
		72224	26-36	C2	117	15	86	80	73	62		32		29	11	A-6	CL
Pewamo silty clay loam:	Glacial till	FR-42															
Plain Township, T. 2 N., R. 16 W., 2.5 miles northeast of New Albany, 750 yards north and 120 yards east of southwest corner of sec. 10		73249	0-8	Ap	90	27	100	100	99	94		54		45	13	A-7-5	ML
		73250	18-28	B22tg	110	17	100	100	97	90		53		37	18	A-6	CL
		73251	67-79	C2	115	15	92	87	79	67		40		33	12	A-6	CL

TABLE 18.--CLASSIFICATION OF THE SOILS

[An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series]

Soil name	Family or higher taxonomic class
Alexandria	Fine, illitic, mesic Typic Hapludalfs
Algiers	Fine-loamy, mixed, nonacid, mesic Aquic Udifluvents
Bennington	Fine, illitic, mesic Aeric Ochraqualfs
Blount	Fine, illitic, mesic Aeric Ochraqualfs
Cardington	Fine, illitic, mesic Aquic Hapludalfs
Carlisle	Euic, mesic Typic Medisaprists
Celina	Fine, mixed, mesic Aquic Hapludalfs
Condit	Fine, illitic, mesic Typic Ochraqualfs
Crane	Fine-loamy, mixed, mesic Aquic Argiudolls
Crosby	Fine, mixed, mesic Aeric Ochraqualfs
Eel	Fine-loamy, mixed, nonacid, mesic Aquic Udifluvents
Eldean	Fine, mixed, mesic Typic Hapludalfs
*Genesee	Fine-loamy, mixed, nonacid, mesic Typic Udifluvents
Glynwood	Fine, illitic, mesic Aquic Hapludalfs
Hennepin	Fine-loamy, mixed, mesic Typic Eutrochrepts
Kendallville	Fine-loamy, mixed, mesic Typic Hapludalfs
Kokomo	Fine, mixed, mesic Typic Argiaquolls
Lewisburg	Fine, mixed, mesic Typic Hapludalfs
Medway	Fine-loamy, mixed, mesic Fluvaquentic Hapludolls
Miamian	Fine, mixed, mesic Typic Hapludalfs
Milton	Fine, mixed, mesic Typic Hapludalfs
Mitiwanga	Fine-loamy, mixed, mesic Aeric Ochraqualfs
Montgomery	Fine, mixed, mesic Typic Haplaquolls
Ockley	Fine-loamy, mixed, mesic Typic Hapludalfs
Pewamo	Fine, mixed, mesic Typic Argiaquolls
*Ritchey	Loamy, mixed, mesic Lithic Hapludalfs
Ross	Fine-loamy, mixed, mesic Cumulic Hapludolls
Shoals	Fine-loamy, mixed, nonacid, mesic Aeric Fluvaquents
Sleeth	Fine-loamy, mixed, mesic Aeric Ochraqualfs
Sloan	Fine-loamy, mixed, mesic Fluvaquentic Haplaquolls
Thackery	Fine-loamy, mixed, mesic Aquic Hapludalfs
Udorthents	Loamy, mixed, mesic Typic Udorthents
Warsaw	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Typic Argiudolls
Wea	Fine-loamy, mixed, mesic Typic Argiudolls
Westland	Fine-loamy, mixed, mesic Typic Argiaquolls

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