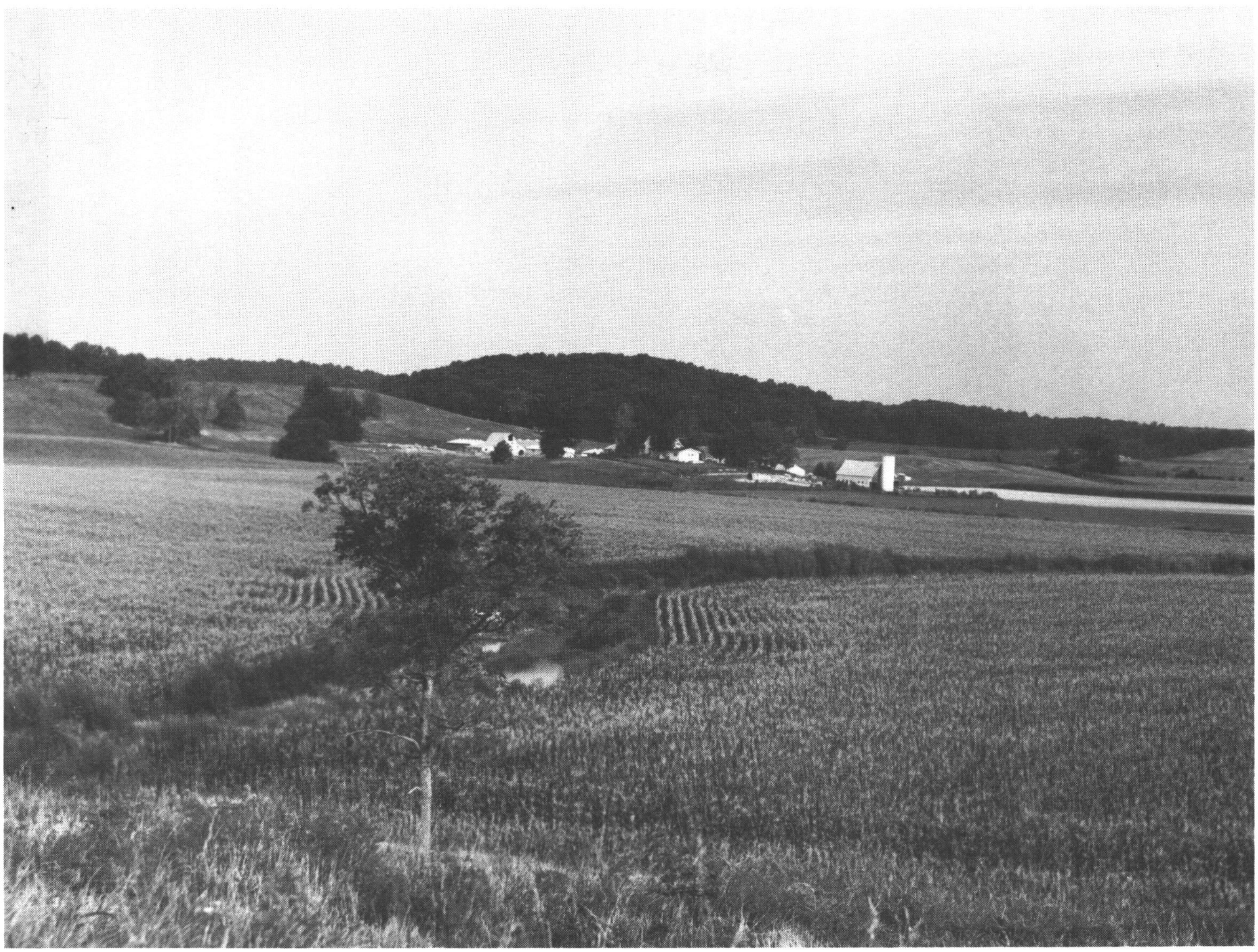
United States
Department of
Agriculture

Soil
Conservation
Service

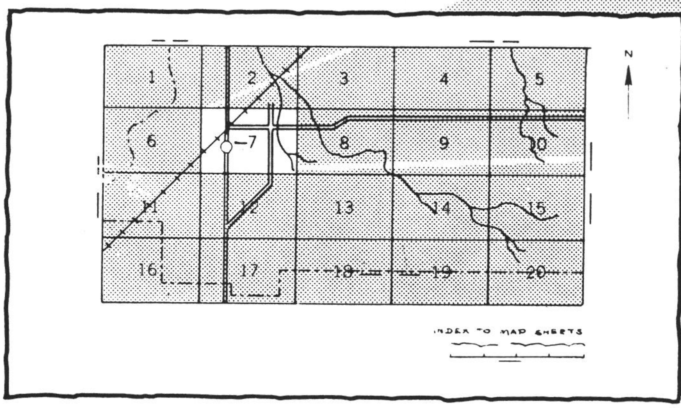
In cooperation with
United States Department of
Agriculture, Forest Service;
Purdue University
Agricultural Experiment
Station; and Indiana
Department of Natural
Resources, Soil and Water
Conservation Committee

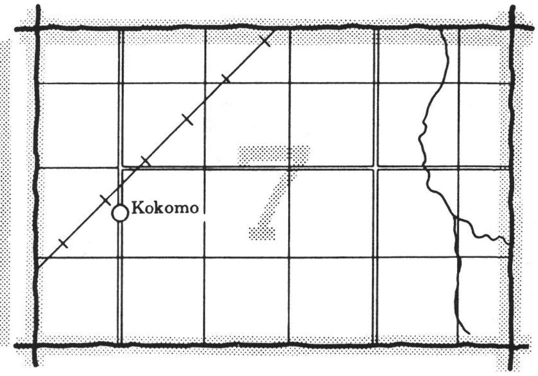
Soil Survey of Martin County, Indiana



HOW TO USE

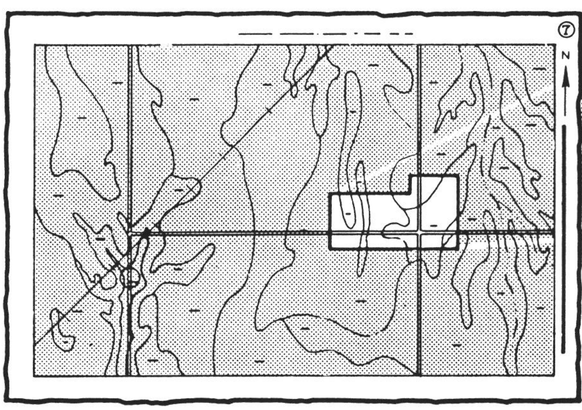
1. Locate your area of interest on the "Index to Map Sheets"

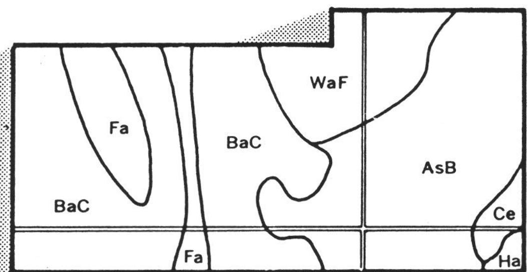




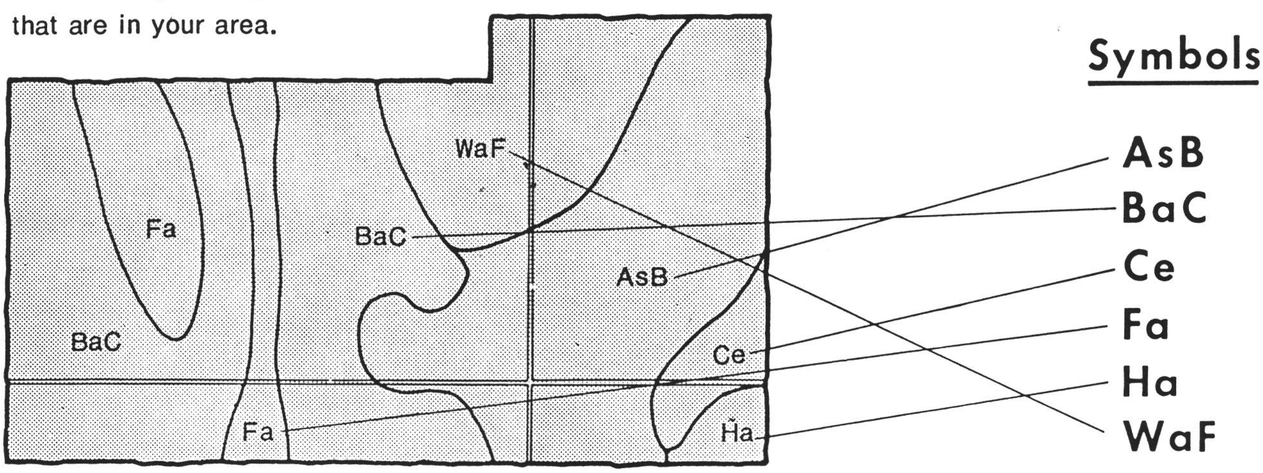
2. Note the number of the map sheet and turn to that sheet.

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



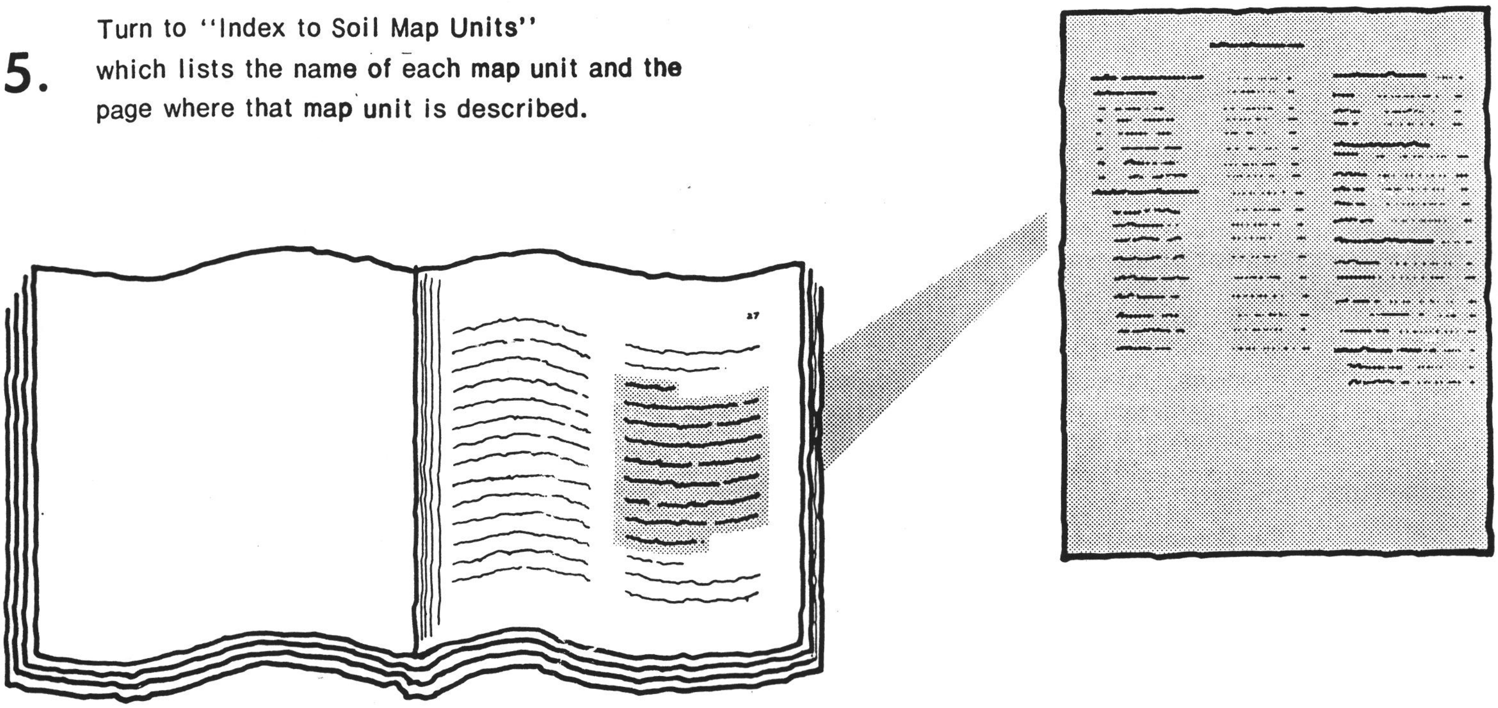


4. List the map unit symbols that are in your area.

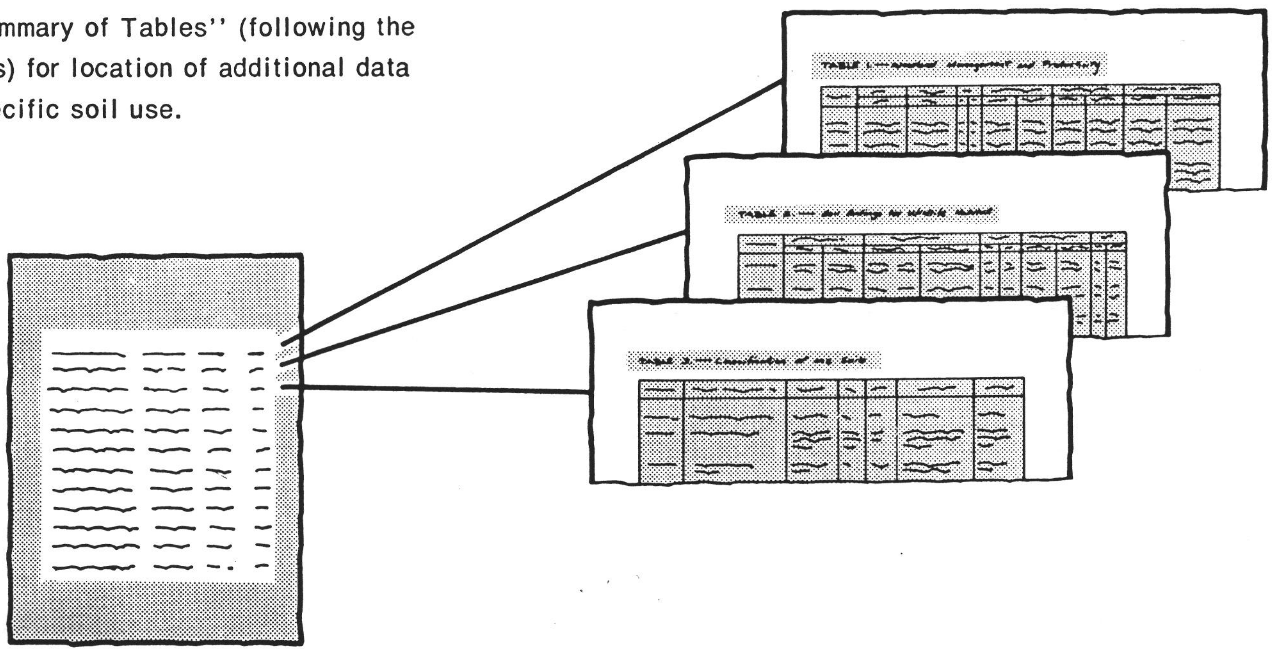


THIS SOIL SURVEY

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

Major fieldwork for this soil survey was completed in 1982. Soil names and descriptions were approved in 1984. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1982. This survey was made cooperatively by the Soil Conservation Service, the Forest Service, the Purdue University Agricultural Experiment Station, and the Indiana Department of Natural Resources, Soil and Water Conservation Committee. It is part of the technical assistance furnished to the Martin County Soil and Water Conservation District. Financial assistance was made available by the Martin County Board of Commissioners and the Indiana Department of Natural Resources.

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

Cover: Corn in an area of Wakeland, Wilbur, and Haymond soils on bottom land and Zipp and McGary soils on terraces.

Contents

Soil Series

Issued September 1988

Index to Map Units

Summary of Tables

Foreword

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

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

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

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

Robert L. Eddleman
State Conservationist
Soil Conservation Service

Location of Martin County in Indiana.

Soil Survey of Martin County, Indiana

By George McElrath, Jr., Soil Conservation Service

Fieldwork by George McElrath, Jr., Soil Conservation Service, and
David A. Tuszynski, Indiana Department of Natural Resources,
Soil and Water Conservation Committee

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

MARTIN COUNTY is in the southwestern part of Indiana. It has a total area of 217,888 acres, or about 340 square miles. It extends about 28 miles from north to south and about 13 miles from west to east. Shoals is the county seat. The population of the county is about 11,000.

The county was established in 1820. The identity of the person after whom the county was named has never been ascertained (*4*).

The county is in the hilly part of Indiana. It lies almost entirely within the Crawford Upland, the most rugged and highly dissected part of Indiana. The streams flow southwesterly in narrow, deeply entrenched, meandering channels. The East Fork of the White River drains practically all of the county. It flows about 250 feet below the general level of the hilltops. A small area in the northwestern part of the county is drained by First Creek, a tributary of the West Fork of the White River. Land elevation in the county ranges from about 425 to 860 feet above sea level.

This survey updates the soil survey of Martin County published in 1946 (*6*). It provides additional information and larger maps, which show the soils in greater detail.

General Nature of the County

This section gives general information concerning the county. It describes farming, natural resources, and climate.

Farming

The chief farm products in Martin County are cattle, hogs, and poultry and corn, hay, soybeans, and wheat. Meadow crops provide forage for livestock. Most pastures support a mixture of fescue, timothy, red clover, and alfalfa. In 1978, about 74 percent of the local farm income came from the sale of livestock and poultry and their products. From 1974 to 1978, the number of cattle decreased and the number of hogs and poultry increased (*9*).

From 1974 to 1978, the number of farms decreased from 447 to 423, the average size of the farms decreased from 192 to 185 acres, the number of full owners of the farms decreased from 353 to 312, the number of part owners increased from 72 to 91, and the number of tenant farmers decreased from 22 to 20 (*9*). Some farmland has been converted to woodland.

Natural Resources

Soil is the most important natural resource in the county. It provides a growing medium for crops, for the plants grazed by livestock, and for timber.

Wisconsinan-age outwash fills the valley of the East Fork of the White River, which flows through the county. This outwash is an important source of moderate to large water supplies (*5*). The county has several lakes. Lake Greenwood, at the Crane Naval Weapons Support Center, is a large, multipurpose lake. Scattered ponds are throughout the county.

Raw gypsum is mined in the county. Some of it is used as fertilizer, and much of it is used by the building industry. Coal is strip-mined in a few small areas, mainly in the southern part of the county.

Climate

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

Summers in Martin County are hot in the valleys and slightly cooler in the hills. Winters are moderately cold. Rainfall is fairly heavy and is well distributed throughout the year. Snow falls nearly every winter, but the snow cover usually lasts only a few days.

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

In winter the average temperature is 32 degrees F, and the average daily minimum temperature is 21 degrees. The lowest temperature on record, which occurred at Shoals on January 29, 1963, is -23 degrees. In summer the average temperature is 74 degrees, and the average daily maximum temperature is 86 degrees. The highest recorded temperature, which occurred at Shoals on July 14, 1966, is 103 degrees.

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

The total annual precipitation is about 43 inches. Of this, nearly 24 inches, or 55 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 19 inches. The heaviest 1-day rainfall during the period of record was 6.07 inches at Shoals on September 7, 1971. Thunderstorms occur on about 45 days each year.

The average seasonal snowfall is 16 inches. The greatest snow depth at any one time during the period of record was 12 inches. On the average, 11 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 70 percent of the time possible in summer and 40 percent in winter. The prevailing wind is from the south-southwest. Average windspeed is highest, 10 miles per hour, in spring.

How This Survey Was Made

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

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

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

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

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

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

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

Map Unit Composition

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

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

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

General Soil Map Units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, it 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 another but in a different pattern.

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

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

The names, descriptions, and delineations of the soils identified on the general soil map of this county do not always agree or join fully with those of the soils identified on the maps of adjoining counties published at an earlier date. Some differences are the result of changes in concepts of soil series. Other differences result from variations in the extent of the soils. Others are the result of variations in the slope range allowed in the map units.

Soil Descriptions

1. Wellston-Berks-Gilpin

Deep and moderately deep, gently sloping to very steep, well drained soils formed in loess and material weathered from sandstone, siltstone, and shale on uplands

This map unit is on ridgetops and side slopes in the uplands. Areas are large and are separated by long, narrow bottom land and ridges.

This map unit makes up about 44 percent of the county. It is about 43 percent Wellston soils, 15 percent Berks soils, 10 percent Gilpin soils, and 32 percent soils of minor extent (fig. 1).

Wellston soils are deep and are gently sloping to very steep. Typically, they are silt loam throughout. The surface layer is dark grayish brown. The subsurface layer is brown. The subsoil is dark yellowish brown, strong brown, and brown. The underlying material is yellowish brown.

Berks soils are moderately deep and are moderately steep to very steep. Typically, they have a surface layer of brown channery silt loam. The subsoil is light yellowish brown channery and very channery loam. Rippable sandstone bedrock is at a depth of about 38 inches.

Gilpin soils are moderately deep and are strongly sloping to very steep. Typically, they have a surface layer of very dark grayish brown channery silt loam. The subsoil is yellowish brown channery silt loam and brown loam. The underlying material is yellowish brown channery loam. Bedrock is at a depth of about 39 inches.

The minor soils in this map unit are the well drained Burnside soils, the somewhat poorly drained Wakeland soils, the moderately well drained Wilbur soils, and the well drained and moderately well drained Zanesville soils. Burnside soils are deep and are on the lower end of drainageways that extend into the valley floors. Wakeland and Wilbur soils are along the streams that dissect the unit. Zanesville soils are deep, have a fragipan, and are on the ridgetops and side slopes.

This map unit is used mainly as woodland. Some of the less sloping areas are used as pasture or cropland. The soils are generally unsuited to cultivated crops. Because of the slope and the depth to bedrock, they are generally unsuitable as sites for dwellings and sanitary facilities. They are poorly suited to intensive recreational uses because of the slope.

2. Wellston-Gilpin

Deep and moderately deep, gently sloping to very steep, well drained soils formed in loess and material weathered from sandstone, siltstone, and shale on uplands

This map unit is on ridgetops and side slopes in the uplands. Areas are large and are separated by long, narrow bottom land and ridges.

This map unit makes up about 35 percent of the county. It is about 50 percent Wellston soils, 15 percent Gilpin soils, and 35 percent soils of minor extent (fig. 2).

Wellston soils are deep and are gently sloping to very steep. Typically, they are silt loam throughout. The surface layer is dark grayish brown. The subsurface layer is brown. The subsoil is dark yellowish brown, strong

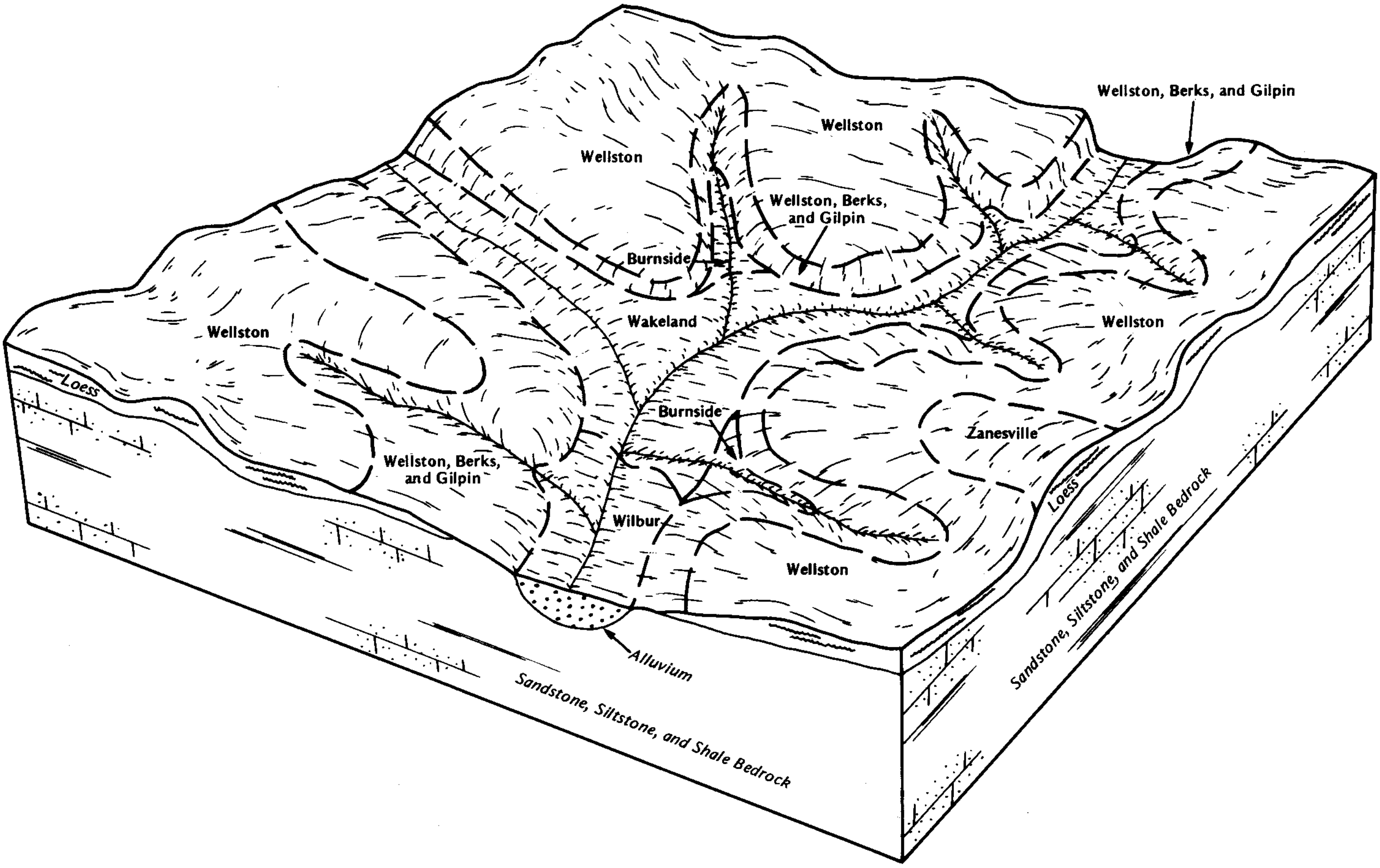


Figure 1.—Typical pattern of soils and parent material in the Wellston-Berks-Gilpin map unit.

brown, and brown. The underlying material is yellowish brown.

Gilpin soils are moderately deep and are strongly sloping to very steep. Typically, they have a surface layer of very dark grayish brown channery silt loam. The subsoil is yellowish brown channery silt loam and brown loam. The underlying material is yellowish brown channery loam. Bedrock is at a depth of about 39 inches.

The minor soils in this map unit are the well drained Berks, Burnside, and Hosmer soils; the somewhat poorly drained Wakeland soils; and the well drained and moderately well drained Zanesville soils. Berks soils are moderately deep and are near the top of the side slopes. Burnside soils are deep and are on the lower end of drainageways that extend into the valley floors. Hosmer and Zanesville soils are deep, have a fragipan, and are on the ridgetops. Zanesville soils also are on the side slopes. Wakeland soils are along the streams that dissect the unit.

This map unit is used mainly as woodland. Some areas are used as pasture. A few are used for cultivated crops. Because of the slope, the soils are poorly suited to cultivated crops and to intensive recreational uses. Because of the slope and the depth to bedrock, they are poorly suited to dwellings and sanitary facilities.

3. Wakeland-Wilbur-Haymond

Deep, nearly level, somewhat poorly drained to well drained soils formed in alluvium on bottom land

This map unit is on broad bottom land along meandering streams. Areas generally vary in size and shape.

This map unit makes up about 10 percent of the county. It is about 39 percent Wakeland soils, 13 percent Wilbur soils, 12 percent Haymond soils, and 36 percent soils of minor extent (fig. 3).

Wakeland soils are somewhat poorly drained. They are on broad flats and on narrow bottom land along streams. They formed in medium acid to neutral alluvium washed

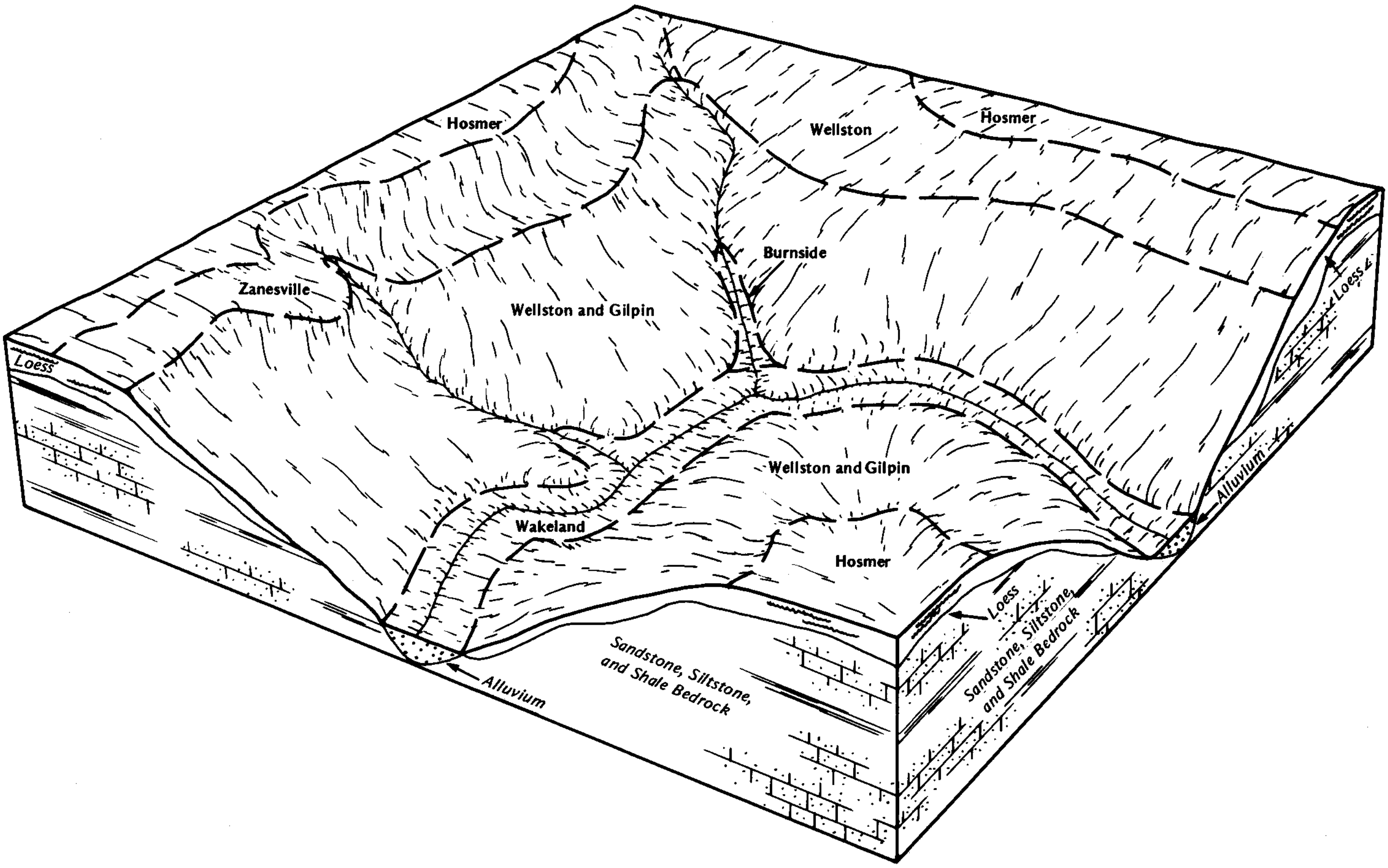


Figure 2.—Typical pattern of soils and parent material in the Wellston-Gilpin map unit.

from loess-covered uplands. Typically, they are silt loam throughout. The surface layer is brown. The underlying material is dark yellowish brown, light brownish gray, pale brown, and gray and is mottled.

Wilbur soils are moderately well drained. They are along streams and are slightly higher on the landscape than the Wakeland soils. They formed in medium acid to neutral alluvium washed from loess-covered uplands. Typically, they are silt loam throughout. The surface layer is brown. The underlying material is dark yellowish brown and yellowish brown and is mottled.

Haymond soils are well drained. They are along streams and are higher on the landscape than the Wakeland and Wilbur soils. They formed in alluvium washed from loess-covered uplands. Typically, they are silt loam throughout. The surface layer is brown. The underlying material is dark yellowish brown.

The minor soils in this map unit are the well drained Burnside soils, the moderately well drained Pekin soils, and the poorly drained Birds and Bonnie soils. Burnside soils are on the narrow bottom land along drainageways that empty into the main streams. Pekin soils are on low terraces. Birds and Bonnie soils are on narrow flats and in depressions.

This map unit is used mainly for cultivated crops. Some areas are used for hay, pasture, or woodland. These soils are well suited to cultivated crops. Frequent flooding early in spring can delay planting. The Wakeland and Wilbur soils are also limited by wetness. All of the major soils are suited to trees. Because the frequent flooding is a severe hazard, they are generally unsuitable as sites for dwellings and sanitary facilities. They are suited to intensive recreational uses, but the flooding is a hazard early in spring.

4. Wellston-Berks-Ebal

Deep and moderately deep, gently sloping to very steep, well drained and moderately well drained soils formed in loess and material weathered from sandstone, siltstone, and shale on uplands

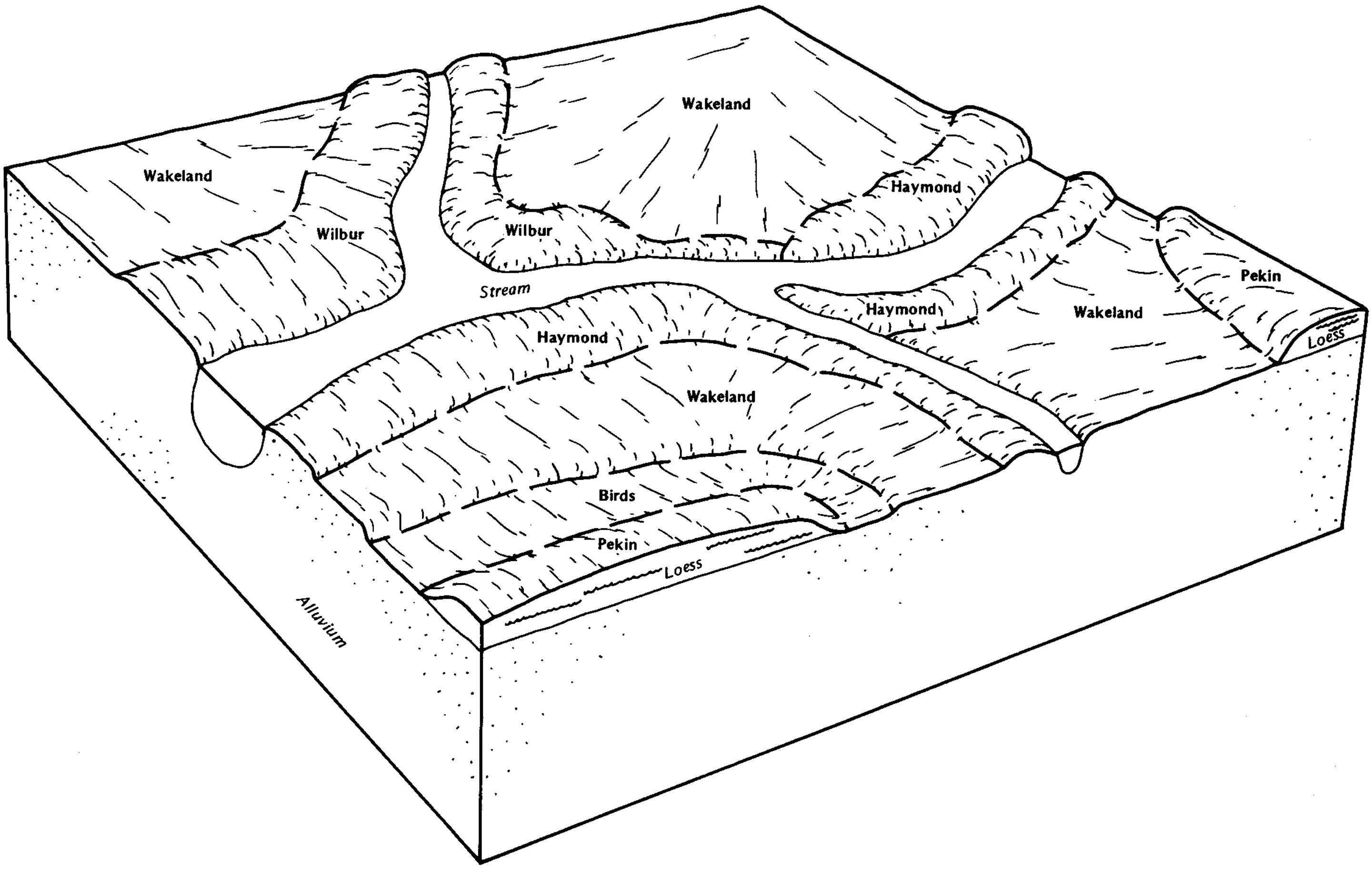


Figure 3.—Typical pattern of soils and parent material in the Wakeland-Wilbur-Haymond map unit.

This map unit is on ridgetops and side slopes in the uplands. Areas are large and are separated by long, narrow bottom land and ridges.

This map unit makes up about 5 percent of the county. It is about 35 percent Wellston soils, 30 percent Berks and similar soils, 15 percent Ebal soils, and 20 percent soils of minor extent.

Wellston soils are deep, gently sloping to very steep, and well drained. Typically, they are silt loam throughout. The surface layer is dark grayish brown. The subsurface layer is brown. The subsoil is dark yellowish brown, strong brown, and brown. The underlying material is yellowish brown.

Berks soils are moderately deep, moderately steep to very steep, and well drained. Typically, they have a surface layer of brown channery silt loam. The subsurface layer is light yellowish brown channery silt loam. The subsoil is light yellowish brown channery and very channery loam. Rippable sandstone bedrock is at a depth of about 38 inches. In some areas the content of coarse fragments is lower.

Ebal soils are deep, moderately sloping and strongly sloping, and moderately well drained. Typically, they have a surface layer of dark grayish brown silt loam. The subsoil is strong brown channery silty clay and channery clay in the upper part and yellowish brown, mottled clay in the lower part. The underlying material is yellowish brown shaly clay.

The minor soils in this map unit are the well drained Burnside and well drained and moderately well drained Zanesville soils. Burnside soils are deep and formed in alluvium at the lower end of drainageways. Zanesville soils are deep, have a fragipan, and are on the ridgetops and side slopes.

This map unit is used mainly as woodland. A few areas are used as pasture. The soils are poorly suited to cultivated crops. Because of the slope and the depth to bedrock, they are poorly suited to dwellings and sanitary facilities. They are poorly suited to intensive recreational uses because of the slope.

5. Newark-Wirt-Nolin

Deep, nearly level, somewhat poorly drained and well drained soils formed in alluvium on bottom land

This map unit is on broad bottom land, mainly along the White River. Areas generally vary in size and shape.

This map unit makes up about 3 percent of the county. It is about 30 percent Newark soils, 29 percent Wirt soils, 28 percent Nolin soils, and 13 percent soils of minor extent (fig. 4).

Newark soils are somewhat poorly drained. Typically, the surface layer and subsurface layer are dark grayish brown silt loam. The subsoil is grayish brown, mottled silt loam in the upper part and light brownish gray, mottled silty clay loam in the lower part. The underlying material is gray and dark yellowish brown, mottled silty clay loam.

Wirt soils are well drained. Typically, they have a surface layer of brown fine sandy loam. The subsoil is dark yellowish brown and brown fine sandy loam in the upper part and dark yellowish brown sandy loam in the lower part. The underlying material is brown loam.

Nolin soils are well drained. Typically, they are silt loam throughout. The surface layer is dark grayish brown. The subsoil is brown. The underlying material is dark yellowish brown.

The minor soils in this map unit are the well drained Abscota and Haymond soils and the somewhat poorly drained Wakeland soils. Abscota soils have more sand than the major soils and are along bends of the river. Haymond and Wakeland soils contain less clay than the Newark and Nolin soils and are along the streams that dissect the unit.

This map unit is used mainly for cultivated crops. Some areas are used for hay, pasture, or woodland. These soils are well suited to cultivated crops. Frequent flooding early in spring can delay planting. The Newark soils are also limited by wetness. All of the major soils are suited to trees. Because the frequent flooding is a severe hazard, they are generally unsuitable as sites for dwellings and sanitary facilities. They are suited to intensive recreational uses, but the flooding is a hazard early in spring.

6. Hosmer-Bartle

Deep, gently sloping and nearly level, well drained and

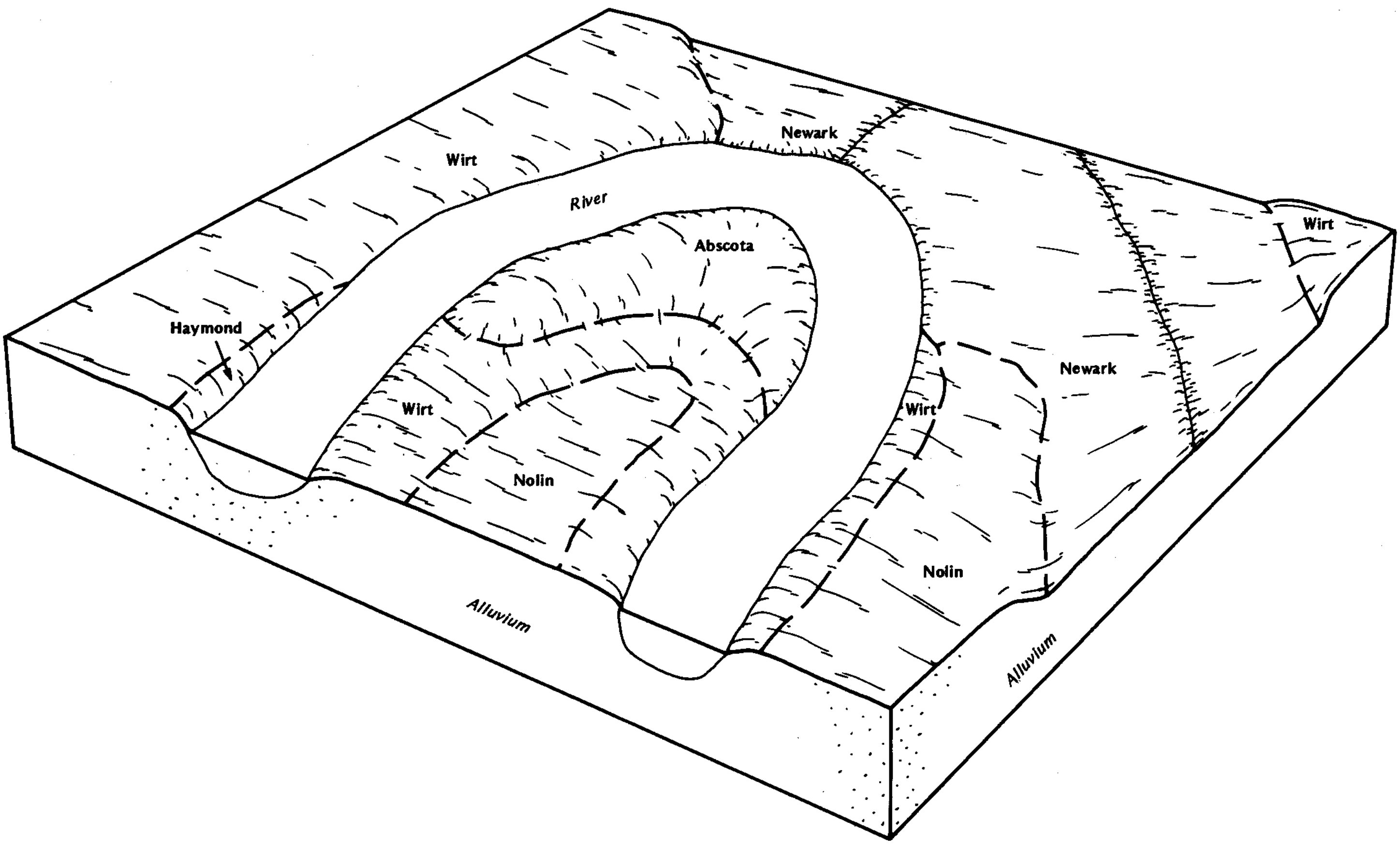


Figure 4.—Typical pattern of soils and parent material in the Newark-Wirt-Nolin map unit.

somewhat poorly drained soils formed in loess or acid, silty material on uplands

This map unit is on ridgetops, terraces, and lake plains in the western part of the county. It makes up about 2 percent of the county. It is about 35 percent Hosmer soils, 20 percent Bartle soils, and 45 percent soils of minor extent.

Hosmer soils are gently sloping and well drained. They formed in loess on ridgetops. Typically, the surface layer is silt loam. It is dark grayish brown in the upper part and brown in the lower part. The upper part of the subsoil is strong brown and yellowish brown silt loam. The next part is a fragipan of yellowish brown, strong brown, and dark yellowish brown, mottled silty clay loam and silt loam. The lower part is brown, mottled silt loam. The underlying material is yellowish brown, mottled silty clay.

Bartle soils are nearly level and somewhat poorly drained. They are on lake plains and stream terraces. They formed in acid, silty material of mixed origin and in material weathered from shale, siltstone, and sandstone. Typically, they are silt loam throughout. The surface layer is brown. The subsurface layer is pale brown and mottled. The subsoil is light brownish gray and mottled in the upper part; a grayish brown and yellowish brown, mottled fragipan in the next part; and brown and mottled in the lower part. The underlying material is yellowish brown and mottled.

The minor soils in this map unit are the well drained Camden soils, the somewhat poorly drained Wakeland soils, and the poorly drained Bonnie soils. Camden soils do not have grayish colors in the subsoil. Bonnie and Wakeland soils are on bottom land.

This map unit is used mainly for cultivated crops. Some areas are used for hay, pasture, or woodland. The Hosmer soils are well suited to cultivated crops, and the Bartle soils are well suited if they are drained. The rooting depth of crops is limited by the fragipan in the Hosmer and Bartle soils. These soils are suited to trees. They are poorly suited to dwellings, sanitary facilities, and intensive recreational uses, mainly because of the very slow permeability in the fragipan of both soils and the wetness of the Bartle soils.

7. Alvin-Chelsea-Martinsville

Deep, nearly level to steep, well drained and excessively drained soils formed in eolian and water-deposited, sandy and loamy material on terraces and uplands

This map unit is on terraces and uplands along the East Fork of the White River. It makes up about 1 percent of the county. It is about 35 percent Alvin soils, 25 percent Chelsea soils, 20 percent Martinsville soils, and 20 percent soils of minor extent.

Alvin soils are gently sloping to steep and are well drained. They are on uplands. Typically, they have a surface layer of very dark grayish brown loamy fine sand and a subsurface layer of dark grayish brown loamy fine sand. The subsoil is brown and strong brown fine sandy loam, sandy clay loam, and loamy fine sand. The underlying material is brown fine sand.

Chelsea soils are gently sloping to steep and are excessively drained. They are on uplands. Typically, the surface layer is loamy fine sand. It is very dark gray in the upper part and very dark grayish brown in the lower part. The subsurface layer is dark yellowish brown loamy fine sand. The subsoil is dark yellowish brown fine sand that has thin bands of brown loamy fine sand.

Martinsville soils are nearly level and well drained. They are on terraces. Typically, they have a surface layer of dark grayish brown loam. The subsurface layer is brown loam. The subsoil is brown and strong brown loam and fine sandy loam. The upper part of the underlying material is brown sandy loam that has strata of loamy sand. The lower part is yellowish brown sand.

The minor soils in this map unit are the well drained Negley and Nolin soils. Negley soils are on outwash terraces. Nolin soils are on bottom land.

This map unit is used mainly for hay, pasture, and cultivated crops. Some areas are used as woodland. These soils are suited to cultivated crops but are limited by the slope and the hazard of erosion. They are suitable for trees. The less sloping areas are suitable as sites for dwellings, sanitary facilities, and intensive recreational uses. In the steeper areas, however, the slope is a limitation affecting these uses.

Broad Land Use Considerations

The general soil map helps to identify broad areas in the county where the soils are likely to be suitable for different uses. The general soil map is helpful in broad land use planning, but it cannot be used for the selection of sites for specific uses.

The nearly level and gently sloping soils in the Wellston-Berks-Gilpin, Wellston-Gilpin, Wellston-Berks-Ebal, and Alvin-Chelsea-Martinsville map units are well suited to cultivated crops, but the more sloping soils in these units are poorly suited or generally unsuited. Most of the steeper soils are not cultivated because the erosion hazard is severe. The Wakeland-Wilbur-Haymond and Newark-Wirt-Nolin map units are well suited to cultivated crops. Flooding is a hazard on the soils in these units. The wetness of the Wakeland, Wilbur, and Newark soils in these units and of the Bartle soils in the Hosmer-Bartle map unit is a limitation. In many areas, however, a drainage system has sufficiently reduced the wetness. The Hosmer-Bartle map unit is well suited to cultivated crops if the Bartle soils are drained.

Most of the soils in the county are well suited to pasture and hay. Exceptions are the strongly sloping to very steep soils in the Wellston-Berks-Gilpin, Wellston-Gilpin, Wellston-Berks-Ebal, and Alvin-Chelsea-Martinsville map units. Wetness is a limitation in some areas of the Wakeland-Wilbur-Haymond, Newark-Wirt-

Nolin, and Hosmer-Bartle map units. Water-tolerant grasses and legumes should be selected for planting in these areas.

Most of the soils in the county are well suited or fairly well suited to woodland. Commercially valuable trees are less common and generally do not grow so rapidly on the wetter soils in the Wakeland-Wilbur-Haymond, Newark-Wirt-Nolin, and Hosmer-Bartle map units as on other soils. The fragipan in the major soils of the Hosmer-Bartle map unit also restricts tree growth.

Many of the soils in the county are generally unsuitable for urban development. In the Wellston-Berks-Gilpin, Wellston-Gilpin, and Wellston-Berks-Ebal map units, the slope and the depth to bedrock are the dominant limitations. The nearly level and gently sloping soils in the Alvin-Chelsea-Martinsville map unit are well suited to urban development. The Hosmer-Bartle map unit is poorly suited, mainly because the very slowly permeable fragipan is a severe limitation on sites for sanitary facilities. The Wakeland-Wilbur-Haymond and Newark-Wirt-Nolin map units are generally unsuited to urban development because of flooding.

Because of the slope, many soils in the county are poorly suited to intensive recreational uses, such as camp areas and picnic areas. The nearly level and gently sloping soils in the Alvin-Chelsea-Martinsville, Wellston-Gilpin, and Wellston-Berks-Gilpin map units, however, are well suited to these uses. Many soils are well suited to extensive recreational uses, such as hiking trails and nature study parks. Hardwood forests enhance the beauty of many areas.

Detailed Soil Map Units

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

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

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

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

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Wellston silt loam, 12 to 18 percent slopes, severely eroded, is a phase in the Wellston series.

Some map units are made up of two or more major soils. These map units are called soil complexes. A *soil complex* consists of two or more soils, or one or more soils and a miscellaneous area, in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Wellston-Berks-Gilpin complex, 18 to 70 percent slopes, is an example.

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

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. The Pits part of the Udorthents-Pits complex 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.

The names, descriptions, and delineations of the soils identified on the detailed soil maps of this county do not always agree or fully join with those of the soils identified on the maps of adjoining counties published at an earlier date. Some differences are the result of changes in concepts of soil series. Other differences result from variations in the extent of the soils. Others are the result of variations in the slope range allowed in the map units.

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

Ab—Abscota loamy sand, frequently flooded. This nearly level, deep, well drained soil is on bottom land. It is flooded for brief periods. Individual areas are irregular in shape and are 30 to 60 acres in size.

In a typical profile, the surface layer is dark grayish brown loamy sand about 8 inches thick. The subsoil is about 16 inches thick. It is friable. It is dark grayish brown loamy fine sand in the upper part and brown sand in the lower part. The underlying material to a depth of 60 inches is yellowish brown, brown, and dark yellowish brown sand. In some areas the surface layer is loam. In other areas it is calcareous.

Included with this soil in mapping are small areas of the well drained Nolin soils. These soils contain more clay and less sand in the subsoil than the Abscota soil. Also, they are farther from streams. Also included are small areas of Wirt soils, which contain more sand than the Abscota soil. Included soils make up about 10 percent of the map unit.

Available water capacity is low in the Abscota soil. Permeability is rapid. Surface runoff is slow. The organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled.

Most areas of this soil are used for hay or pasture. A few are used for cultivated crops or woodland.

This soil is poorly suited to corn and soybeans. Flooding and drought are hazards. A system of conservation tillage that leaves protective amounts of crop residue on the surface conserves moisture. Cover crops and green manure crops improve or maintain tilth and the organic matter content.

This soil is suited to grasses and legumes for hay and pasture. The low available water capacity is a limitation. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

This soil is suited to trees. Plant competition and seedling mortality are management concerns. Seedlings survive and grow well if competing vegetation is controlled by cutting, spraying, or girdling. Because of the seedling mortality rate, special planting stock and overstocking are needed.

Because of the flooding, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields and is severely limited as a site for local roads and streets. Constructing the roads on raised, well compacted fill material, establishing adequate roadside drainage ditches, and installing culverts help to prevent the damage caused by flooding.

The land capability classification is IVs. The woodland ordination symbol is 5S.

AvC2—Alvin-Chelsea loamy fine sands, 4 to 10 percent slopes, eroded. These gently sloping and moderately sloping, deep soils are on uplands. They generally are on ridgetops and side slopes. The Alvin soil is well drained, and the Chelsea soil is excessively drained. Individual areas are dominantly 5 to 30 acres in size. They are about 60 percent Alvin soil and 30 percent Chelsea soil. The two soils occur as areas so intricately mixed that mapping them separately is not practical.

In a typical profile of the Alvin soil, the surface layer is brown loamy fine sand about 5 inches thick. It is mixed with some dark brown subsoil material. The subsoil is about 65 inches thick. It is friable. The upper part is dark brown loamy fine sand, the next part is strong brown and brown sandy clay loam and silt loam, and the lower part is brown sandy loam. The underlying material to a depth of 80 inches is dark brown and light yellowish brown sandy loam and sand. In places gravel and sand are in the underlying material.

In a typical profile of the Chelsea soil, the surface layer is brown loamy fine sand about 10 inches thick. The subsurface layer is dark yellowish brown fine sand about 20 inches thick. The subsoil is about 42 inches thick. It is dark yellowish brown, loose fine sand that has bands of friable loamy fine sand. The underlying material to a depth of 80 inches is very pale brown, calcareous fine sand. In some areas the soil has bands that total more than 6 inches thick within a depth of 60 inches. In other areas it does not have bands within a depth of 60 inches.

Included with these soils in mapping are small areas of the well drained Martinsville and Nolin soils. Martinsville soils have more clay in the subsoil than the Alvin and Chelsea soils. Also, they are lower on the landscape. Nolin soils have less sand in the subsoil than the Alvin and Chelsea soils. They are on bottom land. Included soils make up about 10 percent of the map unit.

Available water capacity is moderate in the Alvin soil and low in the Chelsea soil. Permeability is moderate or moderately rapid in the Alvin soil and rapid in the Chelsea soil. Surface runoff is medium on both soils. The organic matter content is low in the surface layer. This layer is very friable and can be easily tilled.

Most areas are used for hay and pasture. Some are used for cultivated crops or woodland. These soils generally are unsuited to corn, soybeans, and small grain because of droughtiness. If crops are grown to reestablish pastures, a conservation tillage system that leaves protective amounts of crop residue on the surface helps to control wind erosion and water erosion and helps to maintain the organic matter content.

These soils are poorly suited to grasses and legumes for hay and pasture. In years when rainfall is below average or poorly distributed, the growth of pasture plants may be poor. Overgrazing should be avoided. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

These soils are suited to trees. Some small areas support stands of native hardwoods. Plant competition and seedling mortality are management concerns. Seedlings survive and grow well if competing vegetation is controlled by cutting, spraying, or girdling. Because of the seedling mortality rate, special planting stock and overstocking are needed.

These soils are suitable as sites for dwellings. The Chelsea soil is severely limited as a site for septic tank absorption fields because of a poor filtering capacity. The effluent is readily absorbed by the soil, but it can pollute ground water supplies.

No major limitations or hazards affect the use of the Chelsea soil as a site for local roads and streets. The Alvin soil, however, is moderately limited because of frost action. Replacing or covering the upper soil layers with suitable base material helps to prevent the damage caused by frost action.

The land capability classification is VIs. The woodland ordination symbol of the Alvin soil is 4A, and that of the Chelsea soil is 3S.

AvE—Alvin-Chelsea loamy fine sands, 15 to 35 percent slopes. These strongly sloping to steep, deep soils are on uplands. They are generally on side slopes. The Alvin soil is well drained, and the Chelsea soil is excessively drained. Individual areas are dominantly 20 to 40 acres in size. They are about 55 percent Alvin soil and 35 percent Chelsea soil. The two soils occur as areas so intricately mixed that mapping them separately is not practical.

In a typical profile of the Alvin soil, the surface layer is very dark grayish brown loamy fine sand about 5 inches thick. The subsurface layer is dark grayish brown loamy fine sand about 7 inches thick. The subsoil is about 60 inches thick. It is brown, friable fine sandy loam in the upper part; strong brown, firm sandy clay loam in the next part; and strong brown, friable loamy fine sand in the lower part. The underlying material to a depth of 80 inches is brown fine sand. In some areas sandstone bedrock crops out.

In a typical profile of the Chelsea soil, the surface layer is very dark gray loamy fine sand about 2 inches thick. The subsurface layer is very dark grayish brown and dark yellowish brown loamy fine sand about 27 inches thick. The subsoil to a depth of 80 inches is dark yellowish brown, loose fine sand that has bands of dark brown, friable loamy fine sand. In some areas the soil has clay bands that total more than 6 inches thick within a depth of 60 inches. In other areas it has no bands within a depth of 60 inches.

Included with these soils in mapping are small areas of the well drained Martinsville soils in the lower landscape positions and the well drained Nolin soils on bottom land. Included soils make up about 10 percent of the map unit.

Available water capacity is moderate in the Alvin soil and low in the Chelsea soil. Permeability is moderate or moderately rapid in the Alvin soil and rapid in the Chelsea soil. Surface runoff is rapid on both soils. The organic matter content is low in the surface layer.

Most areas are used for pasture. Many support stands of native hardwoods. These soils generally are unsuited to cultivated crops, such as corn, soybeans, and small grain, mainly because of droughtiness. The slope, runoff, and erosion are additional problems.

These soils are poorly suited to grasses and legumes for pasture. In years when rainfall is below average or poorly distributed, the growth of pasture plants may be poor. Overgrazing should be avoided. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

These soils are suited to trees. The erosion hazard, the equipment limitation, plant competition, and seedling mortality are management concerns. Constructing haul roads on the contour and preserving as much of the understory as possible help to control erosion. Special harvest methods, such as yarding the logs uphill with a cable, may be needed to minimize the use of rubber-tired and crawler tractors. Seedlings survive and grow well if competing vegetation is controlled by cutting, girdling, and spraying. Because of the seedling mortality rate, special planting stock and overstocking are needed.

Because of the slope, these soils are severely limited as sites for dwellings. The buildings should be designed so that they conform to the natural slope of the land. The soils are severely limited as sites for septic tank absorption fields because of the slope of both soils and a poor filtering capacity in the Chelsea soil. Land shaping and installing the distribution lines across the slope help to ensure that the absorption field functions properly. The effluent is readily absorbed by the Chelsea soil, but it can pollute ground water supplies. The slope is a severe limitation on sites for local roads and streets. Building on the contour and land shaping help to overcome this limitation.

The land capability classification is VIIs. The woodland ordination symbol of the Alvin soil is 4R, and that of the Chelsea soil is 3R.

Ba—Bartle silt loam. This nearly level, deep, somewhat poorly drained soil is on lake plains and stream terraces. Individual areas are broad and irregularly shaped and are 20 to 200 acres in size. The dominant size is about 80 acres.

In a typical profile, the surface layer is brown silt loam about 10 inches thick. The subsurface layer is pale brown silt loam about 5 inches thick. The subsoil is about 43 inches thick. The upper part is light brownish gray, mottled, friable silt loam; the next part is a fragipan of grayish brown and yellowish brown, mottled, firm, brittle silt loam; and the lower part is brown, mottled, firm silt loam. The underlying material to a depth of 80 inches is yellowish brown, mottled silt loam. In places the slope is more than 2 percent. In some areas the fragipan is weakly expressed or does not occur.

Included with this soil in mapping are small areas of the poorly drained Bonnie soils in the lower landscape positions. Also included are small areas of the well drained Hosmer soils on the steeper slopes. Included soils make up about 10 percent of the map unit.

Available water capacity is moderate in the Bartle soil. Permeability is moderate above the fragipan and very slow in the fragipan. Surface runoff is slow. The organic matter content is moderate in the surface layer. The water table is often at a depth of 1 to 2 feet during winter and early spring. The firm, brittle fragipan, which is at a depth of 24 to 30 inches, restricts the penetration of roots. The surface layer is friable and can be easily tilled.

Most areas of this soil are used for cultivated crops. A few are used for hay or pasture or for woodland.

If drained, this soil is well suited to corn, soybeans, and small grain. The wetness is the major limitation. Excess water can be removed by surface or subsurface drains. Because the very slowly permeable fragipan restricts the downward movement of water, the soil is often saturated in winter and spring. As a result, fieldwork is delayed. The soil is somewhat droughty during long dry periods in the summer. A system of conservation tillage that leaves protective amounts of crop residue on the surface, crop residue management, cover crops, and green manure crops help to maintain tilth and the organic matter content.

This soil is well suited to grasses and shallow-rooted legumes for hay and pasture. It is not well suited to deep-rooted legumes, such as alfalfa. Grazing during wet periods causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to prevent excessive compaction and maintain good tilth and plant density.

This soil is suited to trees. Plant competition is the main management concern. Seedlings survive and grow well if competing vegetation is controlled by cutting, spraying, and girdling. Prolonged seasonal wetness hinders harvesting, logging, and planting.

Because of the wetness, this soil is severely limited as a site for dwellings. Subsurface drains help to lower the water table. The soil is severely limited as a site for septic tank absorption fields because of the very slow permeability and the wetness. Installing the absorption field in suitable fill material helps to minimize the restricted permeability. Enlarging or elevating the absorption field minimizes the wetness. Frost action is a severe limitation on sites for local roads and streets. Replacing or covering the upper soil layers with suitable base material helps to prevent the damage caused by frost action.

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

Bk—Birds silt loam, frequently flooded. This nearly level, deep, poorly drained soil is on broad bottom land. It is flooded for long periods and is subject to ponding. Individual areas are irregular in shape and are 10 to 70 acres in size.

In a typical profile, the surface layer is dark grayish brown, mottled silt loam about 6 inches thick. The underlying material to a depth of 60 inches is gray and light brownish gray, mottled, friable silt loam. In a few areas the soil has less clay between depths of 10 and 40 inches.

Included with this soil in mapping are a few small areas of the somewhat poorly drained Wakeland and moderately well drained Wilbur soils. These soils are in the slightly higher positions on the bottom land. They make up about 10 percent of the map unit.

Available water capacity is high in the Birds soil. Permeability is moderately slow. Surface runoff is slow. The organic matter content is moderate in the surface layer. The water table is often near or above the surface during winter and spring. The surface layer is friable and can be easily tilled throughout a fairly wide range in moisture content.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture or for woodland.

If drained, this soil is suited to corn and soybeans. The high water table is a limitation, and the frequent flooding is a hazard. Establishing an adequate drainage system is difficult in areas where suitable outlets are not available. Flooding during the winter destroys most stands of small grain. A system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops, and green manure crops improve or maintain tilth and the organic matter content.

This soil is well suited to grasses and shallow-rooted legumes for hay and pasture. It is not suited to alfalfa and other deep-rooted legumes because of the high water table and a high potential for frost action. A drainage system is necessary. Overgrazing or trampling by livestock when the soil is too wet damages the sod, reduces plant density and forage yields, and causes surface compaction and poor tilth. Proper stocking rates, timely deferment of grazing, and restricted use during wet periods help to prevent excessive compaction and maintain good tilth and plant density.

This soil is suited to trees. Plant competition, the equipment limitation, the windthrow hazard, and seedling mortality are management concerns. Seedlings survive and grow well if competing vegetation is controlled by cutting, spraying, or girdling. Equipment should be used only when the soil is relatively dry or frozen. Harvest methods that do not isolate the remaining trees or leave them widely spaced help to prevent windthrow. Because of the seedling mortality rate, special planting stock and overstocking are needed.

Because of the frequent flooding and the ponding, this soil is generally unsuitable as a site for dwellings. It is unsuitable as a site for septic tank absorption fields because of the flooding, the ponding, and the moderately slow permeability. It is severely limited as a site for local roads and streets because of low strength, ponding, and flooding. Strengthening or replacing the base with better suited material improves the ability of the roads and streets to support vehicular traffic. Constructing the roads on raised, well compacted fill material, establishing adequate roadside drainage ditches, and installing culverts help to prevent the damage caused by ponding and flooding.

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

Bo—Bonnie silt loam, frequently flooded. This nearly level, deep, poorly drained soil is on broad, plane or slightly concave bottom land. It is flooded for brief or long periods and is subject to ponding. Individual areas are irregular in shape and are 40 to 100 acres in size.

In a typical profile, the surface layer is dark grayish brown, mottled silt loam about 9 inches thick. The underlying material to a depth of 60 inches is light gray, mottled silt loam. In a few areas the soil is less acid.

Included with this soil in mapping are a few small areas of the somewhat poorly drained Wakeland soils. These soils are in the slightly higher positions on the landscape. They make up about 10 percent of the map unit.

Available water capacity is high in the Bonnie soil. Permeability is moderately slow. Surface runoff is slow to ponded. The organic matter content is moderate in the surface layer. The water table is often near or above the surface during winter and spring. The surface layer is friable and can be easily tilled throughout a fairly wide range in moisture content.

Most areas of this soil are used for cultivated crops. Some are used for hay or pasture or for woodland.

If drained, this soil is suited to corn and soybeans. The high water table is a limitation, and the frequent flooding is a hazard. Establishing an adequate drainage system is difficult in areas where suitable outlets are not available. Ponding can be controlled in some areas by properly located diversions, which intercept the runoff from higher areas. A system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops, and green manure crops improve or maintain tilth and the organic matter content.

This soil is well suited to grasses and shallow-rooted legumes for hay and pasture. It is not suited to alfalfa and other deep-rooted legumes because of the high water table and a high potential for frost action. A drainage system is necessary. Overgrazing or trampling by livestock when the soil is too wet damages the sod, reduces plant density and forage yields, and causes surface compaction and poor tilth. Proper stocking rates, timely deferment of grazing, and restricted use during wet periods help to prevent excessive compaction and maintain good tilth and plant density.

This soil is suited to trees. Plant competition, the equipment limitation, seedling mortality, and the windthrow hazard are management concerns. Seedlings survive and grow well if competing vegetation is controlled by cutting, spraying, or girdling. Equipment should be used only when the soil is relatively dry or frozen. Because of the seedling mortality rate, special planting stock and overstocking are needed. Harvest methods that do not isolate the remaining trees or leave them widely spaced help to prevent windthrow. Water-tolerant species should be favored in the stands.

Because of the frequent flooding and ponding, this soil is generally unsuitable as a site for dwellings. It is unsuitable as a site for septic tank absorption fields because of the flooding, the ponding, and the moderately slow permeability. It is severely limited as a site for local roads and streets because of low strength, ponding, and flooding. Strengthening or replacing the base with better suited material improves the ability of the roads and streets to support vehicular traffic. Constructing the roads on raised, well compacted fill material, establishing adequate roadside drainage ditches, and installing culverts help to prevent the damage caused by ponding and flooding.

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

Bu—Burnside loam, occasionally flooded. This nearly level, deep, well drained soil is on flood plains. It is flooded for brief periods. Individual areas are long and narrow and are 5 to 25 acres in size.

In a typical profile, the surface layer is brown loam about 5 inches thick. The subsurface layer is dark yellowish brown loam about 4 inches thick. The subsoil is about 20 inches thick. It is dark yellowish brown and friable. It is loam in the upper part and very channery loam in the lower part. The underlying material is dark yellowish brown very gravelly loam about 13 inches thick. Bedrock is at a depth of about 42 inches. In some areas the surface layer is channery or gravelly. In other areas the surface layer and subsoil are silt loam. In places the soil has very strongly acid or strongly acid layers.

Included with this soil in mapping are small areas of the somewhat poorly drained Wakeland soils in slight depressions. Also included are areas of soils that have bedrock within a depth of 40 inches. Included soils make up about 10 to 15 percent of the map unit.

Available water capacity is low in the Burnside soil. Permeability is moderate. Surface runoff is slow. The organic matter content is moderately low in the surface layer. The water table is often at a depth of 3 to 5 feet during winter and spring. The surface layer is friable and can be easily tilled in all areas, except for those where rock fragments are on the surface.

Most areas of this soil are used for hay or pasture or for woodland. A few are used for cultivated crops.

This soil is well suited to corn and soybeans. Drought and the occasional flooding are hazards. Planting early maturing crop varieties helps to overcome the droughtiness. Cover crops and a system of conservation tillage that leaves protective amounts of crop residue on the surface help to maintain tilth and the organic matter content.

This soil is well suited to grasses and legumes for hay and pasture. Hayland and pasture can be damaged by floodwater. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and reduces plant density. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

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

Because of the flooding, this soil is generally unsuitable as a site for dwellings. It is generally unsuitable as a site for septic tank absorption fields because of the flooding and the wetness. It is severely limited as a site for local roads and streets because of the flooding. Constructing the roads on raised, well compacted fill material, establishing adequate roadside drainage ditches, and installing culverts help to prevent the damage caused by flooding.

The land capability classification is IIs. The woodland ordination symbol is 7A.

CaB—Camden silt loam, 1 to 5 percent slopes. This nearly level and gently sloping, deep, well drained soil is on stream terraces. Individual areas are irregular in shape and are 5 to 20 acres in size.

In a typical profile, the surface layer is brown silt loam about 10 inches thick. The subsoil is about 52 inches thick. It is friable. It is yellowish brown silty clay loam in the upper part and strong brown loam in the lower part. The underlying material to a depth of 80 inches is yellowish brown, stratified loam and sandy loam. In some places the subsoil has more clay. In other places the subsoil and underlying material are more acid. In some areas the upper part of the subsoil is mottled. In other areas the slope is more than 5 percent.

Included with this soil in mapping are small areas of the well drained Wellston soils on toe slopes. These soils formed in loess and in material weathered from sandstone, siltstone, and shale. Also included are a few small areas that are severely eroded. Included soils make up about 10 percent of the map unit.

Available water capacity is high in the Camden soil. Permeability is moderate. Surface runoff is medium. The organic matter content is moderately low in the surface layer. This layer is friable and can be easily tilled throughout a wide range in moisture content.

Most areas of this soil are used for cultivated crops or for hay and pasture. A few are wooded.

This soil is well suited to corn, soybeans, and small grain. Erosion is the major hazard if cultivated crops are grown. A system of conservation tillage that leaves protective amounts of crop residue on the surface, crop rotations that include grasses and legumes, contour farming, terraces, and grassed waterways help to control erosion, increase the organic matter content, and help to maintain good tilth.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing or grazing when the soil is too wet causes surface compaction, poor tilth, and excessive runoff. Proper stocking rates and pasture rotation help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Seedlings survive and grow well if competing vegetation is controlled by proper site preparation and by spraying, cutting, or girdling.

Because of the shrink-swell potential in the subsoil, this soil is moderately limited as a site for dwellings. Backfilling with coarser textured material helps to prevent the structural damage caused by shrinking and swelling. The soil is suitable as a site for septic tank absorption fields. It is severely limited as a site for local roads and streets because of frost action and low strength. Strengthening or replacing the base with better suited material improves the ability of the roads and streets to support vehicular traffic and reduces the potential for frost action.

The land capability classification is IIe. The woodland ordination symbol is 7A.

CnB—Cincinnati silt loam, 3 to 10 percent slopes. This gently sloping and moderately sloping, deep, well drained soil is on till plains. Individual areas are irregular in shape and are 5 to 50 acres in size.

In a typical profile, the surface layer is dark grayish brown silt loam about 7 inches thick. The subsoil extends to a depth of 80 inches or more. The upper part is yellowish brown, friable and firm silt loam and silty clay loam, and the lower part is a fragipan of yellowish brown, mottled, firm, brittle silty clay loam. In places the slope is more than 10 percent. In some areas the soil has sandstone, siltstone, and shale residuum in the underlying material. In other areas it has more than 40 inches of loess.

Included with this soil in mapping are a few small areas of the somewhat poorly drained Bartle soils on the less sloping parts of the landscape. Also included are small severely eroded areas on the steeper slopes. Included soils make up about 10 percent of the map unit.

Available water capacity is moderate in the Cincinnati soil. Permeability is moderate above the fragipan and moderately slow or slow in the fragipan. Surface runoff is medium. The organic matter content is moderate in the surface layer. The water table is often at a depth of 2.5 to 4.0 feet during winter and early spring. The firm, brittle fragipan, which is at a depth of 23 to 31 inches, restricts the penetration of roots. The surface layer is friable and can be easily tilled.

Most areas of this soil are pastured. Some are used for cultivated crops or woodland.

This soil is well suited to corn, soybeans, and small grain. If cultivated crops are grown, measures that control runoff and erosion are needed. Examples are crop rotations that include grasses and legumes, a system of conservation tillage that leaves protective amounts of crop residue on the surface, terraces, diversions, contour farming, grassed waterways, and grade stabilization structures. Because the moderately slowly permeable or slowly permeable fragipan restricts the downward movement of water, the soil is often saturated in winter and spring. As a result, fieldwork is delayed. The soil is somewhat droughty during long dry periods in the summer.

This soil is well suited to grasses and shallow-rooted legumes for hay and pasture. It is not suited to deep-rooted legumes, such as alfalfa, because root growth is restricted by the fragipan. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth and reduces plant density. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. The root zone is limited mainly to the part of the profile above the fragipan. Plant competition is the major management concern. Seedlings survive and grow well if competing vegetation is controlled by cutting, girdling, or spraying.

Because of the wetness, this soil is moderately limited as a site for dwellings with basements. It is suitable as a site for dwellings without basements. Buildings with basements can be constructed on raised, well compacted fill material, which helps to overcome the wetness. The soil is severely limited as a site for septic tank absorption fields because of the wetness and the moderately slow or slow permeability. Installing the absorption field in raised suitable fill material helps to minimize the wetness and the restricted permeability.

Low strength and frost action are severe limitations on sites for local roads and streets. Strengthening or replacing the base with better suited material improves the ability of the roads and streets to support vehicular traffic. Constructing the roads on raised, well compacted fill material, establishing adequate roadside ditches, and installing culverts help to prevent the damage caused by frost action.

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

CrC—Crider silt loam, 3 to 10 percent slopes. This gently sloping and moderately sloping, deep, well drained soil is on the tops of ridges in the uplands. Individual areas are irregular in shape and are 5 to 20 acres in size.

In a typical profile, the surface layer is dark yellowish brown silt loam about 8 inches thick. The subsoil extends to a depth of 80 inches or more. It is strong brown, friable silty clay loam in the upper part and red, friable and firm silty clay loam, silty clay, and clay in the lower part. In places the soil has less than 20 inches of loess. In some areas the slope is more than 10 percent.

Included with this soil in mapping are small areas of the well drained Wellston soils. These soils formed in loess and in material weathered from sandstone, siltstone, and shale. Their positions in the landscape are similar to those of the Crider soil. Also included are a few areas of severely eroded soils. Included soils make up about 10 percent of the map unit.

Available water capacity is high in the Crider soil. Permeability is moderate. Surface runoff is medium. The organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled throughout a wide range in moisture content.

Most areas of this soil are used for cultivated crops. A few are used for hay or pasture or for woodland.

This soil is suited to corn, soybeans, and small grain. If cultivated crops are grown, measures that control erosion are needed. Crop rotations that include grasses and legumes, a system of conservation tillage that leaves protective amounts of crop residue on the surface, grade stabilization structures, and cover crops help to control erosion and improve or maintain tilth and the organic matter content.

This soil is well suited to grasses and legumes for hay and pasture. Proper stocking rates and pasture rotation help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is the main management concern. Seedlings survive and grow well if competing vegetation is controlled by proper site preparation and by spraying, cutting, or girdling.

Because of the slope, this soil is moderately limited as a site for dwellings and septic tank absorption fields. Designing the buildings so that they conform to the natural slope of the land and installing the absorption fields on the contour help to overcome this limitation. Low strength is a severe limitation on sites for local roads and streets. Strengthening or replacing the base with better suited material improves the ability of the roads and streets to support vehicular traffic.

The land capability classification is IIIe. The woodland ordination symbol is 8A.

FbD—Fairpoint shaly silt loam, 12 to 45 percent slopes. This strongly sloping to very steep, deep, well drained soil is in areas on uplands where coal has been strip-mined. These areas have been reclaimed by very limited grading. No topsoil has been added. Individual areas are irregular in shape and are 5 to 55 acres in size.

In a typical profile, the surface layer is gray shaly silt loam about 1 inch thick. The underlying material to a depth of 60 inches is yellowish brown and gray very shaly silt loam. In a few areas the soil is medium acid to neutral.

Included with this soil in mapping are small bodies of water and piles of strip-mined coal. Also included are undisturbed areas of the well drained Wellston and Zanesville soils. Included areas make up about 10 percent of the map unit.

Available water capacity is low in the Fairpoint soil. Permeability is moderately slow. Surface runoff is rapid. The organic matter content is very low in the surface layer.

Most areas are planted to pine. This soil is generally unsuited to cultivated crops and to grasses and legumes for hay and pasture. Because of the slope and the rocks on the surface, operating most kinds of farm equipment is difficult or impossible.

This soil is poorly suited to trees. The erosion hazard and seedling mortality are management concerns. Because of the erosion hazard, logging roads, skid trails, and landings should be established on gentle grades and water should be removed by water bars, culverts, and drop structures. Because of the seedling mortality rate, special planting stock and overstocking are needed.

Because of soil slippage and slope, this soil is severely limited as a site for dwellings. Onsite investigation is needed in areas where slippage has occurred. Land shaping and installing retaining walls help to overcome the slope. The soil is severely limited as a site for septic tank absorption fields because of the moderately slow permeability and the slope. The slowly permeable material should be replaced with better suited material. Installing the absorption field on the contour helps to overcome the slope.

Soil slippage and slope are severe limitations on sites for local roads and streets. Strengthening and replacing the base with better suited material improves the ability of the roads and streets to support vehicular traffic. Relocation of some roads may be necessary. Building on the contour and land shaping help to overcome the slope.

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

FcC—Fairpoint shaly silty clay loam, 4 to 16 percent slopes. This gently sloping to strongly sloping, deep, well drained soil is in formerly mined areas on uplands. These areas have been reclaimed by additions of topsoil. They are broad and are 20 to 70 acres in size.

In a typical profile, the surface layer is strong brown, yellowish brown, and light brownish gray shaly silty clay loam about 6 inches thick. The upper part of the underlying material is yellowish brown shaly silty clay loam. The lower part to a depth of 60 inches is dark gray shaly and very shaly silt loam. In some areas the soil is more acid. In other areas it has a lower content of coarse fragments.

Included with this soil in mapping are undisturbed areas of the well drained Wellston and Zanesville soils. These soils make up about 10 percent of the map unit.

Available water capacity is low in the Fairpoint soil. Permeability is moderately slow. Surface runoff is medium. The organic matter content is low in the surface layer.

Most areas are used for hay and pasture. A few are planted to pine. This soil is poorly suited to corn, soybeans, and small grain. It is fairly well suited to grasses and legumes for hay or pasture. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is fairly well suited to trees. The erosion hazard and seedling mortality are management concerns. Because of the erosion hazard, logging roads, skid trails, and landings should be established on gentle grades and water should be removed by water bars, culverts, and drop structures. Because of the seedling mortality rate, special planting stock and overstocking are needed.

Because of the slope and the shrink-swell potential, this soil is moderately limited as a site for dwellings. The buildings should be designed so that they conform to the natural slope of the land. Strengthening foundations, footings, and basement walls and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling. Large stones in the deeper cuts can be a problem in some areas. The soil is severely limited as a site for septic tank absorption fields because of the moderately slow permeability. Installing the absorption field in suitable fill material helps to minimize the restricted permeability.

The slope, frost action, and the shrink-swell potential are severe limitations on sites for local roads and streets. Building on the contour and land shaping help to overcome the slope. Replacing or covering the upper soil layers with suitable base material helps to prevent the damage caused by frost action and by shrinking and swelling.

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

HaD—Hagerstown silt loam, 12 to 18 percent slopes. This strongly sloping, deep, well drained soil is on side slopes in the uplands. Individual areas are generally long and narrow and are 5 to 25 acres in size.

In a typical profile, the surface layer is dark brown silt loam about 6 inches thick. The subsoil is about 46 inches thick. It is brown, friable silt loam in the upper part and reddish brown, firm silty clay loam and silty clay in the lower part. The underlying material to a depth of 60 inches is red clay. In places the soil has a thicker mantle of loess or has limestone bedrock within a depth of 20 inches. Some small areas are severely eroded.

Included with this soil in mapping are small areas of the well drained Crider and Gilpin soils. Crider soils are generally less sloping than the Hagerstown soil. Gilpin soils formed in material weathered from interbedded sandstone, siltstone, and shale. Included soils make up about 10 percent of the map unit.

Available water capacity and permeability are moderate in the Hagerstown soil. Surface runoff is rapid. The organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled throughout a wide range in moisture content.

Most areas of this soil are used for hay and pasture or for woodland. A few are used for cultivated crops.

This soil is poorly suited to corn, soybeans, and small grain. Erosion is the major hazard if cultivated crops are grown. Crop rotations that include grasses and legumes, a system of conservation tillage that leaves protective amounts of crop residue on the surface, diversions, contour farming, and grassed waterways help to control erosion and runoff.

This soil is suited to grasses and legumes for hay and pasture. Overgrazing or grazing when the soil is too wet causes surface compaction, poor tilth, and excessive runoff and erosion. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

This soil is well suited to trees. The erosion hazard and the equipment limitation are the main management concerns. During wet periods, logging roads tend to be slippery and ruts form readily. The use of equipment is limited when the soil is wet and sticky. Establishing logging roads, skid trails, and landings on gentle grades and removing water by water bars, culverts, and drop structures help to control erosion.

Because of the slope, this soil is severely limited as a site for dwellings and septic tank absorption fields. Designing the buildings so that they conform to the natural slope of the land and installing the absorption fields on the contour help to overcome this limitation. The slope and low strength are severe limitations on sites for local roads and streets. Building on the contour and land shaping help to overcome the slope. Strengthening or replacing the base with better suited material improves the ability of the roads and streets to support vehicular traffic.

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

Hd—Haymond silt loam, frequently flooded. This nearly level, deep, well drained soil is on bottom land. It is flooded for brief periods. Individual areas are irregular in shape and are 10 to 60 acres in size.

In a typical profile, the surface layer is brown silt loam about 9 inches thick. The subsoil is dark yellowish brown, friable silt loam about 50 inches thick. It is mottled in the lower part. The underlying material to a depth of 70 inches is dark yellowish brown silt loam that has thin strata of sandy loam. In places the subsoil has more clay. In some areas the subsoil and underlying material are more acid.

Included with this soil in mapping are areas of a soil that has more sand in the subsoil. This included soil is near the riverbanks. Also included are small areas of the somewhat poorly drained Wakeland soils in the lower landscape positions. Included soils make up about 10 percent of the map unit.

Available water capacity is very high in the Haymond soil. Permeability is moderate. Surface runoff is slow. The organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled.

Most areas of this soil are used for cultivated crops. A few are used for hay or pasture or for woodland.

This soil is well suited to corn and soybeans. The flooding is a hazard. In winter and early in spring, it damages small grain that is planted in the fall. A system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops, and green manure crops improve or maintain tilth and the organic matter content.

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

This soil is well suited to trees. Plant competition is the main management concern. Special harvest methods and site preparation may be needed to control undesirable plants.

Because of the flooding, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields. It is severely limited as a site for local roads and streets because of frost action and flooding. Constructing the roads on raised, well compacted fill material, establishing adequate roadside drainage ditches, and installing culverts help to prevent the damage caused by flooding and frost action.

The land capability classification is IIw. The woodland ordination symbol is 8A.

HoB—Hosmer silt loam, 2 to 6 percent slopes. This gently sloping, deep, well drained soil is on upland ridgetops and on loess-capped lake plains. Individual areas are irregular in shape and are 5 to 50 acres in size.

In a typical profile, the surface layer is silt loam about 8 inches thick. It is dark grayish brown in the upper part and brown in the lower part. The subsoil is about 57 inches thick. The upper part is strong brown and yellowish brown, firm silt loam; the next part is a fragipan of yellowish brown and strong brown, firm, brittle silty clay loam and dark yellowish brown, mottled, firm silt loam; and the lower part is brown, mottled, friable silt loam. The underlying material to a depth of 80 inches is yellowish brown, mottled silty clay. In some places the loess is less than 48 inches thick. In other places the slope is more than 6 percent. In some areas mottles are at a depth of 24 to 30 inches.

Included with this soil in mapping are small areas of the well drained, moderately deep Gilpin and well drained Wellston soils on the more sloping ridgetops and side slopes. The lower part of the subsoil in these soils formed in residuum. Also included are small areas of severely eroded soils. Included soils make up about 10 percent of the map unit.

Available water capacity is moderate in the Hosmer soil. Permeability is moderate above the fragipan and very slow in the fragipan. Surface runoff is medium. The organic matter content is moderate in the surface layer. The water table is at a depth of 2.5 to 3.0 feet during winter and early spring. The firm, brittle fragipan, which is at a depth of 23 to 27 inches, restricts the penetration of roots. The surface layer is friable and can be easily tilled.

Most areas of this soil are used for cultivated crops. A few are used for hay and pasture or for woodland.

This soil is well suited to corn, soybeans, and small grain. If cultivated crops are grown, measures that control erosion are needed. Examples are a system of conservation tillage that leaves protective amounts of crop residue on the surface, contour farming, crop rotations that include grasses and legumes, terraces, and grassed waterways. Because the very slowly permeable fragipan restricts the downward movement of water, the soil is often saturated in winter and spring. As a result, fieldwork is delayed. The soil is somewhat droughty during long dry periods in the summer. Cover crops and green manure crops improve or maintain tilth and the organic matter content.

This soil is well suited to grasses and shallow-rooted legumes for hay and pasture. It is not suited to alfalfa and other deep-rooted legumes because root growth is restricted by the fragipan. Erosion and excessive runoff are hazards if the pasture is overgrazed. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is well suited to trees. The windthrow hazard and plant competition are the main management concerns. The root zone is limited mainly to the part of the profile above the fragipan. Harvest methods that do not isolate the remaining trees or leave them widely spaced help to prevent windthrow. Seedlings survive and grow well if competing vegetation is controlled by cutting, girdling, or spraying.

Because of the shrink-swell potential, this soil is moderately limited as a site for dwellings without basements. It is moderately limited as a site for dwellings with basements because of the wetness. Strengthening foundations, footings, and basement walls and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling. Buildings without basements can be constructed on raised, well compacted fill material, which helps to overcome the wetness. The soil is severely limited as a site for septic tank absorption fields because of the wetness and the very slow permeability. The very slowly permeable material should be replaced with better suited material. Installing subsurface drains around the outer edges of the absorption field helps to remove excess water.

A high potential for frost action is a severe limitation on sites for local roads and streets. Replacing or covering the upper soil layers with suitable base material helps to prevent the damage caused by frost action. Roadside drainage ditches reduce the wetness.

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

JoA—Johnsburg silt loam, 0 to 2 percent slopes. This nearly level, deep, somewhat poorly drained soil is on the tops of ridges in the uplands. Individual areas are irregularly shaped and are 5 to 40 acres in size.

In a typical profile, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsurface layer is dark yellowish brown silt loam about 5 inches thick. The subsoil is about 47 inches thick. The upper part is yellowish brown, mottled, friable silty clay loam; the next part is a fragipan of yellowish brown, mottled, firm, brittle silty clay loam; and the lower part is yellowish brown, mottled, friable silt loam. The underlying material to a depth of 70 inches is yellowish brown, mottled silt loam. In some depressional areas the soil is poorly drained, does not have a fragipan, and has more than 4 feet of loess. In places the slope is more than 2 percent.

Included with this soil in mapping are small areas of the well drained Wellston and Zanesville soils on the more sloping parts of the landscape. These soils make up about 10 percent of the map unit.

Available water capacity is moderate in the Johnsburg soil. Permeability is moderate above the fragipan and very slow in the fragipan. Surface runoff is slow. The organic matter content is moderate in the surface layer. The water table is at a depth of 1 to 3 feet during winter and early spring. The firm, brittle fragipan, which is at a depth of about 23 inches, restricts the penetration of roots. The surface layer is friable and can be easily tilled.

Most areas of this soil are used for cultivated crops. A few are used for hay or pasture or for woodland.

If drained, this soil is well suited to corn, soybeans, and small grain. The wetness is the major limitation. Excess water can be removed by surface or subsurface drains. Because the very slowly permeable fragipan restricts the downward movement of water, the soil is often saturated in winter and early spring. As a result, fieldwork is delayed. The soil is somewhat droughty during long dry periods in the summer. A system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops, and green manure crops help to maintain tilth and the organic matter content.

This soil is well suited to grasses and shallow-rooted legumes for hay and pasture. It is not well suited to deep-rooted legumes, such as alfalfa. Grazing during wet periods causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to prevent excessive compaction and maintain good tilth and plant density.

This soil is fairly well suited to trees. Seedling mortality, the windthrow hazard, and plant competition are management concerns. The root zone is limited mainly to the part of the profile above the fragipan. Because of the seedling mortality rate, special planting stock and overstocking are needed. Harvest methods that do not isolate the remaining trees or leave them widely spaced help to prevent windthrow. Plant competition can be controlled by proper site preparation or by cutting, girdling, or spraying.

Because of the wetness, this soil is severely limited as a site for dwellings. Subsurface drains help to lower the water table. The soil is severely limited as a site for septic tank absorption fields because of the wetness and the very slow permeability. Subsurface drains help to lower the water table. Filling or mounding the absorption field with suitable material helps to minimize the restricted permeability.

Frost action is a severe limitation on sites for local roads and streets. Constructing the roads on raised, well compacted fill material, establishing adequate roadside ditches, and installing culverts help to prevent damage caused by frost action.

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

MaB—Markland silt loam, 1 to 5 percent slopes. This nearly level and gently sloping, deep, moderately well drained soil is on lacustrine terraces. Individual areas are irregular in shape and are 5 to 40 acres in size.

In a typical profile, the surface layer is brown silt loam about 5 inches thick. The subsoil is about 30 inches thick. It is yellowish brown, very firm clay and silty clay. The underlying material to a depth of 60 inches is light yellowish brown silty clay loam that has thin strata of silt loam. In some places the subsoil has gray mottles in the upper part. In other places it has less clay throughout. In places the slope is more than 5 percent.

Included with this soil in mapping are small areas of the somewhat poorly drained McGary soils on broad flats. These soils make up about 10 percent of the map unit.

Available water capacity is moderate in the Markland soil. Permeability is slow. Surface runoff is medium. The organic matter content is moderate in the surface layer. The water table is at a depth of 3 to 6 feet during winter and early spring. The surface layer is friable and can be easily tilled.

Most areas of this soil are used for cultivated crops or for hay and pasture. A few are wooded.

This soil is suited to corn, soybeans, and small grain. If cultivated crops are grown, measures that control erosion are needed. A system of conservation tillage that leaves protective amounts of crop residue on the surface, diversions, contour farming, grassed waterways, and grade stabilization structures help to control erosion and improve or maintain tilth and the organic matter content.

This soil is well suited to grasses and legumes for hay or pasture. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

This soil is fairly well suited to trees. Seedling mortality, the windthrow hazard, and plant competition are management concerns. Because of the seedling mortality rate, special planting stock and overstocking are needed. Carefully thinning the stands or not thinning them at all reduces the windthrow hazard. Windthrown trees should be periodically removed. Plant competition can be controlled by proper site preparation or by cutting, girdling, or spraying.

Because of the shrink-swell potential, this soil is severely limited as a site for dwellings. Strengthening foundations, footings, and basement walls and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling. The soil is severely limited as a site for septic tank absorption fields because of the wetness and the slow permeability. Installing the absorption field in suitable fill material helps to minimize the restricted permeability. Installing subsurface drains around the outer edges of the absorption field helps to lower the water table.

Low strength and the shrink-swell potential are severe limitations on sites for local roads and streets. Strengthening or replacing the base with better suited material improves the ability of the roads and streets to support vehicular traffic.

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

McC3—Markland silty clay loam, 6 to 12 percent slopes, severely eroded. This moderately sloping, deep, moderately well drained soil is on lacustrine terraces. Individual areas are irregular in shape and are 5 to 15 acres in size.

In a typical profile, the surface layer is brown silty clay loam about 3 inches thick. It is mixed with some dark yellowish brown subsoil material. The subsoil is dark yellowish brown, very firm silty clay about 24 inches thick. The underlying material to a depth of 60 inches is dark yellowish brown silty clay that has thin strata of silt loam. In some places carbonates are within a depth of 20 inches. In other places the slope is less than 6 or more than 12 percent.

Included with this soil in mapping are the well drained Wellston soils in moderately sloping and strongly sloping areas. These soils make up about 10 percent of the map unit.

Available water capacity is moderate in the Markland soil. Permeability is slow. Surface runoff is rapid. The organic matter content is moderate in the surface layer. The water table is at a depth of 3 to 6 feet during winter and early spring.

Most areas of this soil are used for cultivated crops or for hay and pasture. A few are wooded. Because of the erosion hazard, this soil is generally unsuited to corn, soybeans, and small grain. It is suited to grasses and legumes for hay or pasture. Overgrazing can cause surface compaction, poor tilth, and excessive runoff and erosion. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

This soil is suited to trees. Seedling mortality, the windthrow hazard, and plant competition are management concerns. Because of the seedling mortality rate, special planting stock and overstocking are needed. Carefully thinning the stands or not thinning them at all reduces the windthrow hazard. Plant competition can be controlled by proper site preparation or by cutting, girdling, or spraying.

Because of the shrink-swell potential, this soil is severely limited as a site for dwellings. Strengthening foundations, footings, and basement walls and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling. The soil is severely limited as a site for septic tank absorption fields because of the wetness and the slow permeability. Filling or mounding the absorption field with suitable material helps to minimize the restricted permeability. Installing subsurface drains around the edges of the absorption field helps to lower the water table.

Low strength and the shrink-swell potential are severe limitations on sites for local roads and streets. Strengthening or replacing the base with better suited material improves the ability of the roads and streets to support vehicular traffic.

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

MdA—Martinsville loam, 0 to 2 percent slopes. This nearly level, deep, well drained soil is on terraces. Individual areas are 3 to 140 acres in size.

In a typical profile, the surface layer is dark grayish brown loam about 5 inches thick. The subsurface layer is brown loam about 4 inches thick. The subsoil is about 49 inches thick. The upper part is brown and strong brown, friable and firm loam; the next part is strong brown, firm fine sandy loam; and the lower part is brown, friable fine sandy loam. The upper part of the underlying material is brown sandy loam that has thin strata of loamy sand. The lower part to a depth of 80 inches is yellowish brown sand. In places the slope is more than 2 percent. In some areas the surface layer is sandy loam or silt loam. In other areas the underlying material is stratified silty clay loam and silty clay.

Included with this soil in mapping are small areas of the well drained Alvin and excessively drained Chelsea soils on the steeper slopes. These soils have a sandy surface layer. They make up about 10 percent of the map unit.

Available water capacity is high in the Martinsville soil. Permeability is moderate. Surface runoff is slow. The organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled.

Most areas of this soil are used for cultivated crops. Some are used for pasture, hay, or woodland.

This soil is well suited to corn, soybeans, and small grain. A system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops, and green manure crops increase the organic matter content and help to maintain good tilth.

This soil is well suited to grasses and legumes for hay and pasture. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

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

Because of the shrink-swell potential, this soil is severely limited as a site for dwellings. Strengthening foundations, footings, and basement walls and backfilling with coarse textured material help to prevent the structural damage caused by shrinking and swelling. The soil is suitable as a site for septic tank absorption fields. It is moderately limited as a site for local roads and streets because of low strength and frost action. Strengthening or replacing the base with better suited material improves the ability of the roads and streets to support vehicular traffic. Replacing or covering the upper soil layers with suitable base material helps to prevent the damage caused by frost action.

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

MgA—McGary silty clay loam, rarely flooded, 0 to 2 percent slopes. This nearly level, deep, somewhat poorly drained soil is on lacustrine terraces. Individual areas are irregular in shape and are 5 to 50 acres in size.

In a typical profile, the surface layer is dark grayish brown silty clay loam about 7 inches thick. The subsoil is mottled, firm silty clay about 35 inches thick. It is light brownish gray in the upper part and brown in the lower part. The underlying material to a depth of 60 inches is brown, mottled silty clay. In places the surface layer has less clay.

Included with this soil in mapping are small areas of the moderately well drained Markland soils on slight rises. These soils make up about 15 percent of the map unit.

Available water capacity is moderate in the McGary soil. Permeability is slow. Surface runoff also is slow. The organic matter content is moderate in the surface layer. The water table is at a depth 1 to 3 feet during winter and early spring.

Most areas of this soil are used for cultivated crops. A few are used for hay or pasture or for woodland.

This soil is well suited to corn, soybeans, and small grain. The wetness is the major limitation. Excess water can be removed by surface drains if adequate outlets are available. A system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops, and green manure crops help to maintain tilth and the organic matter content.

This soil is well suited to grasses and shallow-rooted legumes for hay and pasture. It is not well suited to deep-rooted legumes, such as alfalfa. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to prevent excessive compaction and maintain good tilth and plant density.

This soil is suited to trees. The main management concerns are seedling mortality, the windthrow hazard, and plant competition. Because of the seedling mortality rate, special planting stock and overstocking are needed. Harvest methods that do not isolate the remaining trees or leave them widely spaced help to prevent windthrow. Plant competition can be controlled by proper site preparation or by cutting, girdling, or spraying.

Because of the flooding, this soil is generally unsuitable as a site for dwellings. It is severely limited as a site for septic tank absorption fields because of the wetness and the restricted permeability. Subsurface drains help to lower the water table. Installing the absorption field in suitable fill material helps to minimize the restricted permeability. The soil is severely limited as a site for local roads and streets because of the shrink-swell potential and low strength. Strengthening or replacing the base with better suited material improves the ability of the roads and streets to support vehicular traffic.

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

NeE—Negley silt loam, 18 to 35 percent slopes. This moderately steep and steep, deep, well drained soil is on outwash terraces. It is on hillsides and sharp breaks adjacent to drainageways. Individual areas are long and narrow and are 10 to 100 acres in size.

In a typical profile, the surface layer is dark brown silt loam about 3 inches thick. The subsurface layer is yellowish brown loam about 6 inches thick. The subsoil extends to a depth of 80 inches or more. The upper part is reddish brown, friable loam; the next part is yellowish red, friable clay loam; and the lower part is strong brown, friable clay loam. In some areas the surface layer is loam. In some places the slope is more than 35 percent. In other places the soil has little or no gravel throughout.

Included with this soil in mapping are a few small areas of the well drained Parke soils on the less sloping parts of the landscape. These soils are more silty in the upper part than the Negley soil. Also included are a few small areas that are severely eroded. Included soils make up about 10 percent of the map unit.

Available water capacity is high in the Negley soil. Permeability is moderate or moderately rapid. Surface runoff is rapid. The organic matter content is moderate in the surface layer.

Most areas are used as woodland. A few small areas are pastured. This soil is generally unsuited to cultivated crops and is poorly suited to grasses and legumes for hay and pasture because of the moderately steep and steep slopes. Permanent pastures can be established in the less sloping areas.

This soil is well suited to trees. The equipment limitation, the erosion hazard, and plant competition are management concerns. The slope hinders the use of some logging equipment. Establishing logging roads, skid trails, and landings on gentle grades and removing water by water bars, culverts, and drop structures help to control erosion. Seedlings survive and grow well if competing vegetation is controlled by cutting, girdling, or spraying.

Because of the slope, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields and is severely limited as a site for local roads. Constructing the roads on the contour and land shaping help to overcome the slope.

The land capability classification is VIe. The woodland ordination symbol is 7R.

Nm—Newark silt loam, frequently flooded. This nearly level, deep, somewhat poorly drained soil is on flood plains. It is flooded for brief periods. Individual areas are long and irregular in shape and are 50 to 150 acres in size.

In a typical profile, the surface layer is dark grayish brown silt loam about 7 inches thick. The subsurface layer also is dark grayish brown silt loam. It is about 6 inches thick. The subsoil is about 19 inches thick. It is mottled and friable. The upper part is grayish brown silt loam, and the lower part is light brownish gray silty clay loam. The underlying material to a depth of 60 inches is gray and dark yellowish brown, mottled silty clay loam. In places the subsoil has less clay.

Included with this soil in mapping are small areas of the well drained Nolin and Wirt soils. These soils are on the outer edges of the mapped areas. They make up about 10 percent of the map unit.

Available water capacity is high in the Newark soil. Permeability is moderate. Surface runoff is slow. The organic matter content is moderate in the surface layer. The water table is near the surface during winter and early spring. The surface layer is friable and can be easily tilled.

Most areas of this soil are used for cultivated crops. A few are used for hay and pasture or for woodland.

If drained, this soil is well suited to corn, soybeans, and small grain. The wetness is a limitation, and the frequent flooding is a hazard. A subsurface drainage system can lower the water table if adequate outlets are available. A system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops, and green manure crops improve or maintain tilth and the organic matter content.

This soil is well suited to grasses and shallow-rooted legumes for hay and pasture. It is not suited to alfalfa and other deep-rooted legumes because of the high water table, which causes frost heaving. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods and immediately after flooding help to keep the pasture in good condition. A drainage system is necessary. Subsurface drains can lower the water table if adequate outlets are available.

This soil is well suited to trees. The equipment limitation, the windthrow hazard, and plant competition are the main management concerns. The high water table can hinder harvesting, logging, and planting. Harvest methods that do not isolate the remaining trees or leave them widely spaced help to prevent windthrow. Plant competition can be controlled by proper site preparation or by cutting, spraying, or girdling.

Because of the frequent flooding, this soil is generally unsuitable as a site for dwellings. It is unsuitable as a site for septic tank absorption fields because of the flooding and the wetness. It is severely limited as a site for local roads and streets because of low strength, wetness, and flooding. Subsurface drains help to lower the water table. Constructing the roads on raised, well compacted fill material, establishing adequate roadside drainage ditches, and installing culverts help to prevent the damage caused by flooding and improve the ability of the roads to support vehicular traffic.

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

No—Nolin silt loam, frequently flooded. This nearly level, deep, well drained soil is on bottom land along the White River. Individual areas are long and are somewhat oval or irregularly shaped. They are 50 to 100 acres in size.

In a typical profile, the surface layer is dark grayish brown silt loam about 11 inches thick. The subsoil is brown, friable silt loam about 42 inches thick. The underlying material to a depth of 70 inches is dark yellowish brown silt loam. In a few small areas, mottles are within a depth of 24 inches. In some areas the subsoil has less clay.

Included with this soil in mapping are a few small areas of the somewhat poorly drained Newark soils. These soils are near the outer edges of the mapped areas. They make up about 10 percent of the map unit.

Available water capacity is high in the Nolin soil. Permeability is moderate. Surface runoff is slow. The organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled.

Most areas of this soil are used for cultivated crops. A few are used for hay and pasture or for woodland.

This soil is well suited to corn and soybeans. The frequent flooding is a hazard. It usually damages or destroys small grain that is planted in the fall. A system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops, and green manure crops improve or maintain tilth and the organic matter content.

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

This soil is well suited to trees. Plant competition and the equipment limitation are the main management concerns. Equipment should be used only when the hazard of flooding is at a minimum. Seedlings survive and grow well if competing vegetation is controlled by cutting, girdling, or spraying.

Because of the flooding, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields. It is severely limited as a site for local roads and streets because of low strength and flooding. Constructing the roads on raised, well compacted fill material, establishing adequate roadside drainage ditches, and installing culverts help to prevent the damage caused by flooding and improve the ability of the roads to support vehicular traffic.

The land capability classification is IIw. The woodland ordination symbol is 8W.

PaC2—Parke silt loam, 6 to 12 percent slopes, eroded. This moderately sloping, deep, well drained soil is on loess-capped outwash terraces. Individual areas are irregular in shape and are 5 to 40 acres in size.

In a typical profile, the surface layer is brown silt loam about 6 inches thick. It is mixed with some dark brown subsoil material. The subsoil extends to a depth of 80 inches or more. The upper part is dark brown, friable silty clay loam and firm silt loam; the next part is reddish brown, firm loam; and the lower part is reddish brown, firm sandy loam. In a few areas the soil has a thicker loess cap. In places the slope is more than 12 percent.

Included with this soil in mapping are small areas of the well drained Negley soils on side slopes along drainageways. These soils contain more sand in the subsoil than the Parke soil. They make up about 10 percent of the map unit.

Available water capacity is high in the Parke soil. Permeability is moderate. Surface runoff is rapid. The organic matter content is moderate in the surface layer. The water table is at a depth of 3 to 6 feet during winter and early spring. The surface layer is friable and can be easily tilled throughout a fairly wide range in moisture content.

Most areas of this soil are used for hay or pasture. Some are used for cultivated crops. A few are wooded.

This soil is suited to corn, soybeans, and small grain. If cultivated crops are grown, measures that control erosion are needed. A system of conservation tillage that leaves protective amounts of crop residue on the surface, crop rotations that include grasses and legumes, diversions, contour farming, grassed waterways, and grade stabilization structures help to control erosion and improve or maintain tilth and the organic matter content.

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

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

Because of the slope, this soil is moderately limited as a site for dwellings with basements. It is moderately limited as a site for dwellings without basements because of the slope and the shrink-swell potential. The buildings should be designed so that they conform to the natural slope of the land. Backfilling with coarse textured material helps to prevent the structural damage caused by shrinking and swelling. The soil is moderately limited as a site for septic tank absorption fields because of the slope. Installing the absorption field on the contour helps to overcome this limitation.

Frost action and low strength are severe limitations on sites for local roads and streets. Replacing, covering, or strengthening the upper soil layers with better suited material improves the ability of the roads and streets to support vehicular traffic and helps to prevent the damage caused by frost action.

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

PaD2—Parke silt loam, 12 to 18 percent slopes, eroded. This strongly sloping, deep, well drained soil is on loess-capped outwash terraces. Individual areas are irregular in shape and are 5 to 10 acres in size.

In a typical profile, the surface layer is brown silt loam about 4 inches thick. It is mixed with some strong brown subsoil material. The subsoil extends to a depth of 80 inches or more. The upper part is strong brown, firm silty clay loam; the next part is strong brown, firm clay loam; and the lower part is yellowish red, firm clay loam. In places the slope is less than 12 or more than 18 percent.

Included with this soil in mapping are small areas of the well drained Negley soils on side slopes along drainageways. These soils contain more sand and less silt in the subsoil than the Parke soil. They make up about 10 percent of the map unit.

Available water capacity is high in the Parke soil. Permeability is moderate. Surface runoff is very rapid. The organic matter content is moderate in the surface layer.

Most areas of this soil are used for hay or pasture. A few are used for cultivated crops or woodland.

This soil is poorly suited to corn, soybeans, and small grain. Cultivated crops can be grown occasionally. Erosion is the major hazard. A system of conservation tillage that leaves all or part of the crop residue on the surface helps to control erosion, increases the organic matter content, and helps to maintain good tilth.

This soil is suited to grasses and legumes for hay and pasture. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

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

Because of the slope, this soil is severely limited as a site for dwellings and septic tank absorption fields. Designing the buildings so that they conform to the natural slope of the land and installing the absorption fields on the contour help to overcome this limitation. Low strength, slope, and frost action are severe limitations on sites for local roads and streets. Strengthening or replacing the base with better suited material improves the ability of the roads and streets to support vehicular traffic and reduces the potential for frost action. Building on the contour and land shaping help to overcome the slope.

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

PeB—Pekin silt loam, 2 to 6 percent slopes. This gently sloping, deep, moderately well drained soil is on low terraces. Individual areas are irregularly shaped and are 3 to 70 acres in size.

In a typical profile, the surface layer is dark grayish brown silt loam about 12 inches thick. The subsoil is about 46 inches thick. It is yellowish brown and mottled. The upper part is friable silt loam, and the lower part is a fragipan of firm, brittle silty clay loam. The underlying material to a depth of 70 inches is yellowish brown, mottled silt loam. In places the slope is less than 2 or more than 6 percent.

Included with this soil in mapping are small areas of the somewhat poorly drained Wakeland soils in the lower landscape positions. These soils make up about 10 percent of the map unit.

Available water capacity is moderate in the Pekin soil. Permeability is moderate above the fragipan and very slow in the fragipan. Surface runoff is medium. The organic matter content is moderate in the surface layer. The water table is at a depth of 2 to 6 feet during winter and early spring. The firm, brittle fragipan, which is at a depth of 24 to 30 inches, restricts the penetration of roots. The surface layer is friable and can be easily tilled.

Most areas of this soil are used for cultivated crops. A few are used for hay or pasture or for woodland.

This soil is well suited to corn, soybeans, and small grain. If cultivated crops are grown, measures that control erosion are needed. Examples are a system of conservation tillage that leaves protective amounts of crop residue on the surface, contour farming, crop rotations that include grasses and legumes, terraces, and grassed waterways. Because the very slowly permeable fragipan restricts the downward movement of water, the soil is often saturated in winter and spring. As a result, fieldwork is delayed. The soil is somewhat droughty during long dry periods in the summer. Cover crops and green manure crops improve or maintain tilth and the organic matter content.

This soil is well suited to grasses and shallow-rooted legumes for hay and pasture. It is not suited to alfalfa and other deep-rooted legumes because root growth is restricted by the fragipan. Erosion and excessive runoff are hazards if the pasture is overgrazed. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

This soil is suited to trees. The fragipan, however, limits the effective rooting depth.

Because of the very slow permeability and the wetness, this soil is severely limited as a site for dwellings and septic tank absorption fields. Subsurface drains help to lower the water table. Installing the absorption fields in suitable fill material helps to minimize the restricted permeability. Frost action and low strength are severe limitations on sites for local roads and streets. Replacing or covering the upper soil layers with suitable base material helps to overcome these limitations.

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

PkB—Pike silt loam, 2 to 6 percent slopes. This gently sloping, deep, well drained soil is on loess-capped outwash terraces. It is mainly on irregularly shaped ridgetops. Individual areas are dominantly 5 to 25 acres in size.

In a typical profile, the surface layer is brown silt loam about 7 inches thick. The subsurface layer is dark yellowish brown silt loam about 7 inches thick. The subsoil extends to a depth of 80 inches or more. The upper part is brown and reddish brown, friable silt loam and silty clay loam; the next part is dark brown and strong brown, firm and friable silty clay loam and silt loam; and the lower part is reddish brown, friable loam. In places the slope is less than 2 or more than 6 percent. In some areas the mantle of loess is less than 40 inches thick.

Included with this soil in mapping are a few small areas of the well drained Negley soils on the more sloping parts of the landscape. These soils contain more sand in the subsoil than the Pike soil. They make up about 10 percent of the map unit.

Available water capacity is high in the Pike soil. Permeability is moderate. Surface runoff is medium. The organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled throughout a fairly wide range in moisture content.

Most areas of this soil are used for hay or pasture. A few are used for cultivated crops or woodland.

This soil is well suited to corn, soybeans, and small grain. Erosion is the major hazard if cultivated crops are grown. A system of conservation tillage that leaves protective amounts of crop residue on the surface, crop rotations that include grasses and legumes, contour farming, crop residue management, terraces, and grassed waterways help to control erosion, increase the organic matter content, and help to maintain good tilth.

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

This soil is suited to trees. Plant competition is the main management concern. Seedlings survive and grow well if competing vegetation is controlled by proper site preparation and by spraying, cutting, or girdling.

This soil is suitable as a site for dwellings and septic tank absorption fields. It is severely limited as a site for local roads and streets because of low strength and frost action. Strengthening or replacing the base with better suited material improves the ability of the roads and streets to support vehicular traffic and reduces the potential for frost action.

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

UhD—Udorthents, silty, 6 to 14 percent slopes. These moderately sloping and strongly sloping, moderately deep and deep, well drained soils are on uplands. They are in excavated areas that formerly were used as sanitary landfills. Individual areas are less than 40 acres in size.

In a typical profile, the upper 40 inches is mottled gray and yellowish brown shaly silty clay loam. The underlying material is refuse. In places the slope is less than 6 percent.

Included with these soils in mapping are small undisturbed areas of the well drained Wellston and Zanesville soils. These soils make up about 10 percent of the map unit.

Available water capacity and permeability are generally moderate in the Udorthents. Surface runoff is rapid. The organic matter content is very low.

These soils support grasses and pines. They are generally unsuited to cultivated crops, hay and pasture, and woodland. In areas where plants are grown, lime and fertilizer should be added according to the results of soil tests and the needs of the plants.

These soils are generally unsuited to most uses. Onsite investigation is needed before the soils are used for any purpose.

No land capability classification or woodland ordination symbol is assigned.

Up—Udorthents-Pits complex. This unit is in excavated areas on uplands. It occurs as areas of soil material left over from sandstone quarrying and a few areas of sand pits. Individual areas are 18 to 36 acres in size. They are generally elongated, but some are irregular in shape. The unit is about 55 percent Udorthents and 35 percent Pits. The Udorthents and Pits occur as areas so intricately mixed that mapping them separately is not practical.

In a typical profile of the Udorthents, the surface layer is yellowish brown gravelly sand about 1 inch thick. The content of quartz and sandstone fragments in this layer is 85 to 90 percent. Between depths of 1 and 12 inches, the soil material is dominantly brownish yellow gravelly sand in which the content of quartz and sandstone fragments is 35 to 60 percent. Light gray and yellowish brown gravel is between depths of 12 and 26 inches. The gravel is quartzite and sandstone fragments 0.25 to 0.5 inch in size. Sandstone bedrock is at a depth of about 26 inches.

The Pits are open excavations 20 to 100 feet deep. They have high walls of sandstone. Piles of large waste rocks have been dumped into some of the pits. A few pits are sandy throughout and have few or no rocks. A large number have been abandoned for many years. Some contain water. Generally, the pits support few or no plants. In some of the smaller abandoned ones where soil has accumulated at the bottom, vegetation, such as weeds, shrubs, trees, and wild grasses, has become established. In places the slope is less than 2 or more than 14 percent.

Included with this unit in mapping are a few areas of the well drained, moderately steep and steep Negley soils; a few small areas of the somewhat poorly drained, nearly level Wakeland soils along streams; and a few areas of the well drained, moderately sloping and strongly sloping Wellston soils. Included soils make up about 10 percent of the map unit.

Available water capacity is generally very low in the Udorthents. Permeability is generally rapid. The organic matter content is low.

Most areas are abandoned and support native trees, weeds, and grasses. Some of the sandy areas where the content of gravel is lower are used as a source of fill material.

This unit is generally unsuited to cultivated crops, hay and pasture, and woodland. In areas where plants are grown, lime and fertilizer should to be added according to the results of soil tests and the needs of the plants. Seedling mortality is a management concern in areas where trees and shrubs are planted. Onsite investigation is needed before areas of this unit are used as building sites.

No land capability classification or woodland ordination symbol is assigned.

Wa—Wakeland silt loam, frequently flooded. This nearly level, deep, somewhat poorly drained soil is on flood plains. It is flooded for brief periods. Individual areas are long and irregularly shaped and are 5 to 600 acres in size.

In a typical profile, the surface layer is brown silt loam about 7 inches thick. The underlying material to a depth of 60 inches is dark yellowish brown, light brownish gray, pale brown, and gray, mottled silt loam. In places the soil is more acid or less gray below the surface layer.

Included with this soil in mapping are small areas of the well drained Haymond soils on slight rises. These soils make up about 10 percent of the map unit.

Available water capacity is high in the Wakeland soil. Permeability is moderate. Surface runoff is slow. The organic matter content is moderate in the surface layer. The water table is at a depth of 1 to 3 feet during winter and early spring. The surface layer is friable and can be easily tilled.

Most areas of this soil are used for cultivated crops. A few are used for hay and pasture or for woodland.

If drained, this soil is suited to corn and soybeans. The wetness is a limitation, and the frequent flooding is a hazard (fig. 5). A subsurface drainage system can lower the water table if adequate outlets are available. A system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops, and green manure crops improve or maintain tilth and the organic matter content.

This soil is well suited to grasses and shallow-rooted legumes for hay and pasture. It is not suited to alfalfa and other deep-rooted legumes because of the high water table, which causes frost heaving. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and reduces plant density. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition. A drainage system is necessary. Subsurface drains can lower the water table if adequate outlets are available.

This soil is suited to trees. Plant competition is the main management concern. Seedlings survive and grow well if competing vegetation is controlled by cutting, girdling, or spraying. The flooding can hinder harvesting, logging, and planting.

Because of the frequent flooding, this soil is generally unsuitable as a site for dwellings. It is unsuitable as a site for septic tank absorption fields because of the flooding and the wetness. It is severely limited as a site for local roads and streets because of frost action and flooding. Constructing the roads on raised, well compacted fill material, establishing adequate roadside drainage ditches, and installing culverts help to prevent the damage caused by flooding and frost action.

Figure 5.—Corn damaged by floodwater in an area of Wakeland silt loam, frequently flooded.

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

WeB—Wellston silt loam, 2 to 6 percent slopes. This gently sloping, deep, well drained soil is on ridgetops. Individual areas are typically narrow and irregularly shaped and are 5 to 40 acres in size.

In a typical profile, the surface layer is brown silt loam about 10 inches thick. The subsoil is about 23 inches thick. It is friable. The upper part is strong brown silty clay loam, and the lower part is yellowish brown silt loam. The underlying material is about 8 inches of yellowish brown channery loam in which the content of sandstone fragments is about 15 percent. Sandstone bedrock is at a depth of about 41 inches. In a few small areas, the slope is more than 6 percent.

Included with this soil in mapping are small areas of the moderately well drained and well drained Zanesville soils, which have a fragipan. These soils make up about 10 percent of the map unit.

Available water capacity is high in the Wellston soil. Permeability is moderate. Surface runoff is medium. The organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled.

Most areas of this soil are used for hay, pasture, or woodland. A few are used for cultivated crops.

This soil is well suited to corn, soybeans, and small grain. Erosion and runoff are the major hazards if cultivated crops are grown. A system of conservation tillage that leaves all or part of the crop residue on the surface, crop rotations that include grasses and legumes, contour farming, terraces, diversions, and grassed waterways help to control erosion, increase the organic matter content, and help to maintain good tilth.

This soil is well suited to grasses and legumes for hay and pasture. Overgrazing causes surface compaction and poor tilth and reduces plant density. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

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

Because of the depth to bedrock, this soil is moderately limited as a site for dwellings with basements. It is suitable as a site for dwellings without basements. Providing fill material increases the depth to bedrock. The soil is moderately limited as a site for septic tank absorption fields because of the restricted permeability and the depth to bedrock. Installing the absorption field in suitable fill material helps to minimize the restricted permeability. Onsite investigation is needed to determine the depth to bedrock before construction or installation. Frost action is a severe limitation on sites for local roads and streets. Replacing or covering the upper soil layers with suitable base material helps to prevent the damage caused by frost action.

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

WeC2—Wellston silt loam, 6 to 12 percent slopes, eroded. This moderately sloping, deep, well drained soil is on ridgetops and side slopes along drainageways in the uplands. Individual areas are generally narrow and irregularly shaped and are 12 to 18 acres in size.

In a typical profile, the surface layer is very dark grayish brown silt loam about 3 inches thick. The subsurface layer is brown silt loam about 3 inches thick. It is mixed with some dark yellowish brown subsoil material. The subsoil is about 42 inches thick. The upper part is dark yellowish brown, friable silt loam, and the lower part is strong brown, firm and friable silt loam and silty clay loam. The underlying material to a depth of 60 inches is dark yellowish brown very channery loam in which the content of sandstone fragments is about 60 percent. In some areas the subsoil and underlying material are fine textured. In other areas the slope is less than 6 or more than 12 percent. In some places the upper part of the subsoil is mottled. In other places small gullies have formed.

Included with this soil in mapping are small areas of the moderately well drained and well drained Zanesville soils. These soils have a fragipan. They are mainly on the wider ridgetops. Also included are severely eroded areas, mainly near the top of the slopes. Included soils make up about 10 percent of the map unit.

Available water capacity is high in the Wellston soil. Permeability is moderate. Surface runoff is rapid. The organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled.

Most areas of this soil are used for hay, pasture, or woodland. A few are used for cultivated crops.

This soil is suited to corn, soybeans, and small grain. If cultivated crops are grown, measures that control erosion are needed. Crop rotations that include grasses and legumes, a system of conservation tillage that leaves all or part of the crop residue on the surface, terraces, diversions, contour farming, grassed waterways, grade stabilization structures, and cover crops help to control erosion and improve or maintain tilth and the organic matter content.

This soil is well suited to grasses and legumes for hay and pasture. Overgrazing causes surface compaction, excessive runoff, and poor tilth and reduces plant density. Proper stocking rates and pasture rotation help to keep the pasture in good condition.

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

Because of the slope and the depth to bedrock, this soil is moderately limited as a site for dwellings with basements. It is moderately limited as a site for dwellings without basements because of the slope. The buildings should be designed so that they conform to the natural slope of the land. Measures that overcome the depth to bedrock generally are prohibitively expensive. The soil is moderately limited as a site for septic tank absorption fields because of the slope, the moderate permeability, and the depth to bedrock. Installing the absorption field on the contour helps to overcome the slope. Filling or mounding with suitable material increases the depth to bedrock. It also helps to minimize the restricted permeability.

Frost action is a severe limitation on sites for local roads and streets. Replacing or covering the upper soil layers with suitable base material helps to prevent the damage caused by frost action.

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

WeD2—Wellston silt loam, 12 to 18 percent slopes, eroded. This strongly sloping, deep, well drained soil is on side slopes along drainageways in the uplands. Individual areas are irregular in shape and are 10 to 30 acres in size.

In a typical profile, the surface layer is dark grayish brown silt loam about 5 inches thick. It is mixed with some strong brown subsoil material. The subsoil is firm silty clay loam about 35 inches thick. The upper part is strong brown, and the lower part is yellowish brown. The underlying material to a depth of 60 inches is yellowish brown, mottled channery clay loam in which the content of sandstone fragments is about 15 percent. In some areas the subsoil is coarser textured. In other areas the subsoil and underlying material are fine textured. In some places the slope is less than 12 or more than 18 percent. In other places small gullies have formed.

Included with this soil in mapping are small areas of the moderately well drained and well drained Zanesville soils. These soils have a fragipan. They are in the less sloping areas. Also included are small areas of alluvial soils along the drainageways. Included soils make up about 10 percent of the map unit.

Available water capacity is high in the Wellston soil. Permeability is moderate. Surface runoff is very rapid. The organic matter content is moderate in the surface layer.

Most areas of this soil are used for hay, pasture, or woodland. Some are used for cultivated crops.

This soil is poorly suited to corn, soybeans, and small grain. Row crops can be grown occasionally to establish hay or pasture species. Erosion is the major hazard. A system of conservation tillage that leaves all or part of the crop residue on the surface, crop rotations that include grasses and legumes, diversions, and grassed waterways help to control erosion, increase the organic matter content, and help to maintain good tilth.

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

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

Because of the slope, this soil is severely limited as a site for dwellings and septic tank absorption fields. Designing the buildings so that they conform to the natural slope of the land and installing the absorption fields on the contour help to overcome this limitation. The absorption fields should be installed in the less sloping areas if possible. Slope and frost action are severe limitations on sites for local roads and streets. Building on the contour and land shaping help to overcome the slope. Replacing or covering the upper soil layers with suitable base material helps to prevent the damage caused by frost action.

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

WeD3—Wellston silt loam, 12 to 18 percent slopes, severely eroded. This strongly sloping, deep, well drained soil is on side slopes along drainageways in the uplands. Individual areas are irregular in shape and are 10 to 30 acres in size.

In a typical profile, the surface layer is mixed dark yellowish brown and strong brown silt loam about 5 inches thick. The subsoil is about 35 inches thick. The upper part is strong brown, firm silty clay loam and silt loam, and the lower part is brown, friable loam. The underlying material to a depth of 60 inches is yellowish brown gravelly loam. In some areas the subsoil is coarser textured. In other areas the subsoil and underlying material are fine textured. In some places the slope is less than 12 or more than 18 percent. In other places gullies have formed.

Included with this soil in mapping are small areas of the moderately well drained and well drained Zanesville soils. These soils have a fragipan. They are in the less sloping areas. Also included are small areas of alluvial soils along the drainageways. Included soils make up about 10 percent of the map unit.

Available water capacity is high in the Wellston soil. Permeability is moderate. Surface runoff is very rapid. The organic matter content is low in the surface layer.

Most areas are used for cultivated crops or pasture. Some are wooded. This soil is generally unsuited to corn, soybeans, and small grain, mainly because of the erosion hazard.

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

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

Because of the slope, this soil is severely limited as a site for dwellings and septic tank absorption fields. Designing the buildings so that they conform to the natural slope of the land and installing the absorption fields on the contour help to overcome this limitation. Slope and frost action are severe limitations on sites for local roads and streets. Building on the contour and land shaping help to overcome the slope. Replacing or covering the upper soil layers with suitable base material helps to prevent the damage caused by frost action.

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

WgG—Wellston-Berks-Gilpin complex, 18 to 70 percent slopes. These moderately steep to very steep, well drained soils are on side slopes in the uplands. The Wellston soil is deep, and the Berks and Gilpin soils are moderately deep. Individual areas are dominantly 50 to 300 acres in size. They are about 47 percent Wellston soil, 25 percent Berks soil, and 18 percent Gilpin soil. The three soils occur as areas so intricately mixed that mapping them separately is not practical.

In a typical profile of the Wellston soil, the surface layer is very dark gray silt loam about 1 inch thick. The subsurface layer is brown silt loam about 2 inches thick. The subsoil is about 39 inches thick. It is dark yellowish brown, friable silt loam in the upper part; strong brown, firm silty clay loam in the next part; and yellowish brown, friable channery clay loam in the lower part. The underlying material to a depth of 60 inches is yellowish brown channery loam.

In a typical profile of the Berks soil, the surface layer is brown channery silt loam about 2 inches thick. The subsoil is about 36 inches thick. It is light yellowish brown and friable. It is channery loam in the upper part and very channery loam in the lower part. Rippable sandstone bedrock is at a depth of about 38 inches.

In a typical profile of the Gilpin soil, the surface layer is very dark grayish brown channery silt loam about 2 inches thick. The subsurface layer is brown channery silt loam about 2 inches thick. The subsoil is about 26 inches thick. It is dark yellowish brown, friable channery silt loam in the upper part and strong brown, firm channery silty clay loam in the lower part. The underlying material is yellowish brown, mottled channery loam about 6 inches thick. Rippable sandstone bedrock is at a depth of about 36 inches. In some areas the soil formed in limestone residuum.

Included with these soils in mapping are a few areas of shallow soils and areas where sandstone bedrock is exposed. These areas are along the major rivers. Also included are severely eroded areas and areas of alluvial soils along drainageways. Included areas make up about 10 percent of the map unit.

Available water capacity is high in the Wellston soil, very low in the Berks soil, and low in the Gilpin soil. Permeability is moderate in the Wellston and Gilpin soils and moderate or moderately rapid in the Berks soil. Surface runoff is rapid or very rapid on all three soils. The organic matter content is moderately low or moderate in the surface layer. This layer is friable.

Most areas are used as woodland. A few are used as pasture. These soils are generally unsuited to cultivated crops and to grasses and legumes for hay and pasture. Because of the slope, the stones on the surface, and the included rock outcrops, operating farm equipment is difficult or impossible. Pasture plants can be established in the less sloping areas, but access to these areas is limited.

These soils are fairly well suited to trees. The erosion hazard, the equipment limitation, and plant competition are management concerns. Seedling mortality also is a concern on the Berks soil. Special logging methods, such as yarding the logs uphill with a cable, may be needed to minimize the use of rubber-tired and crawler tractors. Establishing logging roads, skid trails, and landings on gentle grades and removing water by water bars, out-sloping road surfaces, culverts, and drop structures help to control erosion. Containerized nursery stock may be needed. Seedlings survive and grow well if competing vegetation is controlled by cutting, girdling, or spraying.

Because of the slope and the depth to bedrock, these soils are generally unsuitable as sites for dwellings and septic tank absorption fields. They are severely limited as sites for local roads because of the slope and frost action. Deep cuts are needed if the roads are built on the contour. Frost action can be controlled by replacing or covering the upper soil layers with suitable base material.

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

WlD—Wellston-Ebal silt loams, 10 to 18 percent slopes. These moderately sloping and strongly sloping, deep soils are on side slopes in the uplands. The Wellston soil is well drained, and the Ebal soil is moderately well drained. Individual areas are dominantly 5 to 20 acres in size. They are about 50 percent Wellston soil and 40 percent Ebal soil. The two soils occur as areas so intricately mixed that mapping them separately is not practical.

In a typical profile of the Wellston soil, the surface layer is dark grayish brown silt loam about 4 inches thick. The subsurface layer is brown silt loam about 8 inches thick. The subsoil is about 24 inches thick. It is friable. It is strong brown silt loam and silty clay loam in the upper part and brown silt loam in the lower part. The underlying material to a depth of 60 inches is brown loam. In some areas the upper part of the subsoil is mottled. In other areas the content of sandstone fragments is as much as 20 percent throughout the profile.

In a typical profile of the Ebal soil, the surface layer is dark grayish brown silt loam about 5 inches thick. The subsoil is about 55 inches thick. It is strong brown, firm and very firm channery silty clay and channery clay in the upper part and yellowish brown, very firm clay in the lower part. The underlying material to a depth of 70 inches is yellowish brown shaly clay. In places the slope is less than 10 or more than 18 percent. In some areas the upper part of the subsoil is mottled.

Included with these soils in mapping are small areas of the moderately well drained and well drained Zanesville soils. These soils have a fragipan. They are mainly on the wider ridgetops. Also included are severely eroded areas, mainly near the top of the slopes. Included soils make up about 10 percent of the map unit.

Available water capacity is high in the Wellston soil and moderate in the Ebal soil. Permeability is moderate in the Wellston soil. It is moderate in the upper part of the Ebal soil and very slow in the lower part. Surface runoff is rapid on both soils. The organic matter content is moderate in the surface layer. The Ebal soil has a water table at a depth of 3 to 6 feet during winter and early spring.

Most areas of these soils are used as woodland. A few are pastured.

These soils are poorly suited to cultivated crops. Row crops can be grown occasionally to establish hay or pasture species. Erosion is the major hazard. A system of conservation tillage that leaves all or part of the crop residue on the surface, crop rotations that include grasses and legumes, diversions, and grassed waterways help to control erosion, increase the organic matter content, and help to maintain good tilth.

These soils are suited to grasses and legumes for hay and pasture. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

These soils are suited to trees. Plant competition, seedling mortality, and the windthrow hazard are management concerns. Seedlings survive and grow well if competing vegetation is controlled by cutting, girdling, or spraying. Because of the seedling mortality rate, special planting stock and overstocking are needed. Carefully thinning the stands or not thinning them at all reduces the windthrow hazard.

Because of the shrink-swell potential, these soils are severely limited as sites for dwellings. The slope and the depth to rock also are limitations. The buildings should be designed so that they conform to the natural slope of the land. The layers that have a high shrink-swell potential should be replaced with suitable soil material. Bedrock generally is below a depth of 40 inches. The soils are severely limited as sites for septic tank absorption fields because of the wetness and the restricted permeability. The slope and the depth to bedrock also are limitations. Installing the absorption field on the contour helps to overcome the slope. The more slowly permeable material should be replaced with better suited material.

Frost action, low strength, and the shrink-swell potential are severe limitations on sites for local roads and streets. Replacing or strengthening the upper soil layers with better suited base material helps to overcome these limitations.

The land capability classification is IVe. The woodland ordination symbol of the Wellston soil is 4A, and that of the Ebal soil is 4C.

WnE—Wellston-Gilpin complex, 12 to 30 percent slopes. These strongly sloping to steep, well drained soils are on hillsides in the uplands. The Wellston soil is deep, and the Gilpin soil is moderately deep. Individual areas are dominantly 45 to 300 acres in size. They are about 60 percent Wellston soil and 30 percent Gilpin soil. The two soils occur as areas so intricately mixed that mapping them separately is not practical.

In a typical profile of the Wellston soil, the surface layer is dark grayish brown silt loam about 2 inches thick. The subsurface layer is brown silt loam about 4 inches thick. The subsoil is silt loam about 43 inches thick. It is dark yellowish brown and friable in the upper part, strong brown and firm in the next part, and brown and friable in the lower part. The underlying material to a depth of 60 inches is yellowish brown silt loam. In places the content of sandstone fragments in the subsoil is more than 15 percent.

In a typical profile of the Gilpin soil, the surface layer is very dark grayish brown channery silt loam about 4 inches thick. The subsoil is about 27 inches thick. It is friable. It is yellowish brown channery silt loam in the upper part, brown loam in the next part, and brown, mottled loam in the lower part. The underlying material is yellowish brown, mottled channery loam about 8 inches thick. Rippable sandstone bedrock is at a depth of about 39 inches.

Included with these soils in mapping are a few areas of shallow soils; areas where sandstone bedrock is exposed; and small areas of the well drained, moderately deep Berks soils near the top of the slopes. Also included are severely eroded areas and areas of alluvial soils along drainageways. Included areas make up about 10 percent of the map unit.

Available water capacity is high in the Wellston soil and low in the Gilpin soil. Permeability is moderate in both soils. Surface runoff is medium. The organic matter content is moderate in the surface layer. This layer is friable.

Most areas are used as woodland. A few small areas are pastured. Because of the slope, the stones on the surface, and the included rock outcrops, these soils are generally unsuited to cultivated crops and are poorly suited to grasses and legumes for hay and pasture. Pasture plants can be established in the less sloping areas.

These soils are suited to trees. The erosion hazard, the equipment limitation, and plant competition are management concerns. Establishing logging roads, skid trails, and landings on gentle grades and removing water by water bars, culverts, and drop structures help to control erosion. Special logging methods, such as yarding the logs uphill with a cable, may be needed to minimize the use of rubber-tired and crawler tractors. Seedlings survive and grow well if competing vegetation is controlled by cutting, girdling, or spraying.

Because of the slope, these soils are generally unsuitable as sites for dwellings. They are unsuitable as sites for septic tank absorption fields because of the slope and the depth to bedrock. They are severely limited as sites for local roads because of the slope and frost action. The roads should be constructed on the contour. Frost action can be controlled by replacing or covering the upper soil layers with suitable base material.

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

WpD—Wellston-Udorthents complex, 12 to 18 percent slopes. These strongly sloping, very shallow to deep, well drained soils are on side slopes in the uplands. The Udorthents are in areas that have been affected by earth moving activities. Individual areas are generally irregular in shape and are 5 to 15 acres in size. They are about 48 percent Wellston soil and 42 percent Udorthents. The Wellston soil and Udorthents occur as areas so intricately mixed that mapping them separately is not practical.

In a typical profile of the Wellston soil, the surface layer is dark yellowish brown silt loam about 1 inch thick. The subsoil is strong brown and brown, friable silty clay loam about 38 inches thick. The underlying material is yellowish brown channery loam about 16 inches thick. Bedrock is at a depth of about 55 inches. In places the soil has more sand. In areas affected by construction and earth moving, the surface layer has been removed. In some places small gullies have formed. In other places a thin surface layer is starting to form. In some areas the slope is less than 12 or more than 18 percent.

In a typical profile of the Udorthents, the upper 30 inches is strong brown silt loam, silty clay loam, and loam. Bedrock is at a depth of about 30 inches. In some areas a thin surface layer is starting to form. These areas are at the Crane Naval Weapons Support Center, where a significant amount of construction and earth moving has removed most of the original soil, which has been deposited as fill on building sites.

Included with these soils in mapping are a few small areas of the moderately well drained Ebal soils on ridgetops and side slopes. Also included are a few small areas of the well drained and moderately well drained Zanesville soils and some areas where bedrock is exposed. Zanesville soils have a fragipan. They are in the less sloping areas. Included areas make up about 10 percent of the map unit.

The Wellston soil has a high available water capacity and is moderately permeable. Permeability and available water capacity generally are moderate in the Udorthents. Surface runoff is rapid on both soils. The organic matter content is low in the surface layer.

Most areas are used as woodland. Some are used as grassland. Mainly because of the hazards of erosion and runoff, these soils are generally unsuited to cultivated crops. They are poorly suited to grasses and legumes for hay and pasture. Because of past construction and excavation, they are subject to extensive erosion. A cover of grasses and legumes helps to control erosion.

These soils are suited to trees. Many areas support stands of native hardwoods. Plant competition, seedling mortality, the equipment limitation, and the erosion hazard are management concerns. Seedlings survive and grow well if competing vegetation is controlled by cutting, girdling, or spraying. Because of the seedling mortality rate, special planting stock and overstocking are needed. The use of equipment is restricted when the soils are wet and sticky. Establishing logging roads, skid trails, and landings on gentle grades and removing water by water bars, out-sloping road surfaces, culverts, and drop structures help to control erosion.

Because of the slope, the Wellston soil is severely limited as a site for dwellings and septic tank absorption fields. Designing the buildings so that they conform to the natural slope of the land and installing the absorption fields on the contour help to overcome this limitation. Slope and frost action are severe limitations on sites for local roads and streets. Building on the contour and land shaping help to overcome the slope. Replacing or covering the upper soil layers with suitable base material helps to prevent the damage caused by frost action.

The Wellston soil is assigned to land capability classification VIe and woodland ordination symbol 4A. The Udorthents are not assigned to interpretive groups.

Wr—Wilbur silt loam, frequently flooded. This nearly level, deep, moderately well drained soil is on bottom land. It is flooded for brief periods. Individual areas are long and irregularly shaped and are 15 to 100 acres in size.

In a typical profile, the surface layer is brown silt loam about 6 inches thick. The underlying material to a depth of 60 inches is dark yellowish brown and yellowish brown, mottled silt loam. In some areas the subsoil has more sand. In other areas it is more acid.

Included with this soil in mapping are small areas of the somewhat poorly drained Wakeland soils. These soils are in slight depressions or in positions on the landscape similar to those of the Wilbur soil. They make up about 10 percent of the map unit.

Available water capacity is high in the Wilbur soil. Permeability is moderate. Surface runoff is slow. The organic matter content is moderate in the surface layer. The water table is at a depth of 1.5 to 3.0 feet during winter and early spring. The surface layer is friable and can be easily tilled.

Most areas of this soil are used for cultivated crops. A few are used for hay and pasture or for woodland.

If drained, this soil is well suited to corn and soybeans. The wetness is a limitation, and the frequent flooding is a hazard. A subsurface drainage system can lower the water table if adequate outlets are available. A system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops, and green manure crops improve or maintain tilth and the organic matter content.

This soil is well suited to grasses and shallow-rooted legumes for hay and pasture. It is not suited to alfalfa and other deep-rooted legumes because of the high water table, which causes frost heaving. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and reduces plant density. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition. A drainage system is necessary. Subsurface drains can lower the water table if adequate outlets are available.

This soil is well suited to trees. Plant competition is the main management concern. Seedlings survive and grow well if competing vegetation is controlled by cutting, girdling, or spraying. The flooding can hinder harvesting, logging, and planting.

Because of the frequent flooding, this soil is generally unsuitable as a site for dwellings. It is unsuitable as a site for septic tank absorption fields because of the flooding and the wetness. It is severely limited as a site for local roads and streets because of frost action and flooding. Constructing the roads on raised, well compacted fill material, establishing adequate roadside drainage ditches, and installing culverts help to prevent the damage caused by flooding and frost action.

The land capability classification is IIw. The woodland ordination symbol is 8A.

Wt—Wirt fine sandy loam, frequently flooded. This nearly level, deep, well drained soil is on bottom land. It is flooded for brief periods. Individual areas are irregular in shape and are 10 to 60 acres in size.

In a typical profile, the surface layer is brown fine sandy loam about 6 inches thick. The subsoil is about 34 inches thick. It is dark yellowish brown and brown, friable fine sandy loam and sandy loam. The underlying material to a depth of 60 inches is brown loam. In places the surface layer is loamy sand.

Included with this soil in mapping are small areas of the well drained Nolin soils. These soils are more silty throughout than the Wirt soil. Also, they are farther from streams. They make up about 10 percent of the map unit.

Available water capacity is high in the Wirt soil. Permeability is moderate. Surface runoff is slow. The organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled.

Most areas of this soil are used for cultivated crops. A few are used for hay and pasture or for woodland.

This soil is well suited to corn and soybeans. The flooding is a hazard. A system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops, and green manure crops improve or maintain tilth and the organic matter content.

This soil is well suited to grasses and legumes for hay and pasture. Overgrazing causes surface compaction and poor tilth and reduces plant density. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

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

Because of the flooding, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields and is severely limited as a site for local roads. Constructing the roads on raised, well compacted fill material, establishing adequate roadside drainage ditches, and installing culverts help to prevent the damage caused by flooding.

The land capability classification is IIw. The woodland ordination symbol is 7A.

ZaB—Zanesville silt loam, 2 to 6 percent slopes. This gently sloping, deep, well drained and moderately well drained soil is on ridgetops in the uplands. Individual areas are irregular in shape and are 10 to 150 acres in size.

In a typical profile, the surface layer is brown silt loam about 8 inches thick. The subsoil is yellowish brown silty clay loam about 35 inches thick. It is friable in the upper part and a firm fragipan in the lower part. The underlying material to a depth of 60 inches is yellowish brown silty clay loam. In places the soil has more than 48 inches of loess. In some areas the lower part of the subsoil is extremely acid.

Included with this soil in mapping are a few small areas of somewhat poorly drained soils at the head of drainageways and on broad flats where the slope is less than 2 percent. Also included are a few areas of the well drained Gilpin and Wellston soils and small areas of severely eroded soils on the crest of the slopes. Gilpin and Wellston soils do not have a fragipan. They have a slope of more than 6 percent. Included soils make up about 10 percent of the map unit.

Available water capacity is moderate in the Zanesville soil. Permeability is moderate above the fragipan and slow in the fragipan. Surface runoff is medium. The organic matter content is moderate in the surface layer. The water table is at a depth of 2 to 3 feet during winter and early spring. The firm, brittle fragipan, which is at a depth of 23 to 31 inches, restricts the penetration of roots. The surface layer is friable and can be easily tilled.

Most areas of this soil are used for hay and pasture. Many are used for cultivated crops. A few are wooded (fig. 6).

This soil is well suited to corn, soybeans, and small grain. If cultivated crops are grown, measures that control erosion and runoff are needed. Examples are crop rotations that include grasses and legumes, a system of conservation tillage that leaves protective

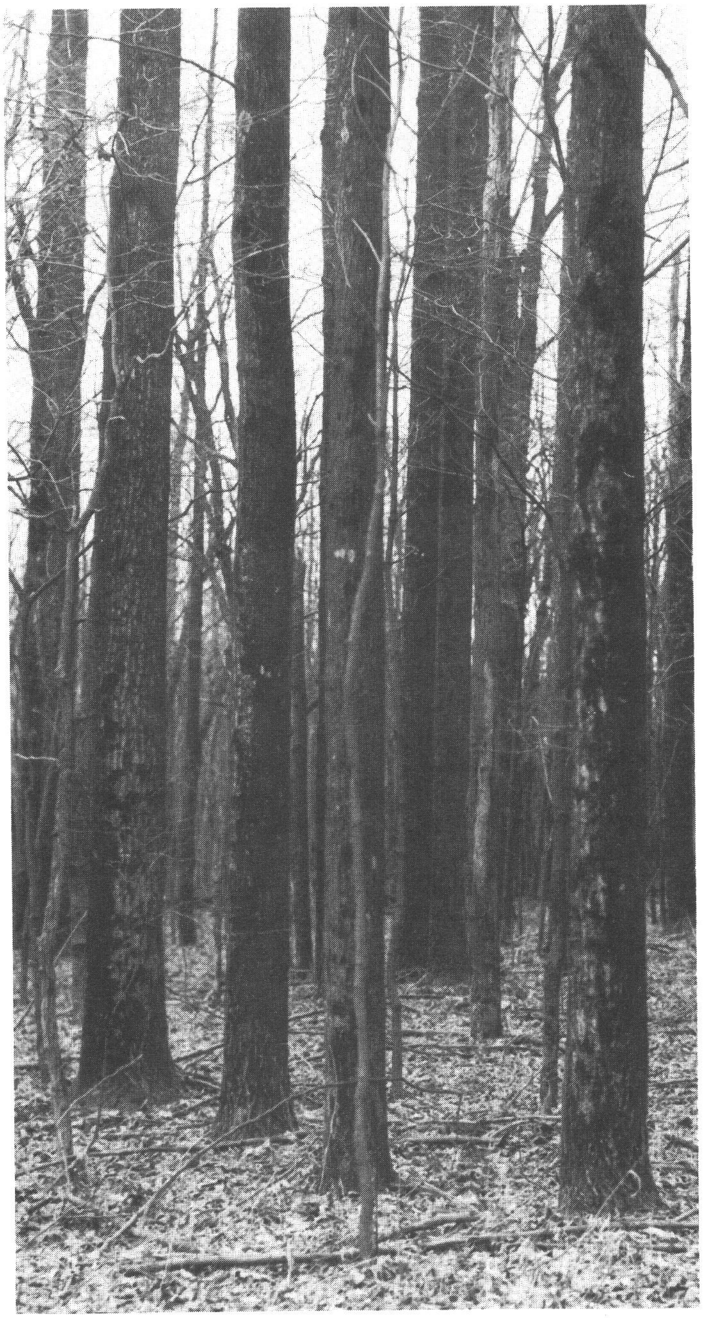


Figure 6.—A wooded area of Zanesville silt loam, 2 to 6 percent slopes.

amounts of crop residue on the surface, terraces, contour farming, and grassed waterways. Because the slowly permeable fragipan restricts the downward movement of water, the soil is often saturated in winter and spring. As a result, fieldwork is delayed. The soil is somewhat droughty during long dry periods in the summer. Crop residue management, cover crops, and green manure crops help to control erosion and maintain tilth and the organic matter content.

This soil is well suited to grasses and shallow-rooted legumes for hay and pasture. It is not suited to deep-rooted legumes because root growth is restricted by the fragipan. Overgrazing causes surface compaction, excessive runoff, and poor tilth and reduces plant density. Proper stocking rates and timely deferment of grazing help to keep the pasture in good condition.

This soil is well suited to trees. The root zone is limited mainly to the part of the profile above the fragipan. Plant competition is the major management concern. Seedlings survive and grow well if competing vegetation is controlled by cutting, girdling, or spraying.

Because of the wetness, this soil is severely limited as a site for dwellings with basements and is moderately limited as a site for dwellings without basements. Subsurface drains help to lower the water table. The soil is severely limited as a site for septic tank absorption fields because of the wetness and the slow permeability. The slowly permeable material should be replaced with better suited material. Installing subsurface drains around the outer edges of the absorption field reduces the wetness.

Low strength is a severe limitation on sites for local roads and streets. Strengthening or replacing the base with better suited material improves the ability of the roads and streets to support vehicular traffic.

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

ZaC2—Zanesville silt loam, 6 to 12 percent slopes, eroded. This moderately sloping, deep, well drained and moderately well drained soil is on ridgetops and the upper side slopes along natural drainageways in the uplands. Individual areas are long and irregularly shaped and are 3 to 20 acres in size.

In a typical profile, the surface layer is brown silt loam about 5 inches thick. It is mixed with some strong brown subsoil material. The subsoil is about 39 inches thick. It is strong brown throughout. The upper part is friable silt loam, the next part is firm silty clay loam, and the lower part is a fragipan of mottled, firm, brittle silt loam. The underlying material to a depth of 60 inches is yellowish brown, mottled channery loam. In places the soil has more than 48 inches of loess, the base saturation is less than 35 percent, and the underlying material is silty clay or clay. In some areas the slope is more than 12 percent. In other areas small gullies have formed.

Included with this soil in mapping are a few small areas of the well drained Wellston soils. These soils do not have a fragipan. They are in the more sloping areas. Also included are small severely eroded areas on the steeper slopes. Included soils make up about 10 percent of the map unit.

Available water capacity is moderate in the Zanesville soil. Permeability is moderate above the fragipan and slow in the fragipan. Surface runoff is rapid. The organic matter content is moderate in the surface layer. The water table is at a depth of 2 to 3 feet during winter and early spring. The firm, brittle fragipan, which is at a depth of about 23 to 31 inches, restricts the penetration of roots. The surface layer is friable and can be easily tilled.

Most areas of this soil are used for hay and pasture. Many are used for cultivated crops, and some are wooded.

This soil is suited to corn, soybeans, and small grain. If cultivated crops are grown, measures that control erosion are needed. Examples are crop rotations that include grasses and legumes, a system of conservation tillage that leaves protective amounts of crop residue on the surface, terraces, diversions, grassed waterways, and grade stabilization structures. Because the slowly permeable fragipan restricts the downward movement of water, the soil is often saturated in winter and spring. As a result, fieldwork is delayed. The soil is somewhat droughty during long dry periods in the summer. Crop residue management and cover crops help to control erosion and maintain tilth and the organic matter content.

This soil is well suited to grasses and shallow-rooted legumes for hay and pasture. It is not suited to deep-rooted legumes, such as alfalfa, because root growth is restricted by the fragipan. Overgrazing causes surface compaction, excessive runoff, and poor tilth and reduces plant density. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

This soil is well suited to trees. The root zone is limited mainly to the part of the profile above the fragipan. Plant competition is the major management concern. Seedlings survive and grow well if competing vegetation is controlled by cutting, girdling, or spraying.

Because of the slope and the wetness, this soil is moderately limited as a site for dwellings without basements. It is severely limited as a site for dwellings with basements because of the wetness. The buildings should be designed so that they conform to the natural slope of the land. Constructing the buildings on raised, well compacted fill material helps to overcome the wetness. The soil is severely limited as a site for septic tank absorption fields because of the slow permeability and the wetness. Installing the absorption field in suitable fill material helps to minimize the restricted permeability. Subsurface drains help to lower the water table.

Low strength is a severe limitation on sites for local roads and streets. Strengthening or replacing the base with better suited material improves the ability of the roads and streets to support vehicular traffic.

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

ZaC3—Zanesville silt loam, 6 to 12 percent slopes, severely eroded. This moderately sloping, deep, well drained and moderately well drained soil is on ridgetops and the upper side slopes along natural drainageways in the uplands. Individual areas are long and irregularly shaped and are 3 to 30 acres in size.

In a typical profile, the surface layer is brown silt loam about 1 inch thick. The subsoil is about 38 inches of silt loam and silty clay loam. The upper part is strong brown and friable, and the lower part is a yellowish brown, firm, brittle fragipan. The underlying material to a depth of 70 inches is yellowish brown silty clay loam. In a few areas the soil is less eroded. In some places the slope is more than 12 percent. In other places the depth to the top of the fragipan is less than 23 inches. In some areas small gullies have formed.

Included with this soil in mapping are a few areas of the well drained Wellston soils. These soils do not have a fragipan. They are in the steeper areas. They make up about 10 percent of the map unit.

Available water capacity is moderate in the Zanesville soil. Permeability is moderate above the fragipan and slow in the fragipan. Surface runoff is rapid. The organic matter content is low in the surface layer. The water table is at a depth of 2 to 3 feet during winter and early spring. The firm, brittle fragipan, which is at a depth of about 23 to 31 inches, restricts the penetration of roots.

Most areas of this soil are used for hay and pasture. Some are wooded. A few are used for cultivated crops.

This soil is poorly suited to corn, soybeans, and small grain. If cultivated crops are grown, measures that control erosion and help to maintain tilth and the organic matter content are needed. Examples are crop rotations that include grasses and legumes, a system of conservation tillage that leaves protective amounts of crop residue on the surface, terraces, diversions, grassed waterways, and grade stabilization structures. Because the slowly permeable fragipan restricts the downward movement of water, the soil is often saturated in winter and spring. As a result, fieldwork is delayed. The soil is somewhat droughty during long dry periods in the summer.

This soil is suited to grasses and shallow-rooted legumes for hay and pasture. It is not suited to deep-rooted legumes, such as alfalfa, because root growth is restricted by the fragipan. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth and reduces plant density. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is poorly suited to trees. The root zone is limited mainly to the part of the profile above the fragipan. Seedling mortality is the main management concern. Because of the seedling mortality rate, special planting stock and overstocking are needed.

Because of the slope and the wetness, this soil is moderately limited as a site for dwellings without basements. It is severely limited as a site for dwellings with basements because of the wetness. The buildings should be designed so that they conform to the natural slope of the land. Constructing the buildings on raised, well compacted fill material helps to overcome the wetness. The soil is severely limited as a site for septic tank absorption fields because of the wetness and the slow permeability. Subsurface drains help to lower the water table. Installing the absorption field in suitable fill material helps to minimize the restricted permeability.

Low strength is a severe limitation on sites for local roads and streets. Strengthening or replacing the base with better suited material improves the ability of the roads and streets to support vehicular traffic.

The land capability classification is IVe. The woodland ordination symbol is 3A.

ZnB—Zanesville-Udorthents complex, 2 to 6 percent slopes. These gently sloping, shallow to deep, well drained and moderately well drained soils are on the tops of ridges in the uplands. The Udorthents are in areas that have been affected by earth-moving activities. Individual areas are generally long and narrow and are 5 to 40 acres in size. They are about 48 percent Zanesville soil and 42 percent Udorthents. The Zanesville soil and Udorthents occur as areas so intricately mixed that mapping them separately is not practical.

In a typical profile of the Zanesville soil, the surface layer is very dark grayish brown silt loam about 1 inch thick. The subsoil is silty clay loam about 58 inches thick. The upper part is yellowish brown and friable; the next part is yellowish brown, mottled, and friable; and the lower part is a strong brown, mottled, firm, brittle fragipan. The underlying material to a depth of 65 inches is yellowish brown, mottled loam in which the content of sandstone fragments is about 10 percent. In areas affected by construction and earth moving, the surface layer has been removed. In some places small gullies have formed. In other places a thin surface layer is starting to form. In some areas the slope is less than 2 or more than 6 percent. In other areas the soil has more than 48 inches of loess.

In a typical profile of the Udorthents, the upper 45 inches is brown, mottled silt loam, silty clay loam, and loam. Bedrock is at a depth of about 45 inches. In some areas a thin surface layer is starting to form. These areas are at the Crane Naval Weapons Support Center, where a significant amount of construction and earth moving has altered the natural landscape.

Included with these soils in mapping are small areas of the somewhat poorly drained Johnsburg soils on the more nearly level parts of the ridgetops. Also included are small areas of the well drained Wellston soils, mainly on the narrower ridgetops. Included soils make up about 10 percent of the map unit.

The Zanesville soil has a moderate available water capacity. It is moderately permeable above the fragipan and slowly permeable in the fragipan. Permeability and available water capacity generally are moderate in the Udorthents. Surface runoff is medium on both soils. The organic matter content is low in the surface layer. The Zanesville soil has a water table at a depth of 2 to 3 feet during winter and early spring. The firm, brittle fragipan, which is at a depth of about 27 inches, restricts the penetration of roots.

Most areas of these soils are used as woodland. Some are used as grassland.

These soils are poorly suited to cultivated crops. Erosion and runoff are the major hazards if cultivated crops are grown. A system of conservation tillage that leaves protective amounts of crop residue on the surface, diversions, and grassed waterways help to control erosion and runoff, increase the organic matter content, and help to maintain good tilth. Because the slowly permeable fragipan restricts downward movement of water, the Zanesville soil is often saturated in winter and spring. As a result, tillage is delayed. The soils are somewhat droughty during long dry periods in the summer.

These soils are well suited to grasses and shallow-rooted legumes for hay and pasture. The Zanesville soil is not suited to deep-rooted legumes because root growth is restricted by the fragipan. Because of past construction and excavation, the soils are subject to extensive erosion. Planting grasses and shallow-rooted legumes helps to prevent excessive soil loss.

These soils are well suited to trees. Some small areas support stands of native hardwoods. Plant competition is the main management concern. It can be controlled by proper site preparation and by spraying, cutting, or girdling.

Because of the wetness, the Zanesville soil is moderately limited as a site for dwellings without basements and is severely limited as a site for dwellings with basements. Subsurface drains help to lower the water table. This soil is severely limited as a site for septic tank absorption fields because of the wetness and the slow permeability. The slowly permeable material should be replaced with better suited material. Installing subsurface drains around the outer edges of the absorption field reduces the wetness.

Low strength is a severe limitation if the Zanesville soil is used as a site for local roads and streets. Strengthening or replacing the base with better suited material improves the ability of the roads and streets to support vehicular traffic.

The Zanesville soil is assigned to land capability classification IIIe and woodland ordination symbol 4A. The Udorthents are not assigned to interpretive groups.

ZnC—Zanesville-Udorthents complex, 6 to 12 percent slopes. These moderately sloping, shallow to deep, well drained and moderately well drained soils are on the tops of ridges in the uplands. The Udorthents are in areas that have been affected by earth-moving activities. Individual areas are generally irregular in shape and are 5 to 25 acres in size. They are about 50 percent Zanesville soil and 40 percent Udorthents. The Zanesville soil and Udorthents occur as areas so intricately mixed that mapping them separately is not practical.

In a typical profile of the Zanesville soil, the surface layer is dark grayish brown silt loam about 1 inch thick. The subsoil is about 47 inches thick. The upper part is brown, friable silt loam; the next part is yellowish red, firm silty clay loam; and the lower part is a fragipan of yellowish brown, firm, brittle silty clay loam. The underlying material is yellowish brown channery clay loam about 7 inches thick. Bedrock is at a depth of about 55 inches. In areas affected by construction and earth moving, the surface layer has been removed. In some places small gullies have formed. In other places a thin surface layer is starting to form. In some areas the slope is less than 6 or more than 12 percent.

In a typical profile of the Udorthents, the upper 48 inches is strong brown silt loam and silty clay loam. Bedrock is at a depth of about 48 inches. In some areas a thin surface layer is starting to form. These areas are at the Crane Naval Weapons Support Center, where a significant amount of construction and earth moving has altered the natural landscape.

Included with these soils in mapping are a few small areas of moderately well drained soils. These included soils do not have a fragipan. They are on ridgetops and side slopes. Also included are a few small areas of the well drained Wellston soils on ridgetops and side slopes. Included soils make up about 10 percent of the map unit.

The Zanesville soil has a moderate available water capacity. It is moderately permeable above the fragipan and slowly permeable in the fragipan. Permeability and available water capacity generally are moderate in the Udorthents. Surface runoff is medium on both soils. The organic matter content is low in the surface layer. The Zanesville soil has a water table at a depth of 2 to 3 feet during winter and early spring. The firm, brittle fragipan, which is at a depth of about 30 inches, restricts the penetration of roots.

Most areas of these soils are used as woodland. Some are used as grassland. Only a few are used as cropland.

These soils are poorly suited to cultivated crops. Erosion and runoff are the major hazards if cultivated crops are grown. A system of conservation tillage that leaves protective amounts of crop residue on the surface, diversions, and grassed waterways help to control erosion and runoff, increase the organic matter content, and help to maintain good tilth. Because the slowly permeable fragipan restricts the downward movement of water, the Zanesville soil is often saturated in winter and spring. As a result, tillage is delayed. The soils are somewhat droughty during long dry periods in the summer.

These soils are suited to grasses and shallow-rooted legumes for hay and pasture. The Zanesville soil is not suited to deep-rooted legumes because root growth is restricted by the fragipan. Because of past construction and excavation, the soils are subject to extensive erosion. Planting grasses and shallow-rooted legumes helps to prevent excessive soil loss.

These soils are suited to trees. Many areas support stands of native hardwoods. The root zone in the Zanesville soil is limited to the part of the profile above the fragipan. Seedling mortality and plant competition are the main management concerns. Because of the seedling mortality rate, special planting stock and overstocking are needed. Seedlings survive and grow well if competing vegetation is controlled by cutting, girdling, or spraying.

Because of the slope and the wetness, the Zanesville soil is moderately limited as a site for dwellings without basements. It is severely limited as a site for dwellings with basements because of the wetness. The buildings should be designed so that they conform to the natural slope of the land. Subsurface drains help to lower the water table. This soil is severely limited as a site for septic tank absorption fields because of the wetness and the slow permeability. The slowly permeable material should be replaced with better suited material. Installing subsurface drains around the outer edges of the absorption field reduces the wetness.

Low strength is a severe limitation if the Zanesville soil is used as a site for local roads and streets. Strengthening or replacing the base with better suited material improves the ability of the roads and streets to support vehicular traffic.

The Zanesville soil is assigned to land capability classification IVe and woodland ordination symbol 4A. The Udorthents are not assigned to interpretive groups.

Zp—Zipp silty clay loam, rarely flooded. This nearly level, deep, very poorly drained soil is on low terraces that are seldom flooded. It is subject to ponding. Individual areas are broad and irregularly shaped and are 5 to 50 acres in size.

In a typical profile, the surface layer is dark grayish brown silty clay loam about 10 inches thick. The subsoil is gray, mottled, firm silty clay about 37 inches thick. The underlying material to a depth of 60 inches is gray, mottled silty clay. In places the subsoil has less clay and more sand. In some areas the surface layer is silty clay. In other areas it is darker.

Included with this soil in mapping are a few small areas of the somewhat poorly drained McGary soils in the higher positions on the landscape. These soils make up about 10 percent of the map unit.

Available water capacity is moderate in the Zipp soil. Permeability is slow. Surface runoff is very slow. The organic matter content is moderate in the surface layer. The water table is near or above the surface during winter and early spring.

Most areas of this soil are used for cultivated crops. A few are used for hay or pasture or for woodland.

This soil is suited to corn, soybeans, and small grain. The wetness is the major limitation. Excess water can be removed by surface drains if adequate outlets are available. A system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops, and green manure crops help to maintain tilth and the organic matter content.

This soil is well suited to grasses and shallow-rooted legumes for hay and pasture. It is not well suited to deep-rooted legumes, such as alfalfa, because of the high water table. If adequate outlets are available, surface drains can reduce the wetness. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and reduces plant density. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is suited to trees. The equipment limitation, seedling mortality, the windthrow hazard, and plant competition are management concerns. Equipment should be used only when the soil is relatively dry or frozen. Because of the seedling mortality rate, special planting stock and overstocking are needed. Harvest methods that do not isolate the remaining trees or leave them widely spaced help to prevent windthrow. Unwanted trees and shrubs can be controlled or removed by cutting, girdling, or spraying or by proper site preparation.

Because of the flooding, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields. Additional problems are the ponding, the shrink-swell potential, and the slow permeability. The soil is severely limited as a site for local roads and streets because of low strength and ponding. Replacing the layers that have a high shrink-swell potential with suitable soil material helps to prevent the damage caused by shrinking and swelling and by low strength. Constructing the roads on raised, well compacted fill material, establishing adequate roadside drainage ditches, and installing culverts help to prevent the damage caused by flooding and ponding.

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

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is the land that is best suited to food, feed, forage, fiber, and oilseed crops. It may be cultivated land, pasture, woodland, or other land, but it is not urban and built-up land or water areas. It either is used for food or fiber crops or is available for those crops. The soil qualities, growing season, and moisture supply are those needed for a well managed soil to produce a sustained high yield of crops in an economic manner. Prime farmland produces the highest yields with minimal inputs of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The level of acidity or alkalinity is acceptable. Prime farmland has few or no rocks and is permeable to water and air. It is not excessively erodible or saturated with water for long periods and is not frequently flooded during the growing season. The slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Soil Conservation Service.

About 24,455 acres in Martin County, or more than 11 percent of the total acreage, meets the soil requirements for prime farmland. Areas of this land are along rivers and streams. They are mainly in general soil map units 3, 4, and 5. Nearly all of the prime farmland is used for corn and soybeans.

A recent trend in land use in some parts of the county has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

The map units in the survey area that are considered prime farmland are listed in table 5. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Some soils that have a seasonal high water table and all soils that are frequently flooded during the growing season qualify for prime farmland only in areas where these limitations have been overcome by drainage measures or flood control. The need for these measures is indicated after the map unit name in table 5. Onsite evaluation is needed to determine whether or not these limitations have been overcome by corrective measures.

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

Fred L. Woods, soil conservation technician, Soil Conservation Service, helped prepare this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed Soil Map Units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

About 68,075 acres in Martin County was used for crops and pasture in 1967. Of this total, 30,075 acres was permanent pasture and 38,000 acres was cropland. Of the acreage used as cropland, 18,489 acres was used for row crops (fig. 7); 2,269 acres for close-grown crops, mainly wheat; 6,000 acres for rotation hay and pasture; 1,890 acres for hay; 6,118 acres for conservation purposes; and 20 acres for orchards. About 3,025 acres was temporarily idle cropland, and 189 acres was other formerly cropped land (*3*).

The potential of the soils in Martin County for increased food production is fair. About 10,401 acres of potentially good cropland is currently used as woodland and 10,728 acres as pasture. In addition to the reserve productive capacity represented by this land, food production could also be increased considerably by extending the latest crop production technology to all cropland in the county. This soil survey can greatly facilitate the application of such technology.

The paragraphs that follow describe the major management concerns in the areas of the county used for crops and pasture. These concerns are water erosion, drainage, fertility, and tilth.

Water erosion is the major management concern on about 92 percent of the cropland and pasture in the county. It is a hazard on soils that have a slope of more than 2 percent. Parke, Wellston, and Zanesville soils are examples.

Loss of the surface layer through erosion is damaging for two reasons. First, productivity is reduced as the surface layer is lost and part of the subsoil is incorporated into the plow layer. Loss of the surface layer is especially damaging on the moderately deep Berks and Gilpin soils and on soils having a layer in the subsoil that limits the depth of the root zone. Such layers include the fragipan in Bartle, Hosmer, and Zanesville soils. Erosion also reduces the productivity of soils that tend to be droughty, such as Alvin and Chelsea soils. Second, erosion results in sedimentation in streams.

Figure 7.—Corn in an area of Wakeland, Wilbur, and Haymond soils on bottom land.

Control of erosion minimizes this pollution and improves the quality of water for municipal use, for recreation, and for fish and wildlife.

On clayey spots in many sloping fields, preparing a good seedbed and tilling are difficult because the original friable surface soil has been eroded away. Such spots are common in areas of the severely eroded Wellston and Zanesville soils.

Erosion-control practices provide a protective cover, reduce the runoff rate, and increase the rate of water infiltration. A cropping system that keeps a vegetative cover on the soil for extended periods can hold soil losses to an amount that does not reduce the productive capacity of the soils. On livestock farms, where pasture and hay are needed, including forage crops of grasses and legumes in the cropping sequence reduces the susceptibility of the more sloping areas to erosion and provides nitrogen and improves tilth for the following crop. Pasture rotation, proper stocking rates, and restricted use during wet periods help to maintain a good plant cover, which helps to prevent excessive runoff and erosion.

Terraces and diversions reduce the length of slopes and thus the runoff rate and the erosion hazard (fig. 8). They are most practical on deep, well drained soils that have regular slopes. The Parke and Pike soils that have a slope of less than 12 percent are examples. Soils that are less well suited to terraces and diversions have strong slopes; a fragipan in the subsoil, which would be exposed in the terrace channels; or bedrock within a depth of 40 inches.

In areas where slopes are short and irregular, a system of conservation tillage helps to control erosion by leaving a substantial amount of crop residue on the surface. Examples are no-till (fig. 9), ridge-plant, and chisel-plant. Most of the soils in the county are suited to one or another of these tillage systems. By minimizing tillage and leaving crop residue on the surface, these systems increase the infiltration rate and reduce the runoff rate and the hazard of erosion. No-till corn is being grown on an increasing acreage in the county, especially in the more sloping areas.

Winter cover crops are needed on some eroded soils. They not only help to control erosion but also improve tilth and help to maintain the supply of plant nutrients by providing additional organic matter. Contour farming and contour stripcropping help to control erosion on the soils in the county, especially those that have uniform slopes, such as Wellston and Zanesville soils. Grassed waterways help to control erosion throughout the county. They are best suited to deep, well drained soils, such as Parke and Wellston soils.

Information about the design of erosion-control practices for each kind of soil is contained in the Technical Guide, available in the local office of the Soil Conservation Service.

Soil drainage is the major management concern on about 10 percent of the acreage used for crops and pasture in the county. Unless drained, some soils are naturally so wet that they generally cannot be used for the crops commonly grown in the county. These are the poorly drained or very poorly drained Birds, Bonnie, and Zipp soils, which make up about 3,290 acres in the county. Unless drained, somewhat poorly drained soils are so wet that crops are damaged during most years. Examples are Bartle, Johnsburg, Newark, and Wakeland soils, which make up about 14,930 acres in the county.

The design of both surface and subsurface drainage systems varies with the kind of soil. A combination of surface and subsurface drains is needed in most areas of the somewhat poorly drained and poorly drained soils used for intensive row cropping. Subsurface drainage is very slow in Bartle soils. Finding adequate outlets for subsurface drainage systems is difficult in some areas of Bonnie soils.

Figure 8.—Parallel tile-outlet terraces on Zanesville soils.

Figure 9.—No-till corn on Zanesville silt loam, 2 to 6 percent slopes.

Soil fertility is naturally low in most of the soils on uplands and terraces in the county. All of these soils, except for Markland soils, are naturally acid. Most of the soils on flood plains, such as Nolin and Wakeland soils, range from medium acid to mildly alkaline and are naturally higher in content of plant nutrients than most upland soils. Other soils on flood plains are more strongly acid. Examples are Bonnie soils.

Some soils are naturally too acid for good crop growth. If these soils have never been limed, applications of ground limestone are needed to raise the pH level sufficiently for good production of alfalfa and other crops that grow well only on nearly neutral soils. Available phosphorus and potash levels are naturally low in most of these soils. On all soils additions of lime and fertilizer should be based on the results of soil tests, on the needs of the crop, and on the expected level of yields. The Cooperative Extension Service can help in determining the kinds and amounts of fertilizer and lime needed.

Soil tilth is an important factor affecting the germination of seeds and the infiltration of water into the soil. Soils with good tilth are granular and porous.

Many of the soils used for crops in the county have a silt loam surface layer that is moderate in content of organic matter. Generally, the structure of these soils is moderate or weak. During periods of heavy rainfall, a crust can form at the surface. In some areas the crust is hard and impervious to water when dry. As a result, it reduces the rate of water infiltration and increases the runoff rate. Returning crop residue to the soil and regularly adding manure and other organic material can improve soil structure and help to prevent excessive crusting.

The surface layer of silt loam in most of the soils in the county is easily compacted. In areas used for pasture, overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Compaction reduces the infiltration rate and increases the runoff rate. Timely deferment of grazing and restricted use during wet periods help to keep the soil in good condition.

The measures used to improve the tilth of the soils in the county generally should not include fall plowing. Much of the cropland is subject to damaging erosion if plowed in the fall.

Field crops suited to the soils and climate in the county include many that are not now commonly grown. Corn and soybeans are the chief row crops. Grain sorghum, sugar beets, potatoes, and similar crops can be grown if economic conditions are favorable. Wheat is the main close-growing crop. Oats, rye, barley, and buckwheat could be grown, and grass seed could be produced from fescue, redtop, and bluegrass.

Specialty crops are not grown extensively in the county. A small acreage is used for apple orchards. Peaches also can be grown in the county.

Deep, well drained soils that have a slope of less than 6 percent are well suited to many vegetables and small fruits. Examples are the gently sloping Pike and Wellston soils. If irrigated, the Alvin and Chelsea soils that have a slope of less than 6 percent are very well suited to vegetables and small fruits. Specialty crops generally can be planted and harvested earlier on these well drained and excessively drained soils than on other soils in the county.

The latest information about growing specialty crops can be obtained from local offices of the Cooperative Extension Service and the Soil Conservation Service.

Pasture species commonly grown in the county are mixtures of fescue, timothy, alfalfa, and red clover. Other suitable species are bluegrass, orchardgrass, reed canarygrass, ladino clover, and lespedeza. Alfalfa and other deep-rooted legumes are not suited to soils that have a seasonal high water table, such as Bonnie soils, unless an adequate drainage system is installed. Alfalfa also is not suited to soils that have a fragipan, such as Bartle and Zanesville soils. Root growth is restricted by the fragipan.

Yields Per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of each map unit also is shown in the table.

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 ensures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for woodland and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c,* used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, woodland, wildlife habitat, or recreation.

The acreage of soils in each capability class and subclass is shown in table 7. The capability classification of each map unit is given in the section "Detailed Soil Map Units" and in the yields table.

Woodland Management and Productivity

Mitchell G. Hassler, forester, Soil Conservation Service, helped prepare this section.

The original plant cover in Martin County was nearly 100 percent hardwood trees. In 1967, a total of 128,769 acres remained wooded (*3*). This acreage is nearly 60 percent of the total acreage in the county.

Soils vary widely in their suitability for the production of wood crops. Productivity is affected by available water capacity, depth of the root zone, thickness of the surface layer, texture, consistence, aeration, natural fertility, and depth to the water table.

Upland oak-hickory is the dominant timber type in the county. It grows on a large acreage of the moderately well drained and well drained soils in the uplands. The tree species include white, black, red, scarlet, and chinkapin oaks and shagbark, bitternut, pignut, and mockernut hickories. Other common species are ash, maple, and yellow-poplar.

Beech-maple is another important timber type on the well drained soils in the uplands. It generally grows on the middle parts of north- and northeast-facing slopes. The dominant trees are American beech, red maple, and sugar maple. Other species include ash, yellow-poplar, and hickory.

The yellow-poplar timber type generally grows on the lower parts of north- and northeast-facing slopes in narrow valleys or coves. Yellow-poplar is one of the more valuable, rapidly growing trees. As a result, it is generally favored in woodland management. Other species in these areas are white oak, red oak, hickory, beech, ash, black walnut, and sugar maple.

Pine is established through planting rather than through natural regeneration. It has been planted to help control erosion and cool down sites no longer suitable for hardwoods. The mixed pine cover type in Martin County is made up of Virginia pine, white pine, red pine, and some shortleaf pine.

Table 8 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination symbol for each suitable soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for an indicator tree species. The number indicates the volume, in cubic meters per hectare per year, which the indicator species can produce. The number 1 indicates low potential productivity; 2 and 3, moderate; 4 and 5, moderately high; 6 to 8, high; 9 to 11, very high; and 12 to 39, extremely high. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *R* indicates steep slopes; *X*, stoniness or rockiness; *W*, excessive water in or on the soil; *T*, toxic substances in the soil; *D*, restricted rooting depth; *C*, clay in the upper part of the soil; *S*, sandy texture; and *F*, high content of coarse fragments in the soil. The letter *A* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: R, X, W, T, D, C, S, and F.

In table 8, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

Erosion hazard is the probability that damage will occur as a result of site preparation and cutting where the soil is exposed along roads, skid trails, fire lanes, and log-handling areas. Forests that have been burned or overgrazed are also subject to erosion. Ratings of the erosion hazard are based on the percent of the slope. A rating of *slight* indicates that no particular prevention measures are needed under ordinary conditions. A rating of *moderate* indicates that erosion-control measures are needed in certain silvicultural activities. A rating of *severe* indicates that special precautions are needed to control erosion in most silvicultural activities.

Equipment limitation reflects the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. The chief characteristics and conditions considered in the ratings are slope, stones on the surface, rock outcrops, soil wetness, and texture of the surface layer. A rating of *slight* indicates that under normal conditions the kind of equipment or season of use is not significantly restricted by soil factors. Soil wetness can restrict equipment use, but the wet period does not exceed 1 month. A rating of *moderate* indicates that equipment use is moderately restricted because of one or more soil factors. If the soil is wet, the wetness restricts equipment use for a period of 1 to 3 months. A rating of *severe* indicates that equipment use is severely restricted either as to the kind of equipment that can be used or the season of use. If the soil is wet, the wetness restricts equipment use for more than 3 months.

Seedling mortality refers to the death of naturally occurring or planted tree seedlings, as influenced by the kinds of soil, soil wetness, and topographic conditions. The factors used in rating the soils for seedling mortality are textures of the surface layer, depth to a seasonal high water table and the length of the period when the water table is high, rock fragments in the surface layer, effective rooting depth, and slope aspect. A rating of *slight* indicates that seedling mortality is not likely to be a problem under normal conditions. Expected mortality is less than 25 percent. A rating of *moderate* indicates that some problems from seedling mortality can be expected. Extra precautions are advisable. Expected mortality is 25 to 50 percent. A rating of *severe* indicates that seedling mortality is a serious problem. Extra precautions are important. Replanting may be necessary. Expected mortality is more than 50 percent.

Windthrow hazard is the likelihood that trees will be uprooted by the wind because the soil is not deep enough for adequate root anchorage. The main restrictions that affect rooting are a seasonal high water table and the depth to bedrock, a fragipan, or other limiting layers. A rating of *slight* indicates that under normal conditions no trees are blown down by the wind. Strong winds may damage trees, but they do not uproot them. A rating of *moderate* indicates that some trees can be blown down during periods when the soil is wet and winds are moderate or strong. A rating of *severe* indicates that many trees can be blown down during these periods.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. The site index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. It applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

The first species listed under *common trees* for a soil is the indicator species for that soil. It is the dominant species on the soil and the one that determines the ordination class.

Trees to plant are those that are suitable for commercial wood production.

Windbreaks and Environmental Plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, help to keep snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 9 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 9 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a commercial nursery.

Recreation

The major recreation areas in Martin County are West Boggs Lake, Lake Greenwood, and Martin State Forest. West Boggs Lake is a popular recreation area in the western part of the county. It was completed in 1972. Lake Greenwood is at the Crane Naval Weapons Support Center. The Martin State Forest provides opportunities for education and recreation.

The soils of the survey area are rated in table 10 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 10, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 10 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 13 and interpretations for dwellings without basements and for local roads and streets in table 12.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

James D. McCall, biologist, Soil Conservation Service, helped prepare this section.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 11, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, sorghum, and sunflowers.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, timothy, lovegrass, bromegrass, bluegrass, 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 bluestem, goldenrod, beggarweed, wheatgrass, ragweed, pokeweed, sheep sorrel, dock, crabgrass, and dandelion.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are oak, poplar, wild cherry, sweetgum, willow, black walnut, apple, hawthorn, dogwood, hickory, hazelnut, elderberry, blackberry, and blueberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian-olive, autumn-olive, and crabapple.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, pondweed, spikerush, wild millet, wildrice, saltgrass, algae, cordgrass, 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, dove, pheasant, meadowlark, field sparrow, cottontail, red fox, and woodchuck.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and white-tailed 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, rails, kingfishers, muskrat, mink, and beaver.

Edge habitat consists of areas where major land uses or cover types adjoin. A good example is the border between dense woodland and a field of no-till corn. Although not rated in the table, edge habitat is of primary importance to animals from the smallest songbirds to white-tailed deer. Most of the animals that inhabit openland or woodland also frequent edge habitat, and desirable edge areas are consistently used by 10 times as many wildlife as are the centers of large areas of woodland or cropland.

Engineering

Max L. Evans, state conservation engineer, Soil Conservation Service, helped prepare this section.

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or *for testing and analysis by personnel experienced in the design and construction of engineering works.*

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 12 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 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 13 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 13 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 13 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage 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 13 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to wind erosion.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 14 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 14, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 15 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

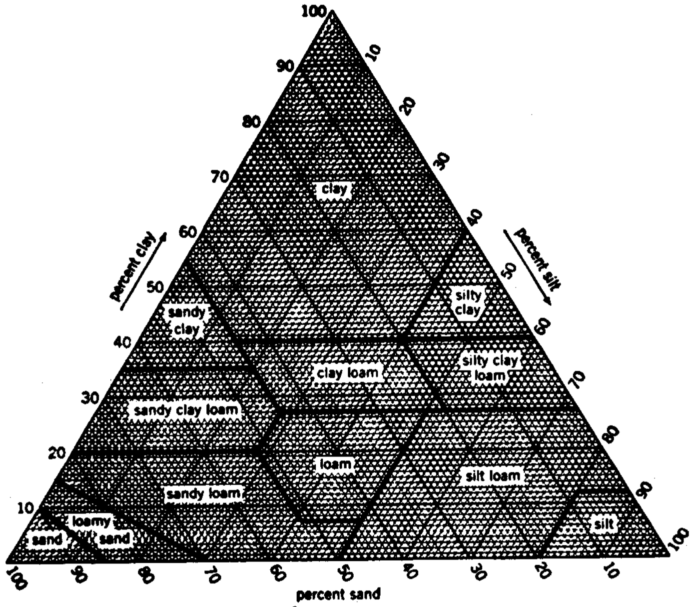


Figure 10.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

Engineering Index Properties

Table 16 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter (fig. 10). "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 17 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion. 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 20 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 20 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to wind erosion.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 17, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 18 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to two hydrologic groups in table 18, the first letter is for drained areas and the second is for undrained areas.

Flooding, the temporary inundation of an area, is caused by overflowing streams or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 18 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *occasional* that it occurs, on the average, once or less in 2 years; and *frequent* that it occurs, on the average, more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 18 are the depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 18.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*8*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 19 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Alfisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udalf (*Ud*, meaning humid, plus *alf*, from Alfisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hapludalfs (*Hapl*, meaning minimal horizonation, plus *udalf*, the suborder of the Alfisols that has a udic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Hapludalfs.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, mesic Typic Hapludalfs.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the underlying material can differ within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the *Soil Survey Manual* (*7*). Many of the technical terms used in the descriptions are defined in *Soil Taxonomy* (*8*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Abscota Series

The Abscota series consists of deep, well drained, rapidly permeable soils on bottom land. These soils formed in sandy alluvium. Slopes range from 0 to 2 percent.

Abscota soils are adjacent to Nolin and Wirt soils. Nolin soils have more clay and less sand in the subsoil than the Abscota soils. Wirt soils have less sand in the subsoil than the Abscota soils. Also, they are farther from streams.

Typical pedon of Abscota loamy sand, frequently flooded, in a hayfield; 2,600 feet east and 660 feet south of the northwest corner of sec. 5, T. 3 N., R. 3 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) loamy sand, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

Bw1—8 to 13 inches; dark grayish brown (10YR 4/2) loamy fine sand; weak medium subangular blocky structure; friable; many fine roots; slightly acid; clear wavy boundary.

Bw2—13 to 24 inches; brown (10YR 4/3) sand; weak coarse subangular blocky structure; friable; many fine roots; slightly acid; gradual wavy boundary.

C1—24 to 49 inches; yellowish brown (10YR 5/4) sand; single grain; loose; many fine roots; few fine brown (10YR 4/3) streaks; slightly acid; abrupt wavy boundary.

C2—49 to 55 inches; brown (10YR 4/3) sand; single grain; loose; common fine roots; slightly acid; abrupt wavy boundary.

C3—55 to 60 inches; dark yellowish brown (10YR 4/4) sand; single grain; loose; slightly acid.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. It is loamy fine sand or loamy sand. The Bw horizon has hue of 10YR, value of 4, and chroma of 2 to 4. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4.

Alvin Series

The Alvin series consists of deep, well drained soils on convex slopes in the uplands. These soils are moderately permeable or moderately rapidly permeable. They formed in eolian or water-deposited, loamy or sandy material. Slopes range from 4 to 35 percent.

Alvin soils are similar to Negley soils and are adjacent to Chelsea, Martinsville, and Nolin soils. Negley soils have more clay in the subsoil than the Alvin soils and have gravel in the subsoil and underlying material. Chelsea soils have less clay in the subsoil than the Alvin soils. Martinsville soils are in nearly level areas. They are more calcareous in the underlying material than the Alvin soils. Their underlying material is stratified and is sandy, silty, and clayey. Nolin soils have less sand in the subsoil than the Alvin soils. They are on bottom land.

Typical pedon of Alvin loamy fine sand, in an area of Alvin-Chelsea loamy fine sands, 15 to 35 percent slopes; 1,320 feet north and 410 feet west of the southeast corner of sec. 34, T. 4 N., R. 3 W.

A—0 to 5 inches; very dark grayish brown (10YR 3/2) loamy fine sand, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; many fine roots; medium acid; clear wavy boundary.

E—5 to 12 inches; dark grayish brown (10YR 4/2) loamy fine sand; moderate fine granular structure; friable; many fine roots; medium acid; clear wavy boundary.

Bt1—12 to 17 inches; brown (7.5YR 5/4) fine sandy loam; weak medium subangular blocky structure; friable; common fine roots; thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; slightly acid; clear irregular boundary.

Bt2—17 to 42 inches; strong brown (7.5YR 5/6) sandy clay loam; moderate medium subangular blocky structure; firm; few fine roots; thin continuous brown (7.5YR 4/4) clay films on faces of peds; medium acid; clear wavy boundary.

BC—42 to 72 inches; strong brown (7.5YR 4/6) loamy fine sand; weak medium subangular blocky structure; friable; thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; slightly acid; gradual irregular boundary.

C—72 to 80 inches; brown (10YR 5/3) fine sand; single grain; loose; mildly alkaline.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 2. The Bt and BC horizons have hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 4 to 6. The C horizon is stratified fine sand and sandy loam, or it is fine sand.

Bartle Series

The Bartle series consists of deep, somewhat poorly drained soils on lake plains and stream terraces. These soils have a fragipan. They are moderately permeable above the fragipan and very slowly permeable in the fragipan. They formed in acid, silty material of mixed origin and in material weathered from shale, siltstone, and sandstone. Slopes range from 0 to 2 percent.

Bartle soils are adjacent to Bonnie and Hosmer soils. Bonnie soils do not have a fragipan. They are generally in the lower positions on the landscape. Hosmer soils are well drained and are on the steeper slopes.

Typical pedon of Bartle silt loam, in a cultivated field; 530 feet east and 1,200 feet north of the southwest corner of sec. 33, T. 3 N., R. 4 W.

Ap—0 to 10 inches; brown (10YR 4/3) silt loam, very pale brown (10YR 7/3) dry; weak medium granular structure; friable; many fine roots; medium acid; abrupt smooth boundary.

E—10 to 15 inches; pale brown (10YR 6/3) silt loam; many medium faint light gray (10YR 7/2) and few fine distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; common fine roots; very strongly acid; clear smooth boundary.

Bt—15 to 24 inches; light brownish gray (10YR 6/2) silt loam; common medium prominent yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; few fine roots; thin discontinuous light brownish gray (10YR 6/2) clay films on faces of peds; few light gray (10YR 7/2) silt coatings on faces of peds; very strongly acid; gradual smooth boundary.

Btx1—24 to 35 inches; grayish brown (10YR 5/2) silt loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak very coarse prismatic structure; firm; brittle; thin discontinuous light brownish gray (10YR 6/2) clay films on faces of peds; many medium black (10YR 2/1) iron and manganese oxide accumulations; very strongly acid; gradual smooth boundary.

Btx2—35 to 53 inches; yellowish brown (10YR 5/4) silt loam; many coarse distinct light brownish gray (10YR 6/2) and common medium faint yellowish brown (10YR 5/6) mottles; weak very coarse prismatic structure; firm; brittle; thin discontinuous brown (10YR 5/3) clay films on faces of peds; very strongly acid; gradual wavy boundary.

BC—53 to 58 inches; brown (10YR 5/3) silt loam; many medium faint yellowish brown (10YR 5/6) and common medium distinct light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; firm; thin discontinuous yellowish brown (10YR 5/4) clay films on faces of peds; strongly acid; gradual wavy boundary.

C—58 to 80 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct gray (10YR 6/1) mottles; massive; firm; medium acid.

The thickness of the solum ranges from 52 to 58 inches. The Bt horizon has hue of 10YR, value of 5 or 6, and chroma of 2 or 3. It is silt loam or silty clay loam.

Berks Series

The Berks series consists of moderately deep, well drained, moderately permeable or moderately rapidly permeable soils on uplands. These soils formed in material weathered from sandstone, siltstone, and shale bedrock. Slopes range from 18 to 70 percent.

Berks soils are adjacent to Gilpin, Wellston, and Zanesville soils. Gilpin and Wellston soils have more clay in the subsoil than the Berks soils and have a lower content of coarse fragments in the solum. Zanesville soils have a firm fragipan. They are on ridgetops.

Typical pedon of Berks channery silt loam, in a wooded area of Wellston-Berks-Gilpin complex, 18 to 70 percent slopes; 2,200 feet west and 10 feet south of the northeast corner of sec. 36, T. 4 N., R. 4 W.

A—0 to 2 inches; brown (10YR 4/3) channery silt loam, light brownish gray (10YR 6/2) dry; weak medium granular structure; friable; many fine and medium roots; about 15 percent sandstone fragments; strongly acid; clear wavy boundary.

Bw1—2 to 11 inches; light yellowish brown (10YR 6/4) channery loam; weak medium subangular blocky structure; friable; common medium roots; about 25 percent sandstone fragments; strongly acid; clear smooth boundary.

Bw2—11 to 38 inches; light yellowish brown (10YR 6/4) very channery loam; weak medium subangular blocky structure; friable; few medium roots; about 40 percent sandstone fragments; strongly acid; abrupt smooth boundary.

R—38 inches; rippable sandstone bedrock.

The thickness of the solum and the depth to bedrock range from 20 to 40 inches. The A horizon has hue of 10YR, value of 2 to 4, and chroma of 1 to 4. It is silt loam, loam, or the channery analogs of these textures. The Bw horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 to 6. It is extremely channery silt loam, channery loam, or channery silt loam.

Birds Series

The Birds series consists of deep, poorly drained, moderately slowly permeable soils on bottom land. These soils formed in silty alluvium derived from loess-covered uplands. Slopes range from 0 to 2 percent.

Birds soils are similar to Bonnie soils and are adjacent to Wakeland and Wilbur soils. Bonnie soils are more acid in the control section than the Birds soils. Wakeland and Wilbur soils are better drained than the Birds soils and are in the slightly higher positions on the bottom land.

Typical pedon of Birds silt loam, frequently flooded, in a cultivated field; 2,200 feet east and 530 feet north of the southwest corner of sec. 31, T. 4 N., R. 3 W.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; common fine distinct light gray (10YR 7/2) mottles; weak fine granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

Cg1—6 to 21 inches; light brownish gray (10YR 6/2) silt loam; common medium prominent dark yellowish brown (10YR 4/6) and few medium prominent yellowish brown (10YR 5/6) mottles; massive; friable; few medium and coarse roots; slightly acid; clear smooth boundary.

Cg2—21 to 38 inches; light brownish gray (10YR 6/2) silt loam; common medium prominent yellowish brown (10YR 5/6) mottles; massive; friable; slightly acid; gradual smooth boundary.

Cg3—38 to 51 inches; gray (10YR 6/1) silt loam; few medium prominent yellowish brown (10YR 5/6) mottles; massive; friable; slightly acid; gradual smooth boundary.

Cg4—51 to 60 inches; gray (10YR 6/1) silt loam; common medium prominent yellowish brown (10YR 5/8) mottles; massive; friable; neutral.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The Cg horizon has hue of 10YR, value of 5 or 6, and chroma of 2 or less. It has mottles with higher chroma.

Bonnie Series

The Bonnie series consists of deep, poorly drained, moderately slowly permeable soils on bottom land. These soils formed in silty, acid alluvium derived from loess-covered uplands. Slopes range from 0 to 2 percent.

These soils contain more sand and less clay than is definitive for the Bonnie series. This difference, however, does not alter the usefulness or behavior of the soils.

Bonnie soils are similar to Birds soils and are adjacent to Wakeland soils. Birds soils are less acid than the Bonnie soils. Wakeland soils are less gray in the control section than the Bonnie soils. They are in the slightly higher positions on the landscape.

Typical pedon of Bonnie silt loam, frequently flooded, in a cultivated field; 1,580 feet north and 260 feet west of the southeast corner of sec. 33, T. 3 N., R. 4 W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, light gray (10YR 7/2) dry; common fine distinct gray (10YR 6/1) mottles; weak medium granular structure; friable; common fine roots; medium acid; abrupt smooth boundary.

Cg1—9 to 20 inches; light gray (10YR 7/1) silt loam; few medium prominent yellowish red (5YR 5/6) and common medium prominent yellowish brown (10YR 5/6) mottles; weak medium granular structure; friable; few fine roots; few fine pores; very strongly acid; gradual wavy boundary.

Cg2—20 to 32 inches; light gray (10YR 7/1) silt loam; common medium prominent yellowish brown (10YR 5/6) mottles; massive; friable; few fine pores; few fine very dark grayish brown (10YR 3/2) iron and manganese oxide accumulations; very strongly acid; gradual wavy boundary.

Cg3—32 to 60 inches; light gray (10YR 7/1) silt loam; common medium prominent reddish brown (5YR 4/4) mottles; massive; friable; very strongly acid.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2. The Cg horizon has hue of 10YR, value of 5 to 7, and chroma of 2 or less. It has mottles with higher chroma.

Burnside Series

The Burnside series consists of deep, well drained, moderately permeable soils on bottom land. These soils formed in loamy, skeletal alluvium derived from sandstone, siltstone, and shale residuum. Slopes range from 0 to 2 percent.

These soils are less acid in the underlying material than is definitive for the Burnside series. This difference, however, does not alter the usefulness or behavior of the soils.

Burnside soils are adjacent to Wakeland soils. The adjacent soils are grayer than the Burnside soils and do not have coarse fragments in the control section. They are on the wider, lower lying bottom land.

Typical pedon of Burnside loam, occasionally flooded, in a pasture; 2,240 feet west and 400 feet north of the southeast corner of sec. 27, T. 3 N., R. 3 W.

Ap—0 to 5 inches; brown (10YR 4/3) loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; many fine roots; about 10 percent sandstone fragments; medium acid; abrupt smooth boundary.

A—5 to 9 inches; dark yellowish brown (10YR 4/4) loam; weak medium subangular blocky structure; friable; few fine roots; about 10 percent sandstone fragments; medium acid; clear smooth boundary.

Bw1—9 to 16 inches; dark yellowish brown (10YR 4/4) loam; moderate medium subangular blocky structure; friable; few fine roots; thin discontinuous brown (10YR 4/3) organic coatings on faces of peds; about 10 percent sandstone fragments; medium acid; clear smooth boundary.

Bw2—16 to 29 inches; dark yellowish brown (10YR 4/4) very channery loam; weak medium subangular blocky structure; friable; few fine roots; about 55 percent sandstone fragments; medium acid; gradual smooth boundary.

C—29 to 42 inches; dark yellowish brown (10YR 4/4) very gravelly loam; massive; friable; about 75 percent sandstone fragments; neutral; abrupt smooth boundary.

R—42 inches; sandstone bedrock.

The depth to bedrock ranges from 40 to 60 inches. The A horizon has hue of 10YR and chroma of 2 to 4. It generally has value of 4 or 5, but in some uncultivated areas it has value of 3. It is silt loam or loam. The Bw horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is loam in the upper part and the channery, very channery, gravelly, or very gravelly analogs of loam or sandy loam in the lower part. The C horizon has hue of 10YR, value of 4, and chroma of 3 or 4. It is slightly acid or neutral. It is the gravelly, very gravelly, or channery to extremely channery analogs of loam. The content of coarse fragments in this horizon is 70 to 85 percent.

Camden Series

The Camden series consists of deep, well drained, moderately permeable soils on stream terraces. These soils formed in loess and in the underlying outwash. Slopes range from 1 to 5 percent.

Camden soils are similar to Markland soils and are adjacent to Wellston soils. Markland soils have more clay in the subsoil than the Camden soils. Wellston soils are more acid than the Camden soils. They have interbedded sandstone, siltstone, and shale residuum in the underlying material. They are on ridgetops and on side slopes along drainageways.

Typical pedon of Camden silt loam, 1 to 5 percent slopes, in a cultivated field; 2,380 feet south and 2,500 feet east of the northwest corner of sec. 33, T. 4 N., R. 3 W.

Ap—0 to 10 inches; brown (10YR 4/3) silt loam, brown (10YR 5/3) dry; weak fine granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

Bt1—10 to 20 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium subangular blocky structure; friable; common fine roots; thin discontinuous brown (7.5YR 5/4) clay films on faces of peds; neutral; clear smooth boundary.

Bt2—20 to 33 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium subangular blocky structure; friable; common fine roots; thin discontinuous brown (7.5YR 5/4) clay films on faces of peds; thin discontinuous pale brown (10YR 6/3) silt coatings on faces of peds; neutral; gradual smooth boundary.

2Bt3—33 to 62 inches; strong brown (7.5YR 5/6) loam; moderate medium subangular blocky structure; friable; few fine roots; thin discontinuous brown (7.5YR 5/4) clay films on faces of peds; thin discontinuous pale brown (10YR 6/3) silt coatings on faces of peds; medium acid; gradual smooth boundary.

2C—62 to 80 inches; yellowish brown (10YR 5/6) stratified loam and sandy loam; friable; pale brown (10YR 6/3) streaks of sand grains; medium acid.

The solum is 40 to 65 inches thick. The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is silt loam or silty clay loam. The 2Bt horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6.

Chelsea Series

The Chelsea series consists of deep, excessively drained, rapidly permeable soils on uplands. These soils formed in sandy eolian material. Slopes range from 4 to 35 percent.

Chelsea soils are adjacent to Alvin, Martinsville, and Nolin soils. Alvin and Martinsville soils have more clay in the subsoil than the Chelsea soils. Martinsville soils are on terraces. Nolin soils have less sand in the subsoil than the Chelsea soils. They are on bottom land.

Typical pedon of Chelsea loamy fine sand, in a pastured area of Alvin-Chelsea loamy fine sands, 15 to 35 percent slopes; 1,320 feet north and 400 feet west of the southeast corner of sec. 34, T. 4 N., R. 3 W.

A1—0 to 2 inches; very dark gray (10YR 3/1) loamy fine sand, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; medium acid; abrupt smooth boundary.

A2—2 to 10 inches; very dark grayish brown (10YR 3/2) loamy fine sand, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; slightly acid; clear smooth boundary.

E—10 to 29 inches; dark yellowish brown (10YR 4/4) loamy fine sand; single grain; loose; medium acid; abrupt smooth boundary.

E&Bt—29 to 80 inches; dark yellowish brown (10YR 4/4) fine sand (E); single grain; loose; discontinuous bands of dark brown (7.5YR 4/4) loamy fine sand (Bt), 0.25 to 0.5 inch thick, at depths of 29, 33, 39, 46, 49, 52, 54, and 58 inches; weak medium subangular blocky structure; friable; neutral.

The solum is more than 60 inches thick. The A horizon has hue of 10YR, value of 3 or 4, and chroma of 1 to 3. The E horizon has hue of 10YR, value of 4, and chroma of 2 to 4. The E part of the E&Bt horizon has hue of 10YR, value of 4 to 6, and chroma of 3 or 4. The Bt part has hue of 7.5YR and value and chroma of 3 or 4. It is sandy loam or loamy fine sand. The bands in this horizon are 0.25 to 0.5 inch thick and have a maximum combined thickness of 4 inches.

Cincinnati Series

The Cincinnati series consists of deep, well drained soils on uplands. These soils have a fragipan. They are moderately permeable above the fragipan and moderately slowly permeable or slowly permeable in the fragipan. They formed in loess and in the underlying glacial till. Slopes range from 3 to 10 percent.

Cincinnati soils are similar to Hosmer and Zanesville soils and are adjacent to Bartle soils. Hosmer soils formed in loess. Zanesville soils formed in loess and material weathered from sandstone, siltstone, and shale. Bartle soils formed in silty material of mixed origin. They are on lake plains and stream terraces.

Typical pedon of Cincinnati silt loam, 3 to 10 percent slopes, in a pasture; 400 feet east and 2,440 feet north of the southwest corner of sec. 13, T. 3 N., R. 5 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, light gray (10YR 7/2) dry; weak fine granular structure; friable; neutral; abrupt smooth boundary.

BE—7 to 12 inches; yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure; friable; thin discontinuous dark grayish brown (10YR 4/2) organic coatings on faces of peds; neutral; gradual wavy boundary.

Bt—12 to 23 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium subangular blocky structure; firm; thin continuous dark yellowish brown (10YR 4/6) clay films on faces of peds; slightly acid; clear wavy boundary.

Btx1—23 to 39 inches; yellowish brown (10YR 5/6) silty clay loam; few fine prominent light brownish gray (10YR 6/2) mottles; moderate very coarse prismatic structure; firm; brittle; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; thin discontinuous light gray (10YR 7/2) silt coatings on faces of prisms; strongly acid; gradual wavy boundary.

2Btx2—39 to 80 inches; yellowish brown (10YR 5/6) silty clay loam; few fine prominent light brownish gray (10YR 6/2) mottles; moderate very coarse prismatic structure; firm; brittle; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; thin discontinuous light gray (10YR 7/2) silt coatings on faces of prisms; strongly acid.

The thickness of the solum ranges from 49 to 100 inches. The A horizon has hue of 10YR, value of 4, and chroma of 2 to 4. The Bt and Btx horizons have hue of 10YR, value of 4 or 5, and chroma of 4 to 6. They are silty clay loam or loam. Some pedons have a 2BC horizon. This horizon has hue of 10YR, value of 4 or 5, and chroma of 4. It is silty clay loam, loam, or clay loam.

Crider Series

The Crider series consists of deep, well drained, moderately permeable soils on uplands. These soils formed in loess and in the underlying limestone residuum. Slopes range from 3 to 10 percent.

Crider soils are similar to Pike soils and are adjacent to Wellston soils. Pike soils have less clay and more sand in the underlying material than the Crider soils. They formed in loess and outwash. Wellston soils have less clay in the underlying material than the Crider soils. They formed in loess and in material weathered from sandstone, siltstone, or shale. They are in the higher lying areas.

Typical pedon of Crider silt loam, 3 to 10 percent slopes, in a cultivated field; 2,480 feet west and 2,240 feet north of the southeast corner of sec. 36, T. 5 N., R. 3 W.

Ap—0 to 8 inches; dark yellowish brown (10YR 4/4) silt loam, pale brown (10YR 6/3) dry; weak medium granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

Bt1—8 to 18 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium subangular blocky structure; friable; thin discontinuous brown (7.5YR 5/4) clay films on faces of peds; thin discontinuous dark grayish brown (10YR 4/2) organic coatings; slightly acid; gradual smooth boundary.

Bt2—18 to 37 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium subangular blocky structure; friable; thin discontinuous brown (7.5YR 5/4) clay films on faces of peds; strongly acid; gradual smooth boundary.

2Bt3—37 to 50 inches; red (2.5YR 4/6) silty clay loam; moderate medium angular blocky structure; friable; thin discontinuous reddish brown (2.5YR 4/4) clay films on faces of peds; thin discontinuous brown (7.5YR 5/2) silt coatings on faces of peds; strongly acid; gradual smooth boundary.

2Bt4—50 to 70 inches; red (2.5YR 4/8) silty clay; strong medium angular blocky structure; firm; thin discontinuous red (2.5YR 4/6) clay films on faces of peds; common black (10YR 2/1) iron and manganese oxide concretions; medium acid; gradual smooth boundary.

2Bt5—70 to 80 inches; red (2.5YR 4/8) clay; strong medium angular blocky structure; firm; thin discontinuous red (2.5YR 4/6) clay films on faces of peds; about 5 percent chert fragments; medium acid.

The solum ranges from 60 to 100 inches in thickness. The A horizon has hue of 7.5YR or 10YR, value of 4, and chroma of 2 to 4. The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. The 2Bt horizon has hue of 10R to 5YR, value of 3 to 5, and chroma of 4 to 8.

Ebal Series

The Ebal series consists of deep, moderately well drained soils on convex side slopes along drainageways that dissect the uplands. These soils are moderately permeable in the upper part and very slowly permeable in the lower part. They formed in colluvium and residuum derived from interbedded shale and thin layers of sandstone. Slopes range from 10 to 18 percent.

Ebal soils are similar to Hagerstown soils and are adjacent to Zanesville soils. Hagerstown soils formed in loess and in the underlying limestone residuum. Zanesville soils have a fragipan and formed in loess and in the underlying material weathered from sandstone and siltstone. They are on the less sloping side slopes and ridgetops.

Typical pedon of Ebal silt loam, in a pastured area of Wellston-Ebal silt loams, 10 to 18 percent slopes; 700 feet east and 1,350 feet north of the southwest corner of sec. 24, T. 5 N., R. 3 W.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; weak medium granular structure; friable; common fine roots; strongly acid; abrupt smooth boundary.

Bt1—5 to 15 inches; strong brown (7.5YR 5/6) channery silty clay; strong medium subangular blocky structure; firm; few fine roots; about 20 percent sandstone fragments; thin continuous brown (7.5YR 5/4) clay films on faces of peds; strongly acid; clear wavy boundary.

Bt2—15 to 24 inches; strong brown (7.5YR 5/6) channery clay; common fine prominent light brownish gray (10YR 6/2) mottles; strong medium subangular blocky structure; very firm; few fine roots; about 20 percent sandstone fragments; thin continuous brown (10YR 5/4) clay films on faces of peds; strongly acid; gradual wavy boundary.

2Bt3—24 to 48 inches; yellowish brown (10YR 5/6) clay; common fine prominent light brownish gray (10YR 6/2) mottles; strong medium subangular blocky structure; very firm; yellowish brown (10YR 5/4) slickensides; strongly acid; gradual wavy boundary.

2Bt4—48 to 60 inches; yellowish brown (10YR 5/6) clay; common fine prominent light brownish gray (10YR 6/2) mottles; strong medium subangular blocky structure; very firm; grayish brown (10YR 5/2) and yellowish brown (10YR 5/4) slickensides; strongly acid; gradual wavy boundary.

2C—60 to 70 inches; yellowish brown (10YR 5/6) shaly clay; common fine prominent light brownish gray (10YR 6/2) mottles; massive; firm; about 20 percent partly weathered shale fragments; strongly acid.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The Bt horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 4 to 6. The 2Bt horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 8.

Fairpoint Series

The Fairpoint series consists of deep, well drained, moderately slowly permeable soils in surface-mined areas on uplands. These soils formed in a mixture of fine earth and fragments of siltstone, shale, and some sandstone. Slopes range from 4 to 45 percent.

Fairpoint soils are adjacent to Wellston and Zanesville soils. The adjacent soils formed in loess and in material weathered from sandstone, siltstone, and shale. They are in areas that have not been mined.

Typical pedon of Fairpoint shaly silty clay loam, 4 to 16 percent slopes, in a pasture; 1,000 feet west and 500 feet north of the southeast corner of sec. 17, T. 2 N., R. 4 W.

A—0 to 6 inches; strong brown (7.5YR 5/6), yellowish brown (10YR 5/6), and light brownish gray (10YR 6/2) shaly silty clay loam, reddish yellow (7.5YR 7/6), yellow (10YR 7/6), and light gray (10YR 7/1) dry; massive; firm; common fine roots; about 30 percent shale fragments; neutral; abrupt wavy boundary.

C1—6 to 14 inches; yellowish brown (10YR 5/6) shaly silty clay loam; massive; firm; few fine roots; about 30 percent shale fragments; about 20 percent grayish brown (10YR 5/2) soil material; medium acid; clear wavy boundary.

C2—14 to 25 inches; dark gray (N 4/0) shaly silt loam; massive; very firm; few fine roots; about 30 percent shale fragments; neutral; gradual wavy boundary.

C3—25 to 60 inches; dark gray (N 4/0) very shaly silt loam; massive; very firm; about 80 percent shale fragments; neutral.

The A horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 2 to 6. It is silt loam, silty clay loam, or the channery or shaly analogs of these textures. It is medium acid to neutral. The C horizon has hue of 10YR to 2.5YR, value of 3 to 6, and chroma of 1 to 6 or is neutral in hue and has value of 3 to 6.

Gilpin Series

The Gilpin series consists of moderately deep, well drained, moderately permeable soils on uplands. These soils formed in material weathered from sandstone, siltstone, and shale bedrock. Slopes range from 12 to 70 percent.

Gilpin soils are adjacent to Berks, Wellston, and Zanesville soils. Berks soils have less clay in the subsoil than the Gilpin soils. The deep Wellston soils contain more sand and less silt in the subsoil than the Gilpin soils. The deep Zanesville soils are on ridgetops. They have a firm fragipan in the subsoil.

Typical pedon of Gilpin channery silt loam, in a wooded area of Wellston-Gilpin complex, 12 to 30 percent slopes; 2,500 feet east and 1,590 feet north of the southwest corner of sec. 5, T. 3 N., R. 4 W.

A—0 to 4 inches; very dark grayish brown (10YR 3/2) channery silt loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; many fine roots; about 15 percent sandstone fragments; very strongly acid; abrupt smooth boundary.

BE—4 to 15 inches; yellowish brown (10YR 5/4) channery silt loam; weak medium and coarse subangular blocky structure; friable; many fine roots; few very dark grayish brown (10YR 3/2) organic coatings on faces of peds; about 20 percent sandstone fragments; very strongly acid; clear wavy boundary.

Bt1—15 to 25 inches; brown (7.5YR 5/4) loam; moderate medium subangular blocky structure; friable; few fine roots; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; about 10 percent sandstone fragments; very strongly acid; gradual wavy boundary.

Bt2—25 to 31 inches; brown (7.5YR 5/4) loam; common medium distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; friable; few fine roots; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; about 10 percent sandstone fragments; very strongly acid; gradual wavy boundary.

C—31 to 39 inches; yellowish brown (10YR 5/4) channery loam; common medium distinct light brownish gray (10YR 6/2) and common medium prominent brownish yellow (10YR 6/8) mottles; massive; firm; few black (10YR 2/1) iron and manganese oxide concretions; about 30 percent sandstone fragments; very strongly acid; clear wavy boundary.

R—39 inches; rippable sandstone bedrock.

The thickness of the solum ranges from 20 to 36 inches. The depth to bedrock ranges from 20 to 40 inches.

The A horizon has hue of 10YR, value of 3 to 5, and chroma of 2 to 4. It is silt loam, loam, or the channery analogs of these textures. The Bt and C horizons have hue of 10YR or 7.5YR, value of 5, and chroma of 4 to 6. The Bt horizon is silty clay loam, silt loam, loam, or the channery analogs of these textures. The C horizon is channery silty clay loam or channery loam.

Hagerstown Series

The Hagerstown series consists of deep, well drained, moderately permeable soils on uplands. These soils formed in loess and in the underlying limestone residuum. Slopes range from 12 to 18 percent.

Hagerstown soils are adjacent to Crider, Gilpin, and Wellston soils. Crider and Gilpin soils have less clay in the subsoil than the Hagerstown soils. Crider soils are generally in the less sloping areas. Gilpin and Wellston soils are in the higher lying areas. Gilpin soils formed in material weathered from interbedded sandstone, siltstone, and shale. Wellston soils have less clay than the Hagerstown soils. They formed in loess and in material weathered from interbedded sandstone, siltstone, and shale.

Typical pedon of Hagerstown silt loam, 12 to 18 percent slopes, in a pasture; 900 feet north and 660 feet west of the southeast corner of sec. 1, T. 4 N., R. 3 W.

A—0 to 6 inches; dark brown (7.5YR 3/4) silt loam, pale brown (10YR 6/3) dry; weak medium granular structure; about 15 percent brown (7.5YR 5/4) soil material; friable; neutral; clear smooth boundary.

BE—6 to 13 inches; brown (7.5YR 5/4) silt loam; weak medium subangular blocky structure; friable; thin discontinuous dark brown (7.5YR 4/2) organic coatings and fillings in root and worm channels; slightly acid; clear smooth boundary.

Bt1—13 to 19 inches; reddish brown (2.5YR 4/4) silty clay loam; moderate medium subangular blocky structure; firm; thin discontinuous red (2.5YR 4/6) clay films on faces of peds; slightly acid; clear smooth boundary.

2Bt2—19 to 43 inches; reddish brown (2.5YR 4/4) silty clay; moderate medium subangular blocky structure; firm; thin discontinuous red (2.5YR 4/6) clay films; few black (10YR 2/1) iron and manganese oxide accumulations; about 10 percent chert fragments; slightly acid; gradual smooth boundary.

2Bt3—43 to 52 inches; reddish brown (2.5YR 4/4) silty clay; moderate medium subangular blocky structure; firm; thin discontinuous red (2.5YR 4/6) clay films on faces of peds; about 10 percent chert fragments; slightly acid; gradual smooth boundary.

2C—52 to 60 inches; red (2.5YR 4/6) clay; massive; firm; about 10 percent chert fragments; slightly acid.

The solum is 40 to 70 inches thick. The A horizon has hue of 10YR or 7.5YR, value of 3 or 4, and chroma of 2 to 4. It is silt loam or silty clay loam. The Bt horizon has hue of 7.5YR to 2.5YR, value of 4 or 5, and chroma of 4 to 6. The 2Bt horizon has hue of 7.5YR to 2.5YR, value of 4 to 6, and chroma of 3 to 6. It is silty clay loam or silty clay.

Haymond Series

The Haymond series consists of deep, well drained, moderately permeable soils on bottom land. These soils formed in silty alluvium. Slopes range from 0 to 2 percent.

Haymond soils are similar to Nolin soils and are adjacent to Wakeland soils. Nolin soils have more clay in the subsoil than the Haymond soils. The somewhat poorly drained Wakeland soils are grayish below the surface layer. They are in the lower positions on the landscape.

Typical pedon of Haymond silt loam, frequently flooded, in a cultivated field; 2,640 feet north and 100 feet east of the southwest corner of sec. 17, T. 3 N., R. 4 W.

Ap—0 to 9 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

Bw1—9 to 23 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium subangular blocky structure; friable; common fine roots; thin discontinuous brown (10YR 4/3) organic coatings on faces of peds; neutral; gradual wavy boundary.

Bw2—23 to 34 inches; dark yellowish brown (10YR 4/4) silt loam; common fine faint brown (10YR 5/3) mottles; weak coarse subangular blocky structure; friable; common fine roots; thin discontinuous brown (10YR 4/3) organic coatings on faces of peds; neutral; gradual wavy boundary.

Bw3—34 to 46 inches; dark yellowish brown (10YR 4/4) silt loam; few fine distinct pale brown (10YR 6/3) mottles; moderate medium subangular blocky structure; friable; few fine roots; thin discontinuous brown (10YR 4/3) organic coatings on faces of peds; neutral; gradual wavy boundary.

Bw4—46 to 59 inches; dark yellowish brown (10YR 4/4) silt loam; few fine faint grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; friable; few fine roots; thin discontinuous brown (10YR 4/3) organic coatings on faces of peds; neutral; gradual wavy boundary.

C—59 to 70 inches; dark yellowish brown (10YR 4/4) silt loam that has thin strata of sandy loam; common fine distinct grayish brown (10YR 5/2) mottles; massive; friable; mildly alkaline.

The solum ranges from 40 to 70 inches in thickness. It is medium acid to neutral. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The Bw and C horizons have hue of 10YR, value of 4 to 6, and chroma of 3 or 4.

Hosmer Series

The Hosmer series consists of deep, well drained soils on upland ridgetops and loess-capped lake plains. These soils have a fragipan. They are moderately permeable above the fragipan and very slowly permeable in the fragipan. They formed in loess. Slopes range from 2 to 6 percent.

Hosmer soils are similar to Cincinnati and Zanesville soils and are adjacent to Gilpin and Wellston soils. Cincinnati soils formed in loess and in the underlying glacial till. Zanesville soils formed in loess and in material weathered from sandstone, siltstone, and shale. Gilpin and Wellston soils are on the more sloping sides of drainageways. Gilpin soils have more sand in the subsoil than the Hosmer soils, do not have a fragipan, and formed in material weathered from sandstone, siltstone, and shale. Wellston soils do not have a fragipan. They have a loess mantle that is thinner than that of the Hosmer soils.

Typical pedon of Hosmer silt loam, 2 to 6 percent slopes, in a pasture; 165 feet west and 330 feet south of the northeast corner of sec. 36, T. 4 N., R. 5 W.

Ap1—0 to 3 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

Ap2—3 to 8 inches; brown (10YR 4/3) silt loam; weak medium subangular blocky structure; friable; common fine roots; slightly acid; clear smooth boundary.

Bt1—8 to 15 inches; strong brown (7.5YR 5/6) silt loam; moderate medium subangular blocky structure; firm; common fine roots; few fine pores; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; very strongly acid; clear smooth boundary.

Bt2—15 to 23 inches; yellowish brown (10YR 5/6) silt loam; weak coarse subangular blocky structure parting to moderate medium subangular blocky; firm; common fine roots; few fine pores; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; very strongly acid; clear smooth boundary.

Bt3—23 to 26 inches; yellowish brown (10YR 5/6) silt loam; moderate medium subangular blocky structure; firm; few fine roots; few fine pores; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; common pale brown (10YR 6/3) silt coatings on faces of peds; very strongly acid; clear wavy boundary.

Btx1—26 to 33 inches; yellowish brown (10YR 5/6) silty clay loam; moderate very coarse prismatic structure; firm; brittle; few fine roots on faces of prisms; few fine pores; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; few pale brown (10YR 6/3) silt coatings on faces of prisms; extremely acid; gradual wavy boundary.

Btx2—33 to 45 inches; strong brown (7.5YR 5/6) silty clay loam; strong very coarse prismatic structure; firm; brittle; few fine roots; thin discontinuous brown (10YR 4/3) and grayish brown (10YR 5/2) clay films on faces of peds; common light brownish gray (10YR 6/2) silt coatings on faces of prisms; extremely acid; gradual wavy boundary.

Btx3—45 to 55 inches; dark yellowish brown (10YR 4/4) silt loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate very coarse prismatic structure; firm; brittle; few fine roots on faces of prisms; thin discontinuous brown (10YR 5/3) clay films on faces of peds; thin discontinuous light brownish gray (10YR 6/2) silt coatings on faces of prisms; very strongly acid; gradual wavy boundary.

BC—55 to 65 inches; brown (10YR 4/3) silt loam; few medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; thin discontinuous light brownish gray (10YR 6/2) silt coatings on faces of peds; very strongly acid; clear smooth boundary.

2C—65 to 80 inches; yellowish brown (10YR 5/6) silty clay; common medium prominent red (2.5YR 4/8) mottles; strong medium subangular blocky structure; firm; thin discontinuous light brownish gray (10YR 6/2) silt coatings on faces of peds; very strongly acid.

The thickness of the solum ranges from 53 to 80 inches. The depth to the fragipan is 23 to 27 inches.

The Ap horizon has hue of 10YR, value of 4, and chroma of 2 or 3. The Bt horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 4 to 6. The Btx horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. The 2C horizon formed in material weathered from interbedded sandstone, siltstone, and shale.

Johnsburg Series

The Johnsburg series consists of deep, somewhat poorly drained soils on uplands. These soils have a fragipan. They are moderately permeable above the fragipan and very slowly permeable in the fragipan. They formed in loess and in material weathered from siltstone, sandstone, and shale. Slopes range from 0 to 2 percent.

Johnsburg soils are similar to Pekin soils and are adjacent to Wellston and Zanesville soils. Pekin soils are less gray in the subsoil than the Johnsburg soils. Wellston and Zanesville soils are in the more sloping areas. Wellston soils do not have a fragipan. Zanesville soils are less gray in the subsoil than the Johnsburg soils and have a higher base saturation.

Typical pedon of Johnsburg silt loam, 0 to 2 percent slopes, in a cultivated field; 530 feet east and 2,380 feet north of the southwest corner of sec. 14, T. 2 N., R. 3 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; neutral; abrupt smooth boundary.

E—8 to 13 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium granular structure; friable; neutral; clear wavy boundary.

Bt—13 to 23 inches; yellowish brown (10YR 5/6) silty clay loam; common medium distinct light gray (10YR 7/2) mottles; moderate medium subangular blocky structure; friable; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; strongly acid; clear wavy boundary.

Btx—23 to 42 inches; yellowish brown (10YR 5/6) silty clay loam; common medium distinct light brownish gray (10YR 6/2) and reddish brown (5YR 4/4) mottles; moderate very coarse prismatic structure; firm; brittle; thin discontinuous grayish brown (10YR 5/2) and dark yellowish brown (10YR 4/4) clay films on faces of peds; strongly acid; gradual wavy boundary.

2BC—42 to 60 inches; yellowish brown (10YR 5/6) silt loam; common medium distinct light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; friable; strongly acid; gradual wavy boundary.

2C—60 to 70 inches; yellowish brown (10YR 5/6) silt loam; common medium distinct light brownish gray (10YR 6/2) mottles; massive; friable; about 5 percent sandstone fragments; strongly acid.

The thickness of the solum ranges from 42 to 60 inches. The thickness of the loess ranges from 35 to 42 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The E horizon has hue of 10YR, value of 4 or 5, and chroma of 1 to 4. The Bt horizon has hue of 10YR, value of 5 or 6, and chroma of 3 to 6. It is mottled. The Btx horizon has hue of 10YR, value of 5 or 6, and chroma of 2 to 6. It is loam, silt loam, or silty clay loam.

Markland Series

The Markland series consists of deep, moderately well drained, slowly permeable soils on lacustrine terraces. These soils formed in silty loess and in the underlying silty and clayey lacustrine sediments. Slopes range from 1 to 12 percent.

Markland soils are adjacent to McGary and Wellston soils. McGary soils have a subsoil that is grayer than that of the Markland soils. They are on broad flats. Wellston soils have less clay in the subsoil than the Markland soils. They are in gently sloping to strongly sloping areas.

Typical pedon of Markland silt loam, 1 to 5 percent slopes, in a pasture; 2,380 feet east and 400 feet south of the northwest corner of sec. 33, T. 4 N., R. 3 W.

Ap—0 to 5 inches; brown (10YR 4/3) silt loam, light gray (10YR 7/2) dry; moderate fine granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

Bt1—5 to 21 inches; yellowish brown (10YR 5/4) clay; weak coarse prismatic structure parting to strong medium angular blocky; very firm; common fine roots; thin continuous brown (10YR 4/3) clay films on faces of peds; slightly acid; clear wavy boundary.

Bt2—21 to 30 inches; yellowish brown (10YR 5/4) clay; moderate coarse subangular blocky structure; very firm; common fine roots; thin continuous brown (10YR 4/3) clay films on faces of peds; slightly acid; clear wavy boundary.

Bt3—30 to 35 inches; yellowish brown (10YR 5/4) silty clay; moderate medium subangular blocky structure; very firm; few fine roots; thin discontinuous brown (10YR 4/3) clay films on faces of peds; light gray (10YR 7/1) nodules of free lime; strong effervescence; moderately alkaline; gradual wavy boundary.

C—35 to 60 inches; light yellowish brown (10YR 6/4) silty clay loam that has thin strata of silt loam; many medium distinct light gray (10YR 7/2) and many medium faint brown (10YR 5/3) mottles; massive; firm; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 35 to 44 inches. The thickness of loess ranges from 4 to 16 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It is silt loam or silty clay loam. The Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 4. It is clay, silty clay, or silty clay loam. The C horizon has hue of 10YR, value of 6, and chroma of 3 or 4. It is stratified silty clay, silty clay loam, or silt loam.

Martinsville Series

The Martinsville series consists of deep, well drained, moderately permeable soils on terraces. These soils formed in stratified, loamy sediments. Slopes range from 0 to 2 percent.

Martinsville soils are similar to Negley soils and are adjacent to Alvin, Chelsea, and Nolin soils. Negley soils have more gravel in the subsoil and underlying material than the Martinsville soils. Alvin and Chelsea soils are on the steeper slopes. They have less clay in the subsoil than the Martinsville soils. Nolin soils have more silt in the subsoil than the Martinsville soils. They are on bottom land.

Typical pedon of Martinsville loam, 0 to 2 percent slopes, in a cultivated field; 660 feet north and 1,400 feet west of the southeast corner of sec. 14, T. 4 N., R. 3 W.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; few fine roots; neutral; abrupt smooth boundary.

E—5 to 9 inches; brown (10YR 4/3) loam; moderate medium granular structure; friable; neutral; clear wavy boundary.

Bt1—9 to 18 inches; brown (7.5YR 5/4) loam; moderate medium subangular blocky structure; friable; thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; slightly acid; gradual wavy boundary.

Bt2—18 to 27 inches; brown (7.5YR 5/4) loam; moderate medium subangular blocky structure; friable; thin continuous brown (7.5YR 4/4) clay films on faces of peds; slightly acid; gradual wavy boundary.

Bt3—27 to 37 inches; strong brown (7.5YR 5/6) loam; moderate medium subangular blocky structure; firm; thin continuous brown (7.5YR 4/4) clay films on faces of peds; slightly acid; gradual wavy boundary.

Bt4—37 to 47 inches; strong brown (7.5YR 5/6) fine sandy loam; weak coarse subangular blocky structure; firm; thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; slightly acid; clear wavy boundary.

Bt5—47 to 58 inches; brown (7.5YR 5/4) fine sandy loam; weak coarse subangular blocky structure; friable; thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; slightly acid; clear wavy boundary.

C1—58 to 70 inches; brown (10YR 5/3) sandy loam that has thin strata of loamy sand; massive; friable; about 3 percent gravel; neutral; clear smooth boundary.

C2—70 to 80 inches; yellowish brown (10YR 5/4) sand; massive; loose; about 8 percent gravel; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 46 to 60 inches. The Ap horizon has hue of 10YR, value of 4, and chroma of 2 or 3. It is loam or silt loam. The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6.

McGary Series

The McGary series consists of deep, somewhat poorly drained, slowly permeable soils on terraces. These soils formed in calcareous lacustrine deposits. Slopes range from 0 to 2 percent.

McGary soils are adjacent to Markland soils. The adjacent soils are less gray in the subsoil than the McGary soils. They are on slight rises.

Typical pedon of McGary silty clay loam, rarely flooded, 0 to 2 percent slopes, in a cultivated field; 330 feet west and 50 feet south of the northeast corner of sec. 11, T. 1 N., R. 4 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silty clay loam, light gray (10YR 7/2) dry; moderate medium granular structure; firm; many fine roots; neutral; abrupt smooth boundary.

Bt1—7 to 17 inches; light brownish gray (10YR 6/2) silty clay; many medium prominent yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure; firm; few fine roots; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; slightly acid; gradual wavy boundary.

Bt2—17 to 31 inches; brown (10YR 5/3) silty clay; common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure; firm; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; neutral; gradual wavy boundary.

Bt3—31 to 42 inches; brown (10YR 5/3) silty clay; many medium faint grayish brown (10YR 5/2) mottles; weak coarse prismatic structure; firm; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; few light gray (10YR 7/1) lime nodules; slight effervescence; neutral; gradual wavy boundary.

C—42 to 60 inches; brown (10YR 5/3) silty clay; many medium faint yellowish brown (10YR 5/6) mottles; weak coarse angular blocky structure; firm; strong effervescence; mildly alkaline.

The thickness of the solum ranges from 25 to 45 inches. The Ap horizon has hue of 10YR, value of 4 to 6, and chroma of 1 or 2. The Bt horizon has hue of 10YR, value of 4 to 6, and chroma of 1 to 4. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 1 to 3.

Negley Series

The Negley series consists of deep, well drained, moderately permeable or moderately rapidly permeable soils on outwash terraces. These soils formed in a thin layer of loess and in the underlying outwash material. Slopes range from 18 to 35 percent.

These soils contain more sand and less clay than is definitive for the Negley series. This difference, however, does not alter the usefulness or behavior of the soils.

Negley soils are similar to Martinsville soils and are adjacent to Parke and Pike soils. Martinsville soils have less gravel in the subsoil and underlying material than the Negley soils. Parke and Pike soils are in the less sloping areas on ridgetops and side slopes. Parke soils have a mantle of loess that is 20 to 40 inches deep over sandy outwash, and Pike soils have one that is 40 to 60 inches deep over sandy outwash.

Typical pedon of Negley silt loam, 18 to 35 percent slopes, in a wooded area; 2,475 feet west and 2,390 feet north of the southeast corner of sec. 31, T. 3 N., R. 4 W.

A—0 to 3 inches; dark brown (10YR 3/3) silt loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; many medium roots; about 5 percent gravel; medium acid; abrupt smooth boundary.

E—3 to 9 inches; yellowish brown (10YR 5/4) loam; weak coarse subangular blocky structure; friable; many medium roots; about 5 percent gravel; strongly acid; gradual wavy boundary.

Bt1—9 to 25 inches; reddish brown (5YR 4/4) loam; weak medium subangular blocky structure; friable; few fine roots; thin discontinuous reddish brown (5YR 4/3) clay films on faces of peds; about 5 percent gravel; very strongly acid; gradual wavy boundary.

Bt2—25 to 32 inches; reddish brown (5YR 4/4) loam; moderate medium subangular blocky structure; friable; few fine roots; thin discontinuous reddish brown (5YR 4/3) clay films on faces of peds; about 5 percent gravel; very strongly acid; gradual wavy boundary.

Bt3—32 to 49 inches; yellowish red (5YR 4/6) clay loam; moderate medium subangular blocky structure; friable; few fine roots; thin continuous reddish brown (5YR 4/3) clay films on faces of peds; about 10 percent gravel; strongly acid; gradual wavy boundary.

Bt4—49 to 66 inches; yellowish red (5YR 4/6) clay loam; weak medium subangular blocky structure; friable; few fine roots; thin discontinuous reddish brown (5YR 4/4) clay films on faces of peds; very dark gray (10YR 3/1) iron stains; about 10 percent gravel; strongly acid; gradual wavy boundary.

Bt5—66 to 80 inches; strong brown (7.5YR 5/8) clay loam; weak coarse subangular blocky structure; friable; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; about 10 percent gravel; strongly acid.

The solum ranges from 80 to 150 inches in thickness. It is medium acid to very strongly acid. The loess is less than 20 inches thick.

The A horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 2 to 4. It is silt loam or loam. The Bt horizon has hue of 10YR to 5YR, value of 4 or 5, and chroma of 3 to 8. It is loam, sandy clay loam, clay loam, or the gravelly analogs of these textures.

Newark Series

The Newark series consists of deep, somewhat poorly drained, moderately permeable soils on bottom land. These soils formed in silty alluvium. Slopes range from 0 to 2 percent.

Newark soils are similar to Wakeland soils and are adjacent to Nolin and Wirt soils. Wakeland soils have less clay in the solum than the Newark soils. Nolin and Wirt soils are well drained and are higher on the landscape than the Newark soils. Also, Wirt soils have less clay in the subsoil.

Typical pedon of Newark silt loam, frequently flooded, in a cultivated field; 1,700 feet east and 1,450 feet north of the southwest corner of sec. 32, T. 4 N., R. 3 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; common fine roots; medium acid; abrupt smooth boundary.

A—7 to 13 inches; dark grayish brown (10YR 4/2) silt loam; weak medium subangular blocky structure; friable; few fine roots; slightly acid; clear smooth boundary.

Bg1—13 to 22 inches; grayish brown (10YR 5/2) silt loam; common medium distinct yellowish brown (10YR 5/6) and dark yellowish brown (10YR 4/4) mottles; weak medium subangular blocky structure; friable; few fine pores; slightly acid; clear smooth boundary.

Bg2—22 to 32 inches; light brownish gray (10YR 6/2) silty clay loam; common medium prominent yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; friable; few fine pores; slightly acid; gradual smooth boundary.

Cg—32 to 41 inches; gray (10YR 6/1) silty clay loam; common medium prominent yellowish brown (10YR 5/6) and common medium distinct light yellowish brown (10YR 6/4) mottles; weak medium subangular blocky structure; friable; few fine pores; medium acid; gradual smooth boundary.

C—41 to 60 inches; dark yellowish brown (10YR 4/4) silty clay loam; common medium distinct yellowish brown (10YR 5/6) and common medium prominent gray (10YR 6/1) mottles; weak medium subangular blocky structure; friable; medium acid.

The Ap horizon has hue of 10YR, value of 4, and chroma of 2 to 4. The C horizon has hue of 10YR, value of 4 to 6, and chroma of 1 to 4. It is silt loam or silty clay loam.

Nolin Series

The Nolin series consists of deep, well drained, moderately permeable soils on bottom land. These soils formed in silty alluvium. Slopes range from 0 to 2 percent.

Nolin soils are similar to Haymond soils and are adjacent to Newark and Wirt soils. Haymond and Wirt soils have less clay in the subsoil than the Nolin soils. Newark soils are grayer than the Nolin soils. They are in the lower positions on the landscape.

Typical pedon of Nolin silt loam, frequently flooded, in a cultivated field; 600 feet west and 200 feet south of the northeast corner of sec. 6, T. 2 N., R. 4 W.

Ap—0 to 11 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; weak medium granular structure; friable; few fine roots; few fine pores; thin discontinuous very dark grayish brown (10YR 3/2) organic coatings on faces of peds; medium acid; abrupt smooth boundary.

Bw1—11 to 16 inches; brown (10YR 4/3) silt loam; moderate medium subangular blocky structure; friable; few fine roots; few fine pores; thin discontinuous very dark grayish brown (10YR 3/2) organic coatings on faces of peds; slightly acid; clear smooth boundary.

Bw2—16 to 22 inches; brown (10YR 4/3) silt loam; moderate medium subangular blocky structure; friable; few fine roots; few fine pores; thin discontinuous very dark grayish brown (10YR 3/2) organic coatings on faces of peds; slightly acid; clear smooth boundary.

Bw3—22 to 53 inches; brown (10YR 4/3) silt loam; weak coarse subangular blocky structure parting to moderate medium subangular blocky; friable; few fine roots; few fine pores; thin discontinuous very dark grayish brown (10YR 3/2) organic coatings on faces of peds; slightly acid; clear smooth boundary.

C—53 to 70 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium subangular blocky structure parting to weak medium granular; friable; slightly acid.

The Ap horizon has hue of 10YR, value of 4, and chroma of 2 or 3. The Bw horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is medium acid to neutral.

Parke Series

The Parke series consists of deep, well drained, moderately permeable soils on loess-capped outwash terraces. These soils formed in loess and in the underlying outwash. Slopes range from 6 to 18 percent.

Parke soils are similar to Pike soils and are adjacent to Negley soils. Pike soils have a loess mantle that is thicker than that of the Parke soils. Negley soils have more sand in the subsoil than the Parke soils. They are on side slopes along drainageways.

Typical pedon of Parke silt loam, 6 to 12 percent slopes, eroded, in a cultivated field; 260 feet west and 100 feet north of the southeast corner of sec. 33, T. 3 N., R. 4 W.

Ap—0 to 6 inches; brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; mixed with some dark brown (7.5YR 4/4) subsoil material; weak fine granular structure; friable; few fine roots; strongly acid; abrupt smooth boundary.

Bt1—6 to 12 inches; dark brown (7.5YR 4/4) silty clay loam; weak medium subangular blocky structure; friable; thin discontinuous reddish brown (5YR 4/3) clay films on faces of peds; strongly acid; gradual smooth boundary.

Bt2—12 to 26 inches; dark brown (7.5YR 4/4) silt loam; moderate medium subangular blocky structure; firm; thin discontinuous reddish brown (5YR 4/3) clay films on faces of peds; strongly acid; gradual smooth boundary.

Bt3—26 to 34 inches; dark brown (7.5YR 4/4) silt loam; weak coarse subangular blocky structure; firm; thin discontinuous reddish brown (5YR 4/3) clay films on faces of peds; thin discontinuous pale brown (10YR 6/3) silt coatings on faces of peds; very strongly acid; gradual smooth boundary.

2Bt4—34 to 56 inches; reddish brown (5YR 4/4) loam; weak coarse subangular blocky structure; firm; thin discontinuous reddish brown (5YR 4/3) clay films on faces of peds; thin discontinuous pale brown (10YR 6/3) silt coatings on faces of peds; very strongly acid; gradual smooth boundary.

2BC—56 to 80 inches; reddish brown (5YR 4/4) sandy loam; weak medium subangular blocky structure; firm; thin discontinuous brown (10YR 5/3) silt coatings on faces of peds; very strongly acid.

The thickness of the solum ranges from 48 to more than 90 inches. The thickness of the loess ranges from 26 to 37 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The Bt horizon has hue of 7.5YR, value of 4 or 5, and chroma of 4 to 6. The 2Bt horizon has hue of 7.5YR to 2.5YR, value of 4 or 5, and chroma of 4 to 6. It is clay loam, sandy clay loam, or sandy loam.

Pekin Series

The Pekin series consists of deep, moderately well drained soils on low terraces. These soils have a fragipan. They are moderately permeable above the fragipan and very slowly permeable in the fragipan. They formed in a thin layer of loess and in the underlying strongly acid alluvium of mixed origin. Slopes range from 2 to 6 percent.

Pekin soils are adjacent to Bartle, Wakeland, and Wellston soils. Bartle and Wakeland soils are somewhat poorly drained. Bartle soils are in the less sloping areas. Wakeland soils are on flood plains. Wellston soils are well drained and are on the steeper slopes. They do not have a fragipan.

Typical pedon of Pekin silt loam, 2 to 6 percent slopes, in a cultivated field; 1,450 feet west and 920 feet north of the southeast corner of sec. 30, T. 2 N., R. 3 W.

Ap—0 to 12 inches; dark grayish brown (10YR 4/2) silt loam, very pale brown (10YR 7/3) dry; moderate fine granular structure; friable; medium acid; abrupt smooth boundary.

Bt—12 to 24 inches; yellowish brown (10YR 5/6) silt loam; few fine prominent light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; friable; thin discontinuous yellowish brown (10YR 5/4) clay films on faces of peds; strongly acid; gradual wavy boundary.

Btx1—24 to 39 inches; yellowish brown (10YR 5/6) silty clay loam; common fine distinct light brownish gray (10YR 6/2) and common medium faint strong brown (7.5YR 5/6) mottles; moderate very coarse prismatic structure; firm; brittle; thin discontinuous brown (7.5YR 5/4) clay films on faces of peds; thin discontinuous pale brown (10YR 6/3) silt coatings on faces of prisms; strongly acid; gradual wavy boundary.

Btx2—39 to 58 inches; yellowish brown (10YR 5/6) silty clay loam; common fine prominent light brownish gray (10YR 6/2) mottles; moderate very coarse prismatic structure; firm; brittle; thin continuous light brownish gray (10YR 6/2) and yellowish brown (10YR 5/4) clay films on faces of peds; thin continuous light gray (10YR 7/2) silt coatings on faces of prisms; strongly acid; gradual irregular boundary.

C—58 to 70 inches; yellowish brown (10YR 5/4) silt loam; common medium prominent light brownish gray (10YR 6/2) and few medium distinct yellowish brown (10YR 5/6) mottles; massive; friable; slightly acid.

The Ap horizon has hue of 10YR, value of 4, and chroma of 2 or 3. The Btx horizon has hue of 10YR, value of 5 or 6, and chroma of 4 to 6.

Pike Series

The Pike series consists of deep, well drained, moderately permeable soils on loess-capped outwash terraces. These soils formed in loess and in the underlying outwash. Slopes range from 2 to 6 percent.

These soils have a lower base saturation than is definitive for the Pike series. This difference, however, does not alter the usefulness or behavior of the soils.

Pike soils are similar to Parke soils and are adjacent to Negley soils. Parke soils have less than 40 inches of loess. Negley soils have less than 20 inches of loess and contain more sand in the subsoil than the Pike soils. They are on the steeper slopes.

Typical pedon of Pike silt loam, 2 to 6 percent slopes, in a pasture; 600 feet south and 350 feet west of the northeast corner of sec. 4, T. 2 N., R. 4 W.

Ap—0 to 7 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak medium subangular blocky structure parting to weak medium granular; friable; common fine roots; strongly acid; abrupt smooth boundary.

E—7 to 14 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium subangular blocky structure; friable; common fine roots; strongly acid; clear smooth boundary.

Bt1—14 to 19 inches; brown (7.5YR 5/4) silt loam; moderate medium subangular blocky structure; friable; few fine roots; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; strongly acid; clear smooth boundary.

Bt2—19 to 30 inches; reddish brown (5YR 4/4) silty clay loam; moderate medium subangular blocky structure parting to moderate fine subangular blocky; friable; few fine roots; thin discontinuous reddish brown (5YR 4/3) clay films on faces of peds; strongly acid; gradual smooth boundary.

Bt3—30 to 42 inches; dark brown (7.5YR 4/4) silty clay loam; moderate coarse subangular blocky structure; firm; few fine roots; thin discontinuous reddish brown (5YR 4/4) clay films on faces of peds; very strongly acid; gradual smooth boundary.

2Bt4—42 to 57 inches; strong brown (7.5YR 5/6) silt loam; moderate medium subangular blocky structure; friable; few fine roots; thin discontinuous brown (7.5YR 5/4) clay films on faces of peds; thin discontinuous light gray (10YR 7/2) silt coatings on faces of peds; few black (10YR 2/1) iron and manganese oxide accumulations; very strongly acid; gradual wavy boundary.

3BC—57 to 80 inches; reddish brown (5YR 4/4) loam; weak medium subangular blocky structure; friable; few pale brown (10YR 6/3) silt coatings on faces of peds; very strongly acid.

The thickness of the solum ranges from 60 to 90 inches. The thickness of the loess ranges from 42 to 57 inches. The Ap horizon has hue of 10YR, value of 4, and chroma of 3 or 4. The Bt horizon has hue of 7.5YR or

5YR, value of 4 or 5, and chroma of 4 to 6. It is strongly acid or very strongly acid.

Wakeland Series

The Wakeland series consists of deep, somewhat poorly drained, moderately permeable soils on bottom land. These soils formed in silty alluvium derived from loess-covered uplands. Slopes range from 0 to 2 percent.

Wakeland soils are adjacent to Haymond and Wilbur soils. The adjacent soils are browner in the underlying material than the Wakeland soils. They are in the higher positions on the landscape.

Typical pedon of Wakeland silt loam, frequently flooded, in a cultivated field; 660 feet south and 530 feet west of the northeast corner of sec. 12, T. 3 N., R. 5 W.

Ap—0 to 7 inches; brown (10YR 4/3) silt loam, very pale brown (10YR 7/3) dry; weak fine granular structure; friable; few fine roots; slightly acid; clear smooth boundary.

C—7 to 15 inches; dark yellowish brown (10YR 4/4) silt loam; many medium distinct grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; friable; few fine roots; slightly acid; clear smooth boundary.

Cg1—15 to 27 inches; light brownish gray (10YR 6/2) silt loam; common fine distinct dark yellowish brown (10YR 4/4) and common medium distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure parting to weak medium subangular blocky; friable; slightly acid; clear smooth boundary.

Cg2—27 to 37 inches; pale brown (10YR 6/3) silt loam; common medium faint light gray (10YR 7/2) and few medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; slightly acid; clear smooth boundary.

Cg3—37 to 50 inches; gray (10YR 6/1) silt loam; many coarse faint pale brown (10YR 6/3) and many medium distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure parting to moderate medium subangular blocky; friable; slightly acid; clear smooth boundary.

Cg4—50 to 60 inches; gray (10YR 6/1) silt loam; common medium distinct dark brown (7.5YR 4/4) mottles; weak coarse subangular blocky structure; friable; neutral.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The C horizon has hue of 10YR, value of 4 to 6, and chroma of 1 to 4. The Cg horizon has hue of 10YR, value of 5 or 6, and chroma of 1 to 3.

Wellston Series

The Wellston series consists of deep, well drained, moderately permeable soils in the uplands. These soils formed in loess and in material weathered from interbedded sandstone, siltstone, or shale. Slopes range from 2 to 70 percent.

Wellston soils are adjacent to Berks, Ebal, Gilpin, and Zanesville soils. Berks and Gilpin soils are lower on the landscape than the Wellston soils. Also, Berks soils have less silt and more rock material in the subsoil, and the moderately deep Gilpin soils have more sand in the subsoil. Ebal soils have more clay than the Wellston soils and have a thicker subsoil. They are in positions on side slopes similar to those of the Wellston soils. Zanesville soils are on ridgetops and side slopes. They have a firm fragipan.

Typical pedon of Wellston silt loam, in a wooded area of Wellston-Gilpin complex, 12 to 30 percent slopes; 1,060 feet east and 2,120 feet south of the northwest corner of sec. 32, T. 4 N., R. 4 W.

A1—0 to 2 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak medium granular structure; friable; many fine roots; medium acid; abrupt smooth boundary.

A2—2 to 6 inches; brown (10YR 4/3) silt loam; weak medium subangular blocky structure; friable; common fine roots; strongly acid; abrupt smooth boundary.

Bt1—6 to 15 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium subangular blocky structure; friable; few fine roots; few fine pores; strongly acid; gradual wavy boundary.

Bt2—15 to 31 inches; strong brown (7.5YR 5/6) silt loam; moderate medium subangular blocky structure; firm; few fine roots; few fine pores; thin discontinuous brown (7.5YR 5/4) clay films on faces of peds; very strongly acid; clear smooth boundary.

2Bt3—31 to 49 inches; brown (7.5YR 4/4) silt loam; moderate medium prismatic structure parting to moderate medium subangular blocky; friable; few fine pores; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; thin discontinuous pale brown (10YR 6/3) silt coatings on faces of peds; about 10 percent sandstone fragments; very strongly acid; gradual wavy boundary.

2C—49 to 60 inches; yellowish brown (10YR 5/4) silt loam; few fine distinct dark yellowish brown (10YR 4/6) mottles; massive; friable; about 10 percent sandstone fragments; very strongly acid.

The thickness of the solum ranges from 32 to 50 inches. The depth to bedrock ranges from 40 to 72 inches.

The A horizon has hue of 10YR, value of 2 to 4, and chroma of 1 to 4. The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 8. The 2C horizon has hue of 7.5YR or 10YR, value of 5, and chroma of 4 to 6. It is silt loam, loam, or the channery, very channery, gravelly, or very gravelly analogs of these textures.

Wilbur Series

The Wilbur series consists of deep, moderately well drained, moderately permeable soils on bottom land. These soils formed in silty alluvium derived from loess-covered uplands. Slopes range from 0 to 2 percent.

Wilbur soils are adjacent to Haymond and Wakeland soils. Haymond soils are browner than the Wilbur soils. They generally are in the higher positions on the landscape. Wakeland soils are grayer than the Wilbur soils. They are in the lower positions on the landscape.

Typical pedon of Wilbur silt loam, frequently flooded, in a cultivated field; 1,220 feet south and 80 feet west of the northeast corner of sec. 12, T. 3 N., R. 5 W.

Ap—0 to 6 inches; brown (10YR 4/3) silt loam, very pale brown (10YR 7/3) dry; weak fine granular structure; friable; neutral; abrupt smooth boundary.

C1—6 to 12 inches; dark yellowish brown (10YR 4/4) silt loam; few fine distinct grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; friable; slightly acid; clear smooth boundary.

C2—12 to 30 inches; dark yellowish brown (10YR 4/4) silt loam; few fine distinct grayish brown (10YR 5/2) and light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; friable; neutral; gradual wavy boundary.

C3—30 to 46 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct light brownish gray (10YR 6/2) and few fine faint yellowish brown (10YR 5/6) mottles; massive; friable; neutral; gradual wavy boundary.

C4—46 to 60 inches; dark yellowish brown (10YR 4/4) silt loam that has strata of fine sandy loam and fine sand; many medium distinct light brownish gray (10YR 6/2) and few fine distinct yellowish brown (10YR 5/6) mottles; massive; friable; slightly acid.

The Ap and C horizons have hue of 10YR, value of 4 or 5, and chroma of 2 to 4.

Wirt Series

The Wirt series consists of deep, well drained, moderately permeable soils on bottom land. These soils formed in loamy alluvium. Slopes range from 0 to 2 percent.

Wirt soils are adjacent to Nolin soils. The adjacent soils have more clay and less sand in the subsoil than the Wirt soils. Also, they are generally farther from streams.

Typical pedon of Wirt fine sandy loam, frequently flooded, in a cultivated field; 1,100 feet east and 330 feet north of the southwest corner of sec. 10, T. 2 N., R. 4 W.

Ap—0 to 6 inches; brown (10YR 4/3) fine sandy loam, pale brown (10YR 6/3) dry; weak medium granular structure; friable; common fine roots; medium acid; abrupt smooth boundary.

Bw1—6 to 11 inches; dark yellowish brown (10YR 4/4) fine sandy loam; weak coarse subangular blocky structure; friable; few fine roots; slightly acid; clear wavy boundary.

Bw2—11 to 17 inches; brown (10YR 4/3) fine sandy loam; weak coarse subangular blocky structure parting to moderate medium subangular blocky; friable; slightly acid; clear wavy boundary.

Bw3—17 to 40 inches; dark yellowish brown (10YR 4/4) sandy loam; weak medium subangular blocky structure; friable; few fine roots; slightly acid; clear wavy boundary.

C—40 to 60 inches; brown (10YR 4/3) loam; massive; friable; slightly acid.

The solum is 24 to 40 inches thick. It is loam, sandy loam, or fine sandy loam. The Ap and C horizons have hue of 10YR, value of 4, and chroma of 3 or 4. The C horizon is loam or sandy loam.

Zanesville Series

The Zanesville series consists of deep, moderately well drained and well drained soils on loess-capped uplands. These soils have a fragipan. They are moderately permeable above the fragipan and slowly permeable in the fragipan. They formed in loess and in the underlying material weathered from sandstone, siltstone, or shale. Slopes range from 2 to 12 percent.

Zanesville soils are similar to Cincinnati and Hosmer soils and are adjacent to Gilpin, Johnsburg, and Wellston soils. Cincinnati soils formed in loess and in the underlying glacial till. Hosmer soils have more than 48 inches of loess. Gilpin and Wellston soils are in the steeper areas. Gilpin soils have more sand in the subsoil than the Zanesville soils and are less than 40 inches deep over bedrock. Wellston soils do not have a fragipan. Johnsburg soils have a subsoil that is grayer than that of the Zanesville soils. Also, they have a lower base saturation. They are in the less sloping areas.

Typical pedon of Zanesville silt loam, 6 to 12 percent slopes, eroded, in a pasture; 790 feet east and 50 feet south of the northwest corner of sec. 25, T. 2 N., R. 4 W.

Ap—0 to 5 inches; brown (10YR 4/3) silt loam, very pale brown (10YR 7/3) dry; mixed with some strong brown (7.5YR 5/6) subsoil material; moderate fine granular structure; friable; very strongly acid; abrupt smooth boundary.

BA—5 to 11 inches; strong brown (7.5YR 5/6) silt loam; weak medium subangular blocky structure; friable; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; brown (10YR 4/3) streaks; very strongly acid; gradual wavy boundary.

Bt—11 to 30 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium subangular blocky structure; firm; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds; very strongly acid; gradual wavy boundary.

2Btx—30 to 44 inches; strong brown (7.5YR 5/6) silt loam; few fine prominent grayish brown (10YR 5/2) mottles; moderate very coarse prismatic structure; firm; brittle; thin discontinuous brown (10YR 5/3) clay films on faces of peds; thin discontinuous light gray (10YR 7/2) silt coatings on faces of prisms; extremely acid; gradual wavy boundary.

2C—44 to 60 inches; yellowish brown (10YR 5/6) channery loam; common medium distinct grayish brown (10YR 5/2) mottles; massive; friable; about 40 percent sandstone fragments; extremely acid.

The thickness of the solum ranges from 43 to 54 inches. The depth to bedrock is more than 60 inches.

The Ap horizon has hue of 10YR, value of 4, and chroma of 2 to 4. The Bt and 2Btx horizons have hue of 7.5YR, value of 4 or 5, and chroma of 4 to 6. The 2Btx horizon is silty clay loam, silt loam, or loam. The 2C horizon is loam or channery loam.

Zipp Series

The Zipp series consists of deep, very poorly drained, slowly permeable soils on low terraces. These soils formed in lacustrine sediments. Slopes range from 0 to 2 percent.

Zipp soils are adjacent to McGary soils. The adjacent soils are on small rises. They are brighter colored in the subsoil than the Zipp soils.

Typical pedon of Zipp silty clay loam, rarely flooded, in a cultivated field; 1,500 feet east and 200 feet south of the northwest corner of sec. 36, T. 2 N., R. 4 W.

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silty clay loam, light brownish gray (10YR 6/2) dry; moderate coarse granular structure; firm; slightly acid; abrupt smooth boundary.

Bg1—10 to 28 inches; gray (10YR 5/1) silty clay; many medium distinct yellowish brown (10YR 5/6) mottles; moderate coarse angular blocky structure; firm; slightly acid; clear wavy boundary.

Bg2—28 to 47 inches; gray (10YR 5/1) silty clay; many medium distinct dark yellowish brown (10YR 4/4) mottles; weak coarse prismatic structure parting to weak medium angular blocky; firm; neutral; gradual wavy boundary.

Cg—47 to 60 inches; gray (10YR 6/1) silty clay; many medium prominent red (2.5YR 5/6) mottles; weak coarse angular blocky structure; firm; few light gray (10YR 7/1) lime nodules; neutral.

The thickness of the solum ranges from 30 to 48 inches. The Ap horizon has hue of 10YR, value of 4, and chroma of 1 or 2. The Bg horizon has hue of 10YR, value of 4 or 5, and chroma of 1 or less. It is silty clay loam or silty clay.

Formation of the Soils

This section relates the major factors of soil formation to the soils in the county. It also describes the processes of soil formation.

Factors of Soil Formation

Soil forms through processes that act on deposited or accumulated geologic material. The characteristics of the soil at any given point are determined by the physical and mineralogical composition of the parent material; the climate under which the soil material has accumulated and existed since accumulation; the plant and animal life on and in the soil; the relief, or lay of the land; and the length of time that the forces of soil formation have acted on the soil material.

Climate and plant and animal life, chiefly plants, are active factors of soil formation. They act on the parent material that has accumulated through the weathering of rocks and slowly change it into a natural body that has genetically related horizons. The effects of climate and plant and animal life are conditioned by relief. The parent material affects the kind of soil profile that forms and, in extreme cases, determines it almost entirely. Finally, time is needed for the transformation of the parent material into a soil. Some time is always required for the differentiation of soil horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effects of any one factor unless conditions are specified for the other four.

Parent Material

Parent material is the unconsolidated mass in which a soil forms. It determines the limits of the chemical and mineralogical composition of the soil. Most of the soils of Martin County formed in bedrock residuum. The rest of the soils formed in Illinoian glacial till and outwash; Wisconsinan loess, sandy eolian deposits, and lacustrine material; and recent alluvium.

In Martin County, rock formations of late Mississippian age, or about 250 million years old, consist of interbedded shale, sandstone, siltstone, and limestone. Rock formations of Early Pennsylvanian age, or about 230 million years old, consist of interbedded sandstone, siltstone, and shale. Within these formations are thin layers of coal. Most of the soils of Martin County formed in material weathered from sandstone, siltstone, and shale. Hagerstown and Crider soils formed in loess and the underlying limestone residuum.

Glacial till is material laid down directly by glaciers with a minimum of water action. It consists of particles of different sizes that are mixed together. Most small pebbles in glacial till have sharp corners, indicating that they have not been worn by water. Cincinnati soils are an example of soils that formed partly in glacial till. These soils typically are medium textured and have well developed structure.

Outwash material was deposited by running water from melting glaciers. The size of the particles that make up outwash varies according to the speed of the stream that carried the material. When the water slowed down, the coarser particles were deposited first. Finer particles, such as very fine sand, silt, and clay, were carried by the more slowly moving water. Outwash deposits generally occur as layers of particles of similar size, such as sand and gravel. Negley soils formed mainly in these deposits.

The soils on terraces along the many drainageways that dissect the county formed partly in sediments deposited by water. Bartle and Pekin soils are examples.

As the Illinoian glacial ice receded, lakes formed in the valleys that had been blocked by glacial drift. In these temporary glacial lakes, sandy material was deposited by the rapidly moving meltwater. As the ice receded further and the water flowed more slowly, only the finer material, the size of clay and silt, settled out in the lakes. Bartle soils formed partly in silty Illinoian glacial lake deposits. As the Wisconsinan glacial ice receded, it deposited silty and clayey lacustrine material. Markland soils are an example of soils that formed partly in these deposits. They contain free lime and are much less acid than the Bartle soils.

The sandy material that was deposited in the temporary glacial lakes was later carried by the wind out of the valley of the White River and deposited on the adjacent uplands. This material is of Wisconsinan age. It is as much as several feet thick. Alvin soils are an example of soils that formed in this eolian material.

Loess was deposited throughout the county during Late Wisconsinan time. The mantle of loess ranges from a few inches to several feet in thickness. Hosmer soils are an example of soils that formed in a thick layer of loess, and Zanesville soils are an example of soils that formed in loess over sandstone, siltstone, or shale residuum.

Floodwater has recently deposited alluvial material along streams. This material varies in texture, depending on the speed of the water from which it was deposited. The alluvium deposited along a swift stream, such as the East Fork of the White River, is coarser textured than that deposited along a slow, sluggish stream, such as Boggs Creek. Nolin, Wirt, and Burnside are examples of soils that formed in alluvium.

Plant and Animal Life

Plants are the principal organisms that have influenced the soils in Martin County. Bacteria, fungi, and earthworms, however, have also been important. The chief contribution of plant and animal life to soil formation is the addition of organic matter and nitrogen to the soil. The kind of organic material on and in the soil depends on the kind of plants that grew on the soil in the past. The remains of these plants accumulated on the surface, decayed, and eventually became organic matter. The roots of the plants provided channels for the downward movement of water through the soil and added organic matter as they decayed. Bacteria helped to break down the organic matter into plant nutrients.

The native vegetation in Martin County was mainly deciduous trees. Differences in natural soil drainage and minor variations in the parent material have affected the composition of the forest species. The well drained and moderately well drained upland soils, such as Hosmer, Wellston, and Zanesville soils, were covered mainly by upland oaks and hickories. Berks and Gilpin soils were covered by beech and maple. Ash, cottonwood, and sycamore grew mainly on wet soils.

Climate

Climate helps to determine the kind of plant and animal life on and in the soil, the amount of water available for the weathering of minerals and the translocation of soil material, and the rate of chemical reactions in the soil.

The climate in Martin County is cool and humid. It is presumably similar to the climate under which the soils formed. The soils in this county differ from those that formed under a dry, warm climate and from those that formed under a hot, moist climate. Climate is uniform throughout the county, although it is modified locally by the cooling effect of the hills. Only minor differences among the soils are the result of differences in climate. More detailed information about the climate is available under the heading "General Nature of the County."

Relief

Relief has markedly affected the soils in Martin County through its effect on natural drainage, runoff, erosion, plant cover, and soil temperature. Slopes range from 0 to 70 percent. Runoff is most rapid on the steeper slopes. Water is temporarily ponded in low areas.

Natural soil drainage in the county ranges from excessively drained on the ridgetops to very poorly drained in the depressions. Through its effect on aeration in the soil, drainage determines the color of the soil. Water and air move freely through well drained soils but slowly through very poorly drained soils. In Nolin and other well drained, well aerated soils, the iron compounds that give most soils their color are brightly colored and oxidized. Bonnie and other poorly aerated, poorly drained soils are dull gray and mottled.

Time

Generally, a long time is needed for the processes of soil formation to form distinct horizons in the parent material. Differences in the length of time that the parent material has been in place are commonly reflected in the degree of profile development. Some soils form rapidly. Others form slowly.

The soils in the county range from young to mature. The glacial deposits in which many of the soils formed have been exposed to the soil-forming factors for a long enough time to allow distinct horizons to form. Some soils, however, have not been in place long enough for the development of distinct horizons. Wakeland and other young soils that formed in alluvial material are examples.

Processes of Soil Formation

Several processes have been involved in the formation of the soils in Martin County. These processes are the accumulation of organic matter; the dissolution, transfer, and removal of calcium carbonates and bases; the liberation and translocation of silicate clay minerals; and the reduction and transfer of iron. In most soils more than one of these processes have helped to differentiate horizons.

Some organic matter has accumulated in the surface layer of all the soils in the county. The organic matter content of nearly all the soils is moderate. Generally, the soils that have the most organic matter, such as Nolin and Wirt soils, have a moderately thick, brownish surface layer.

Carbonates and bases have been leached from the upper horizons of nearly all the soils in the county. Leaching probably preceded the translocation of silicate clay minerals. Most of the carbonates and some of the bases have been leached from the A and B horizons of well drained soils. Even in the wettest soils, some leaching is indicated by the absence of carbonates and by an acid reaction. Leaching of wet soils is slow because of a high water table or the slow movement of water through the profile.

Clay accumulates in pores and other voids and forms films on the surfaces along which water moves. The leaching of bases and the translocation of silicate clay minerals are among the more important processes of horizon differentiation in the county. Wellston soils are an example of soils in which translocated silicate clay minerals in the form of clay films have accumulated in the Bt horizon.

Gleying, or the reduction and transfer of iron, has occurred in all of the very poorly drained to somewhat poorly drained soils in the county. In the naturally wet soils, this process has significantly affected horizon differentiation. A gray color in the subsoil indicates the redistribution of iron oxide. Reduction is commonly accompanied by some transfer of iron, either from upper horizons to lower ones or completely out of the profile. Mottles, which are in some horizons, indicate the segregation of iron.

References

(1) American Association of State Highway and Transportation Officials. 1982. Standard specifications for highway materials and methods of sampling and testing. Ed. 13, 2 vols., illus.

(2) American Society for Testing and Materials. 1985. Standard test method for classification of soils for engineering purposes. ASTM Stand. D 2487.

(3) Conservation Needs Committee. 1968. Indiana soil and water conservation needs inventory. 224 pp., illus.

(4) Holt, Harry Q. 1953. History of Martin County, Indiana. 366 pp., illus.

(5) Martin County Planning Commission. 1970. Comprehensive area-wide water and sewer plan. 125 pp., illus.

(6) Ulrich, H.P., and others. 1946. Soil survey of Martin County, Indiana. U.S. Dep. Agric., 72 pp., illus.

(7) United States Department of Agriculture. 1951. Soil survey manual. U.S. Dep. Agric. Handb. 18, 503 pp., illus.

(8) United States Department of Agriculture. 1975. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. Soil Conserv. Serv., U.S. Dep. Agric. Handb. 436, 754 pp., illus.

(9) United States Department of Commerce, Bureau of the Census. 1980. 1978 census of agriculture, preliminary report—Martin County, Indiana. AC78-P-18-101, 4 pp., illus.

Glossary

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium or on steep rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

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

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a channer.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.
Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.
Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.
Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.
Soft.—When dry, breaks into powder or individual grains under very slight pressure.
Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:
Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.
Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.
Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.
Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.
Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.
Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.
Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

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.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, any plowed or disturbed surface layer.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) granular, prismatic, or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

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).

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid permeability the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slippage (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes 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, E, 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 grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Breaking up a compact subsoil by pulling a special chisel through the soil.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from about 4 to 10 inches (10 to 25 centimeters).

Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons. It includes all subdivisions of these horizons.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Till plain. An extensive flat to undulating area underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1951-74 at Shoals, Indiana]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days*	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	39.4	19.8	29.6	65	-6	0	3.43	1.95	4.74	7	4.9
February---	43.9	22.0	33.0	69	-5	9	2.55	1.05	3.81	6	3.6
March------	52.6	29.8	41.2	81	9	51	4.43	2.14	6.41	8	3.5
April------	66.9	41.8	54.4	86	22	173	3.84	2.32	5.20	8	.1
May--------	75.8	49.2	62.5	92	30	396	4.48	2.70	6.06	8	.0
June-------	84.4	58.8	71.7	98	42	651	4.10	2.45	5.56	8	.0
July-------	87.3	63.3	75.3	99	47	784	4.87	2.57	6.88	7	.0
August-----	87.1	60.8	74.0	97	46	744	3.21	1.33	4.78	5	.0
September--	81.3	53.9	67.6	96	35	528	3.22	1.13	4.94	5	.0
October----	70.5	41.9	56.2	90	24	233	2.29	1.06	3.34	5	.0
November---	54.8	32.5	43.7	78	13	10	3.77	1.86	5.42	7	.9
December---	42.6	22.4	32.5	68	-7	13	3.01	1.20	4.53	6	3.0
Yearly:											
Average--	65.6	41.4	53.5	---	---	---	---	---	---	---	---
Extreme--	---	---	---	100	-14	---	---	---	---	---	---
Total----	---	---	---	---	---	3,592	43.20	29.48	55.06	80	16.0

* 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 degrees F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1951-74 at Shoals, Indiana]

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--	Apr. 10	Apr. 24	May 15
2 years in 10 later than--	Apr. 6	Apr. 19	May 9
5 years in 10 later than--	Mar. 30	Apr. 10	Apr. 29
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 22	Oct. 14	Oct. 3
2 years in 10 earlier than--	Oct. 26	Oct. 18	Oct. 7
5 years in 10 earlier than--	Nov. 3	Oct. 27	Oct. 15

TABLE 3.--GROWING SEASON

[Recorded in the period 1951-74 at Shoals, Indiana]

Probability	Daily minimum temperature during growing season		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	200	183	147
8 years in 10	206	188	154
5 years in 10	217	199	168
2 years in 10	229	210	182
1 year in 10	235	216	190

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
Ab	Abscota loamy sand, frequently flooded	445	0.2
AvC2	Alvin-Chelsea loamy fine sands, 4 to 10 percent slopes, eroded	1,750	0.8
AvE	Alvin-Chelsea loamy fine sands, 15 to 35 percent slopes	1,350	0.6
Ba	Bartle silt loam	1,000	0.5
Bk	Birds silt loam, frequently flooded	1,160	0.5
Bo	Bonnie silt loam, frequently flooded	1,700	0.8
Bu	Burnside loam, occasionally flooded	3,650	1.7
CaB	Camden silt loam, 1 to 5 percent slopes	780	0.4
CnB	Cincinnati silt loam, 3 to 10 percent slopes	260	0.1
CrC	Crider silt loam, 3 to 10 percent slopes	130	0.1
FbD	Fairpoint shaly silt loam, 12 to 45 percent slopes	170	0.1
FcC	Fairpoint shaly silty clay loam, 4 to 16 percent slopes	260	0.1
HaD	Hagerstown silt loam, 12 to 18 percent slopes	280	0.1
Hd	Haymond silt loam, frequently flooded	2,490	1.1
HoB	Hosmer silt loam, 2 to 6 percent slopes	3,500	1.6
JoA	Johnsburg silt loam, 0 to 2 percent slopes	780	0.4
MaB	Markland silt loam, 1 to 5 percent slopes	1,150	0.5
McC3	Markland silty clay loam, 6 to 12 percent slopes, severely eroded	470	0.2
MdA	Martinsville loam, 0 to 2 percent slopes	870	0.4
MgA	McGary silty clay loam, rarely flooded, 0 to 2 percent slopes	380	0.2
NeE	Negley silt loam, 18 to 35 percent slopes	790	0.4
Nm	Newark silt loam, frequently flooded	2,700	1.2
No	Nolin silt loam, frequently flooded	2,350	1.1
PaC2	Parke silt loam, 6 to 12 percent slopes, eroded	520	0.2
PaD2	Parke silt loam, 12 to 18 percent slopes, eroded	450	0.2
PeB	Pekin silt loam, 2 to 6 percent slopes	580	0.3
PkB	Pike silt loam, 2 to 6 percent slopes	500	0.2
UhD	Udorthents, silty, 6 to 14 percent slopes	100	*
Up	Udorthents-Pits complex	405	0.2
Wa	Wakeland silt loam, frequently flooded	10,450	4.8
WeB	Wellston silt loam, 2 to 6 percent slopes	910	0.4
WeC2	Wellston silt loam, 6 to 12 percent slopes, eroded	10,900	5.0
WeD2	Wellston silt loam, 12 to 18 percent slopes, eroded	9,100	4.2
WeD3	Wellston silt loam, 12 to 18 percent slopes, severely eroded	5,200	2.4
WgG	Wellston-Berks-Gilpin complex, 18 to 70 percent slopes	75,000	34.4
WlD	Wellston-Ebal silt loams, 10 to 18 percent slopes	4,000	1.8
WnE	Wellston-Gilpin complex, 12 to 30 percent slopes	36,000	16.5
WpD	Wellston-Udorthents complex, 12 to 18 percent slopes	1,210	0.6
Wr	Wilbur silt loam, frequently flooded	3,150	1.5
Wt	Wirt fine sandy loam, frequently flooded	2,500	1.1
ZaB	Zanesville silt loam, 2 to 6 percent slopes	10,700	4.9
ZaC2	Zanesville silt loam, 6 to 12 percent slopes, eroded	10,000	4.6
ZaC3	Zanesville silt loam, 6 to 12 percent slopes, severely eroded	2,650	1.2
ZnB	Zanesville-Udorthents complex, 2 to 6 percent slopes	1,050	0.5
ZnC	Zanesville-Udorthents complex, 6 to 12 percent slopes	2,300	1.1
Zp	Zipp silty clay loam, rarely flooded	430	0.2
	Water areas more than 40 acres in size	1,101	0.5
	Water areas less than 40 acres in size	267	0.1
	Total	217,888	100.0

* Less than 0.1 percent.

TABLE 5.--PRIME FARMLAND

[Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name]

Map symbol	Soil name
Ba	Bartle silt loam (where drained)
Bk	Birds silt loam, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
Bo	Bonnie silt loam, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
Bu	Burnside loam, occasionally flooded
CaB	Camden silt loam, 1 to 5 percent slopes
Hd	Haymond silt loam, frequently flooded (where protected from flooding or not frequently flooded during the growing season)
HoB	Hosmer silt loam, 2 to 6 percent slopes
JoA	Johnsburg silt loam, 0 to 2 percent slopes
MaB	Markland silt loam, 1 to 5 percent slopes
MdA	Martinsville loam, 0 to 2 percent slopes
MgA	McGary silty clay loam, rarely flooded, 0 to 2 percent slopes (where drained)
Nm	Newark silt loam, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
No	Nolin silt loam, frequently flooded (where protected from flooding or not frequently flooded during the growing season)
PeB	Pekin silt loam, 2 to 6 percent slopes
PkB	Pike silt loam, 2 to 6 percent slopes
Wa	Wakeland silt loam, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
WeB	Wellston silt loam, 2 to 6 percent slopes
Wr	Wilbur silt loam, frequently flooded (where protected from flooding or not frequently flooded during the growing season)
Wt	Wirt fine sandy loam, frequently flooded (where protected from flooding or not frequently flooded during the growing season)
ZaB	Zanesville silt loam, 2 to 6 percent slopes
Zp	Zipp silty clay loam, rarely flooded (where drained)

TABLE 6.--LAND CAPABILITY CLASSES AND 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	Land capability	Corn	Soybeans	Winter wheat	Orchardgrass-red clover hay	Tall fescue
		Bu	Bu	Bu	Tons	AUM*
Ab----------------------- Abscota	IVs	---	---	---	2.5	5.0
AvC2--------------------- Alvin-Chelsea	VIs	---	---	---	3.5	7.0
AvE---------------------- Alvin-Chelsea	VIIs	---	---	---	---	---
Ba----------------------- Bartle	IIw	110	35	40	3.0	6.0
Bk----------------------- Birds	IIIw	115	38	---	4.2	6.8
Bo----------------------- Bonnie	IIIw	110	36	---	4.0	6.6
Bu----------------------- Burnside	IIs	90	31	---	3.0	6.0
CaB---------------------- Camden	IIe	125	39	45	4.4	8.4
CnB---------------------- Cincinnati	IIe	110	35	35	4.0	8.0
CrC---------------------- Crider	IIIe	115	40	35	4.5	9.0
FbD---------------------- Fairpoint	VIIe	---	---	---	---	---
FcC---------------------- Fairpoint	IVs	---	---	---	2.0	4.0
HaD---------------------- Hagerstown	IVe	70	---	---	3.0	6.0
Hd----------------------- Haymond	IIw	110	39	---	3.7	8.0
HoB---------------------- Hosmer	IIe	105	40	45	3.0	6.0
JoA---------------------- Johnsburg	IIw	110	35	40	3.3	6.6
MaB---------------------- Markland	IIIe	100	35	40	2.6	5.2
McC3--------------------- Markland	VIe	---	---	---	---	---
MdA---------------------- Martinsville	I	120	42	48	4.0	8.0

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Winter wheat	Orchardgrass-red clover hay	Tall fescue
		Bu	Bu	Bu	Tons	AUM*
MgA------------------------ McGary	IIw	100	35	40	2.3	4.6
NeE------------------------ Negley	VIe	---	---	---	---	---
Nm------------------------- Newark	IIw	125	40	---	4.5	9.0
No------------------------- Nolin	IIw	125	45	---	4.0	8.0
PaC2----------------------- Parke	IIIe	105	37	42	3.4	6.8
PaD2----------------------- Parke	IVe	90	32	36	3.0	6.0
PeB------------------------ Pekin	IIe	105	37	47	3.4	6.8
PkB------------------------ Pike	IIe	120	42	48	4.0	8.0
UhD**. Udorthents						
Up**. Udorthents-Pits						
Wa------------------------- Wakeland	IIw	125	45	---	4.4	8.8
WeB------------------------ Wellston	IIe	110	38	48	4.0	8.0
WeC2----------------------- Wellston	IIIe	100	---	40	4.0	---
WeD2----------------------- Wellston	IVe	80	28	32	3.0	6.0
WeD3----------------------- Wellston	VIe	---	---	---	---	---
WgG------------------------ Wellston-Berks-Gilpin	VIIe	---	---	---	---	---
WlD------------------------ Wellston-Ebal	IVe	---	---	33	3.0	6.0
WnE------------------------ Wellston-Gilpin	VIe	---	---	---	---	---
WpD------------------------ Wellston-Udorthents	VIe	---	---	---	---	5.0
Wr------------------------- Wilbur	IIw	125	44	50	4.1	8.2
Wt------------------------- Wirt	IIw	95	32	---	3.2	6.4

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Winter wheat	Orchardgrass-red clover hay	Tall fescue
		Bu	Bu	Bu	Tons	AUM*
ZaB----------------------- Zanesville	IIe	110	35	45	3.5	7.0
ZaC2---------------------- Zanesville	IIIe	75	30	30	3.5	7.0
ZaC3---------------------- Zanesville	IVe	60	---	---	---	5.0
ZnB----------------------- Zanesville-Udorthents	IIIe	---	---	---	---	---
ZnC----------------------- Zanesville-Udorthents	IVe	---	---	---	---	---
Zp------------------------ Zipp	IIIw	105	37	42	3.4	6.8

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.
** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--CAPABILITY CLASSES AND SUBCLASSES

[Miscellaneous areas are excluded. Absence of an entry indicates no acreage]

Class	Total acreage	Major management concerns (Subclass)			
		Erosion (e)	Wetness (w)	Soil problem (s)	Climate (c)
		Acres	Acres	Acres	Acres
I	870	---	---	---	---
II	46,680	17,230	25,800	3,650	---
III	27,040	23,750	3,290	---	---
IV	20,695	19,990	---	705	---
V	---	---	---	---	---
VI	44,210	42,460	---	1,750	---
VII	76,520	75,170	---	1,350	---
VIII	---	---	---	---	---

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
Ab----------------- Abscota	5S	Slight	Slight	Moderate	Slight	Northern red oak---- White ash----------- Silver maple-------- Eastern cottonwood-- American sycamore---	83 80 --- --- ---	Eastern white pine, yellow-poplar.
AvC2*:								
Alvin-------------	4A	Slight	Slight	Slight	Slight	White oak----------- Northern red oak---- Black walnut-------- Yellow-poplar-------	80 80 --- 90	Green ash, black walnut, yellow-poplar, white oak, eastern white pine, American sycamore, sugar maple.
Chelsea-----------	3S	Slight	Slight	Moderate	Slight	White oak-----------	55	Eastern white pine, European larch, red pine, jack pine.
AvE*:								
Alvin-------------	4R	Moderate	Moderate	Slight	Slight	White oak----------- Northern red oak---- Black walnut-------- Yellow-poplar-------	80 80 --- 90	Green ash, black walnut, yellow-poplar, white oak, eastern white pine, American sycamore, sugar maple.
Chelsea-----------	3R	Moderate	Severe	Moderate	Slight	White oak-----------	55	Eastern white pine, European larch, red pine, jack pine.
Ba----------------- Bartle	4A	Slight	Slight	Slight	Slight	White oak----------- Pin oak------------- Yellow-poplar------- Sweetgum------------	75 85 85 80	Eastern white pine, baldcypress, white ash, red maple, yellow-poplar, American sycamore.
Bk----------------- Birds	5W	Slight	Severe	Moderate	Moderate	Pin oak------------- Eastern cottonwood-- Sweetgum------------ Cherrybark oak------ American sycamore---	90 100 --- --- ---	Eastern cottonwood, red maple, American sycamore, baldcypress.
Bo----------------- Bonnie	5W	Slight	Severe	Severe	Severe	Pin oak------------- Eastern cottonwood-- Sweetgum------------ Cherrybark oak------ American sycamore---	90 100 --- --- ---	Eastern cottonwood, red maple, American sycamore, sweetgum, baldcypress, pin oak.
Bu----------------- Burnside	7A	Slight	Slight	Slight	Slight	Yellow-poplar------- Eastern cottonwood-- American sycamore--- Cherrybark oak------ Sweetgum------------ Southern red oak----	95 105 --- --- --- ---	Black walnut, American sycamore, eastern cottonwood, pin oak, red maple.
CaB---------------- Camden	7A	Slight	Slight	Slight	Slight	Yellow-poplar------- White oak----------- Northern red oak---- Sweetgum------------ Green ash-----------	95 85 85 80 76	White oak, black walnut, green ash, eastern white pine, red pine, yellow-poplar, white ash.

See footnote at end of table.

TABLE 8.--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
CnB----------------- Cincinnati	4A	Slight	Slight	Slight	Slight	Northern red oak---- White oak----------- Black walnut-------- Black cherry-------- Sugar maple--------- White ash----------- Yellow-poplar-------	80 --- --- --- --- --- ---	Eastern white pine, black walnut, yellow-poplar, white ash, red pine, northern red oak, white oak.
CrC----------------- Crider	8A	Slight	Slight	Slight	Slight	Yellow-poplar------- Sugar maple--------- Black oak----------- White ash----------- Virginia pine------- Black walnut-------- White oak----------- Hickory------------- Eastern redcedar---- Black cherry--------	102 --- 87 --- 77 --- --- --- --- ---	Eastern white pine, yellow-poplar, black walnut, white ash, northern red oak, white oak, shortleaf pine.
FbD, FcC----------- Fairpoint	---	--------	--------	--------	--------		---	Eastern white pine, yellow-poplar, white spruce, blue spruce.
HaD----------------- Hagerstown	5C	Moderate	Severe	Slight	Slight	Northern red oak---- Yellow-poplar-------	85 95	Black walnut, yellow-poplar, eastern white pine.
Hd------------------ Haymond	8A	Slight	Slight	Slight	Slight	Yellow-poplar------- White oak----------- Black walnut--------	100 90 70	Eastern white pine, black walnut, yellow-poplar.
HoB----------------- Hosmer	4A	Slight	Slight	Slight	Moderate	White oak----------- Yellow-poplar------- Virginia pine------- Sugar maple---------	75 90 75 75	Eastern white pine, shortleaf pine, red pine, yellow-poplar, white ash.
JoA----------------- Johnsburg	4D	Slight	Slight	Moderate	Moderate	White oak----------- Northern red oak---- Pin oak------------- Yellow-poplar------- Sweetgum------------	70 75 85 85 80	Eastern white pine, baldcypress, white ash, red maple, yellow-poplar, American sycamore.
MaB, McC3---------- Markland	4C	Slight	Slight	Severe	Severe	White oak----------- Northern red oak----	75 78	Eastern white pine, red pine, yellow-poplar, white ash.
MdA----------------- Martinsville	4A	Slight	Slight	Slight	Slight	White oak----------- Yellow-poplar------- Sweetgum------------	80 98 76	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
MgA----------------- McGary	5C	Slight	Slight	Moderate	Severe	Pin oak------------- Sweetgum------------ White oak----------- White ash----------- Red maple-----------	85 90 75 --- ---	Eastern white pine, baldcypress, white ash, red maple, yellow-poplar, American sycamore.

See footnote at end of table.

TABLE 8.--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
NeE: Negley	7R	Moderate	Moderate	Slight	Slight	Yellow-poplar	99	Eastern white pine, yellow-poplar, red pine, white ash, white oak, northern red oak.
						Northern red oak	94	
						White oak	---	
						Black cherry	---	
						Sugar maple	---	
						White ash	---	
						Black walnut	---	
Nm: Newark	5W	Slight	Moderate	Slight	Moderate	Pin oak	96	Eastern cottonwood, sweetgum, American sycamore.
						Eastern cottonwood	89	
						Sweetgum	85	
						Green ash	---	
						Cherrybark oak	---	
						Shumard oak	---	
						Overcup oak	---	
No: Nolin	8W	Slight	Moderate	Slight	Slight	Sweetgum	92	Sweetgum.
						Cherrybark oak	97	
						Eastern cottonwood	---	
						River birch	---	
						Black willow	---	
						American sycamore	---	
PaC2, PaD2: Parke	5A	Slight	Slight	Slight	Slight	White oak	90	Eastern white pine, red pine, black walnut, yellow-poplar, white ash, northern red oak, green ash, black cherry, American sycamore, eastern cottonwood, white oak.
						Yellow-poplar	98	
PeB: Pekin	4A	Slight	Slight	Slight	Slight	White oak	70	Eastern white pine, shortleaf pine, red pine, yellow-poplar, white ash.
						Yellow-poplar	85	
						Virginia pine	75	
						Sugar maple	75	
PkB: Pike	5A	Slight	Slight	Slight	Slight	White oak	90	Eastern white pine, red pine, black walnut, yellow-poplar, white ash.
						Yellow-poplar	98	
						Sweetgum	76	
Wa: Wakeland	5A	Slight	Slight	Slight	Slight	Pin oak	90	Eastern white pine, baldcypress, American sycamore, red maple, white ash.
						Sweetgum	88	
						Yellow-poplar	90	
						Virginia pine	85	
WeB, WeC2, WeD2, WeD3: Wellston	4A	Slight	Slight	Slight	Slight	Northern red oak	71	Eastern white pine, black walnut, yellow-poplar, white oak, northern red oak, white ash, red pine, green ash, black cherry, American sycamore.
						Yellow-poplar	90	
						Virginia pine	70	
						White oak	---	
						Black walnut	---	
						Black cherry	---	
						Sugar maple	---	
						White ash	---	

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
WgG*:								
Wellston	4R	Severe	Severe	Slight	Slight	Northern red oak Yellow-poplar Virginia pine White oak Black walnut Black cherry Sugar maple White ash	71 90 70 --- --- --- --- ---	Eastern white pine, black walnut, yellow-poplar, white oak, northern red oak, white spruce, white ash, red pine, green ash, black cherry, American sycamore.
Berks	4R	Moderate	Severe	Moderate	Slight	Northern red oak Black oak Virginia pine	70 70 70	Virginia pine, eastern white pine, Japanese larch, red pine.
Gilpin	4R	Severe	Severe	Slight	Slight	Northern red oak Yellow-poplar	80 95	Japanese larch, Virginia pine, eastern white pine, black cherry, yellow-poplar.
WlD*:								
Wellston	4A	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar Virginia pine White oak Black walnut Black cherry Sugar maple White ash	71 90 70 --- --- --- --- ---	Eastern white pine, black walnut, yellow-poplar, white oak, northern red oak, Scotch pine, white ash, red pine, green ash, black cherry, American sycamore.
Ebal	4C	Slight	Slight	Moderate	Moderate	Black oak Northern red oak Yellow-poplar	80 --- ---	Yellow-poplar, eastern cottonwood, American sycamore, pin oak, Austrian pine, green ash, red maple, black oak.
WnE*:								
Wellston	4R	Moderate	Moderate	Slight	Slight	Northern red oak Yellow-poplar Virginia pine White oak Black walnut Black cherry Sugar maple White ash	71 90 70 --- --- --- --- ---	Eastern white pine, black walnut, yellow-poplar, white oak, northern red oak, Scotch pine, white ash, red pine, green ash, black cherry, American sycamore.
Gilpin	4R	Moderate	Moderate	Slight	Slight	Northern red oak Yellow-poplar	80 95	Japanese larch, Virginia pine, eastern white pine, black cherry, yellow-poplar.
WpD*:								
Wellston	4A	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar Virginia pine White oak Black walnut Black cherry Sugar maple White ash	71 90 70 --- --- --- --- ---	Eastern white pine, black walnut, yellow-poplar, white oak, northern red oak, white ash, red pine, green ash, black cherry, American sycamore.

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
WpD*: Udorthents.								
Wr----------------- Wilbur	8A	Slight	Slight	Slight	Slight	Yellow-poplar-------	100	Eastern white pine, black walnut, yellow-poplar.
Wt----------------- Wirt	7A	Slight	Slight	Slight	Slight	Yellow-poplar-------	95	Eastern white pine, black walnut, yellow-poplar.
ZaB, ZaC2---------- Zanesville	4A	Slight	Slight	Slight	Slight	Northern red oak---- Virginia pine-------	68 70	Virginia pine, eastern white pine, shortleaf pine.
ZaC3--------------- Zanesville	3A	Slight	Slight	Moderate	Slight	Northern red oak---- Virginia pine-------	60 70	Virginia pine, shortleaf pine, eastern white pine.
ZnB*, ZnC*: Zanesville--------	4A	Slight	Slight	Slight	Slight	Northern red oak---- Virginia pine-------	68 70	Virginia pine, shortleaf pine, eastern white pine.
Udorthents.								
Zp----------------- Zipp	5W	Slight	Severe	Severe	Severe	Pin oak------------- White oak----------- Sweetgum------------	86 75 90	Eastern white pine, baldcypress, red maple, white ash, sweetgum.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

[The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil]

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Ab----------------- Abscota	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Washington hawthorn, white fir, blue spruce, northern white-cedar, Austrian pine, Norway spruce.	Eastern white pine.	Pin oak.
AvC2*:					
Alvin-------------	---	Amur privet, Washington hawthorn, Amur honeysuckle, American cranberrybush, Tatarian honeysuckle.	Austrian pine, northern white-cedar, osageorange, eastern redcedar.	Eastern white pine, red pine, Norway spruce.	---
Chelsea-----------	Siberian peashrub	Eastern redcedar, radiant crabapple, Washington hawthorn, autumn-olive, Amur honeysuckle, lilac, Tatarian honeysuckle.	Austrian pine, jack pine, red pine.	Eastern white pine	---
AvE*:					
Alvin-------------	---	Amur privet, Washington hawthorn, Amur honeysuckle, American cranberrybush, Tatarian honeysuckle.	Austrian pine, northern white-cedar, osage-orange, eastern redcedar.	Eastern white pine, red pine, Norway spruce.	---
Chelsea-----------	Siberian peashrub	Eastern redcedar, radiant crabapple, Washington hawthorn, autumn-olive, Amur honeysuckle, lilac, Tatarian honeysuckle.	Austrian pine, jack pine, red pine.	Eastern white pine	---
Ba----------------- Bartle	---	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, Amur honeysuckle, Tatarian honeysuckle, American cranberrybush.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Bk: Birds	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Washington hawthorn, white fir, blue spruce, northern white-cedar, Austrian pine, Norway spruce.	Eastern white pine	Pin oak.
Bo: Bonnie	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	White fir, blue spruce, Washington hawthorn, northern white-cedar, Austrian pine, Norway spruce.	Eastern white pine	Pin oak.
Bu: Burnside	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
CaB: Camden	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
CnB: Cincinnati	---	Eastern redcedar, Washington hawthorn, Tatarian honeysuckle, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Green ash, Austrian pine, osageorange.	Pin oak, eastern white pine.	---
CrC: Crider	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
FbD, FcC. Fairpoint					
HaD: Hagerstown	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
Hd------------------- Haymond	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
HoB------------------ Hosmer	---	Eastern redcedar, arrowwood, Washington hawthorn, Tatarian honeysuckle, Amur privet, American cranberrybush, Amur honeysuckle.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
JoA------------------ Johnsburg	---	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, Amur honeysuckle, Tatarian honeysuckle, American cranberrybush.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
MaB, McC3------------ Markland	---	Arrowwood, Washington hawthorn, eastern redcedar, Amur honeysuckle, American cranberrybush, Tatarian honeysuckle, Amur privet.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
MdA------------------ Martinsville	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
MgA------------------ McGary	---	Eastern redcedar, arrowwood, Washington hawthorn, Amur privet, Amur honeysuckle, American cranberrybush, Tatarian honeysuckle.	Green ash, Austrian pine, osageorange.	Eastern white pine, pin oak.	---
NeE------------------ Negley	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of-- <8	8-15	16-25	26-35	>35
Nm: Newark	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Eastern white pine.	Pin oak.
No: Nolin	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn, Austrian pine.	Norway spruce	Eastern white pine, pin oak.
PaC2, PaD2: Parke	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, northern white-cedar, blue spruce, white fir.	Austrian pine, Norway spruce.	Pin oak, eastern white pine.
PeB: Pekin	---	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, Amur honeysuckle, Tatarian honeysuckle, American cranberrybush.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
PkB: Pike	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, northern white-cedar, blue spruce, white fir.	Austrian pine, Norway spruce.	Pin oak, eastern white pine.
UhD*. Udorthents					
Up*: Udorthents.					
Pits.					
Wa: Wakeland	---	Amur honeysuckle, silky dogwood, Amur privet, American cranberrybush, silky dogwood.	Northern white-cedar, Austrian pine, white fir, blue spruce, Washington hawthorn.	---	Eastern white pine, pin oak.
WeB, WeC2, WeD2, WeD3: Wellston	---	Amur honeysuckle, Amur privet, American cranberrybush, silky dogwood.	White fir, northern white-cedar, blue spruce, Washington hawthorn.	Norway spruce, Austrian pine.	Pin oak, eastern white pine.

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
WgG*:					
Wellston	---	Amur honeysuckle, Amur privet, American cranberrybush, silky dogwood.	White fir, northern white-cedar, blue spruce, Washington hawthorn.	Norway spruce, Austrian pine.	Pin oak, eastern white pine.
Berks	Siberian peashrub	Tatarian honeysuckle, Amur honeysuckle, lilac, autumn-olive, Washington hawthorn, radiant crabapple, eastern redcedar.	Jack pine, Austrian pine, red pine, eastern white pine.	---	---
Gilpin	Siberian peashrub	Tatarian honeysuckle, Amur honeysuckle, lilac, autumn-olive, Washington hawthorn, radiant crabapple, eastern redcedar.	Jack pine, Austrian pine, red pine, eastern white pine.	---	---
WlD*:					
Wellston	---	Amur honeysuckle, Amur privet, American cranberrybush, silky dogwood.	White fir, northern white-cedar, blue spruce, Washington hawthorn.	Norway spruce, Austrian pine.	Pin oak, eastern white pine.
Ebal	---	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, Amur honeysuckle, Tatarian honeysuckle, American cranberrybush.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
WnE*:					
Wellston	---	Amur honeysuckle, Amur privet, American cranberrybush, silky dogwood.	White fir, northern white-cedar, blue spruce, Washington hawthorn.	Norway spruce, Austrian pine.	Pin oak, eastern white pine.
Gilpin	Siberian peashrub	Tatarian honeysuckle, Amur honeysuckle, lilac, autumn-olive, Washington hawthorn, radiant crabapple, eastern redcedar.	Jack pine, Austrian pine, red pine, eastern white pine.	---	---

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
WpD*:					
Wellston	---	Amur honeysuckle, Amur privet, American cranberrybush, silky dogwood.	White fir, northern white-cedar, blue spruce, Washington hawthorn.	Norway spruce, Austrian pine.	Pin oak, eastern white pine.
Udorthents.					
Wr: Wilbur	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
Wt: Wirt	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
ZaB, ZaC2, ZaC3: Zanesville	---	American cranberrybush, Amur honeysuckle, Tatarian honeysuckle, Amur privet, arrowwood, Washington hawthorn, eastern redcedar.	Hackberry, osageorange, Austrian pine.	Pin oak, eastern white pine.	---
ZnB*, ZnC*:					
Zanesville	---	American cranberrybush, Amur honeysuckle, Tatarian honeysuckle, Amur privet, arrowwood, Washington hawthorn, eastern redcedar.	Hackberry, osageorange, Austrian pine.	Pin oak, eastern white pine.	---
Udorthents.					
Zp: Zipp	---	Amur honeysuckle, silky dogwood, Amur privet, American cranberrybush.	Northern white-cedar, Norway spruce, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Ab: Abscota	Severe: flooding, too sandy.	Severe: too sandy.	Severe: too sandy, flooding.	Severe: too sandy.	Severe: flooding.
AvC2*:					
Alvin	Slight	Slight	Severe: slope.	Slight	Slight.
Chelsea	Slight	Slight	Severe: slope.	Slight	Moderate: droughty.
AvE*:					
Alvin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Chelsea	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Ba: Bartle	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
Bk: Birds	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding, flooding.	Severe: ponding.	Severe: ponding, flooding.
Bo: Bonnie	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding, flooding.	Severe: ponding.	Severe: ponding, flooding.
Bu: Burnside	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: large stones, flooding.
CaB: Camden	Slight	Slight	Moderate: slope.	Slight	Slight.
CnB: Cincinnati	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
CrC: Crider	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
FbD: Fairpoint	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, erodes easily.	Severe: small stones, droughty, slope.
FcC: Fairpoint	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Severe: droughty.
HaD: Hagerstown	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Hd------------------- Haymond	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
HoB------------------ Hosmer	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Severe: erodes easily.	Slight.
JoA------------------ Johnsburg	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
MaB------------------ Markland	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight----------	Slight.
McC3----------------- Markland	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
MdA------------------ Martinsville	Slight----------	Slight----------	Moderate: small stones.	Slight----------	Slight.
MgA------------------ McGary	Severe: flooding, wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
NeE------------------ Negley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Nm------------------- Newark	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness, erodes easily.	Severe: wetness, flooding.
No------------------- Nolin	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
PaC2----------------- Parke	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
PaD2----------------- Parke	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
PeB------------------ Pekin	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Slight----------	Slight.
PkB------------------ Pike	Slight----------	Slight----------	Moderate: slope.	Slight----------	Slight.
UhD*. Udorthents					
Up*: Udorthents.					
Pits.					
Wa------------------- Wakeland	Severe: flooding, wetness.	Moderate: flooding, wetness.	Severe: wetness, flooding.	Moderate: flooding, wetness.	Severe: flooding.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
WeB------------------- Wellston	Slight----------	Slight----------	Moderate: slope.	Severe: erodes easily.	Slight.
WeC2, WeD2, WeD3------ Wellston	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
WgG*:					
Wellston-------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Berks----------------	Severe: slope, small stones.	Severe: small stones, slope.	Severe: slope, small stones.	Severe: slope.	Severe: small stones, slope.
Gilpin---------------	Severe: slope.	Severe: slope.	Severe: small stones, slope.	Severe: slope.	Severe: slope.
WlD*:					
Wellston-------------	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Ebal-----------------	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Moderate: slope.
WnE*:					
Wellston-------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Gilpin---------------	Severe: slope.	Severe: slope.	Severe: small stones, slope.	Moderate: slope, large stones.	Severe: slope.
WpD*:					
Wellston-------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Udorthents.					
Wr-------------------- Wilbur	Severe: flooding.	Moderate: flooding, wetness.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
Wt-------------------- Wirt	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
ZaB------------------- Zanesville	Moderate: percs slowly, wetness.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: erodes easily.	Slight.
ZaC2, ZaC3------------ Zanesville	Moderate: slope, percs slowly, wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
ZnB*:					
Zanesville-----------	Moderate: percs slowly, wetness.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: erodes easily.	Slight.
Udorthents.					
ZnC*:					
Zanesville-----------	Moderate: slope, percs slowly, wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Udorthents.					
Zp------------------- Zipp	Severe: flooding, ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--WILDLIFE HABITAT

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba-ceous plants	Hardwood trees	Conif-erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Ab----------------- Abscota	Poor	Fair	Good	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
AvC2*:										
Alvin-------------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Chelsea-----------	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
AvE*:										
Alvin-------------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Chelsea-----------	Very poor.	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Ba----------------- Bartle	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Bk----------------- Birds	Good	Fair	Good	Good	Fair	Good	Good	Good	Good	Good.
Bo----------------- Bonnie	Poor	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
Bu----------------- Burnside	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
CaB---------------- Camden	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
CnB---------------- Cincinnati	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
CrC---------------- Crider	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
FbD---------------- Fairpoint	Very poor.	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.
FcC---------------- Fairpoint	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
HaD---------------- Hagerstown	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Hd----------------- Haymond	Poor	Fair	Fair	Good	Good	Poor	Poor	Fair	Good	Poor.
HoB---------------- Hosmer	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
JoA---------------- Johnsburg	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
MaB----------------- Markland	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
McC3---------------- Markland	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
MdA----------------- Martinsville	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
MgA----------------- McGary	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
NeE----------------- Negley	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Nm------------------ Newark	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
No------------------ Nolin	Poor	Fair	Fair	Good	Good	Poor	Very poor.	Fair	Fair	Very poor.
PaC2---------------- Parke	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
PaD2---------------- Parke	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
PeB----------------- Pekin	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
PkB----------------- Pike	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
UhD*. Udorthents										
Up*: Udorthents.										
Pits.										
Wa------------------ Wakeland	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
WeB----------------- Wellston	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
WeC2, WeD2, WeD3--- Wellston	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
WgG*: Wellston----------	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Berks-------------	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Gilpin------------	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba- ceous plants	Hardwood trees	Conif- erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
W1D*:										
Wellston	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Ebal	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
WnE*:										
Wellston	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Gilpin	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
WpD*:										
Wellston	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Udorthents.										
Wr Wilbur	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Wt Wirt	Poor	Fair	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
ZaB Zanesville	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
ZaC2, ZaC3 Zanesville	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
ZnB*:										
Zanesville	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Udorthents.										
ZnC*:										
Zanesville	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Udorthents.										
Zp Zipp	Poor	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 12.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Ab: Abscota	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
AvC2*:						
Alvin	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
Chelsea	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
AvE*:						
Alvin	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Chelsea	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Ba: Bartle	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
Bk: Birds	Severe: ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: low strength, ponding, flooding.	Severe: ponding, flooding.
Bo: Bonnie	Severe: ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: low strength, ponding, flooding.	Severe: ponding, flooding.
Bu: Burnside	Moderate: depth to rock, large stones, wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: large stones, flooding.
CaB: Camden	Slight	Moderate: shrink-swell.	Slight	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
CnB: Cincinnati	Moderate: dense layer, wetness.	Slight	Moderate: wetness.	Moderate: slope.	Severe: low strength, frost action.	Slight.
CrC: Crider	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
FbD: Fairpoint	Severe: slope, slippage.	Severe: slope, slippage.	Severe: slope, slippage.	Severe: slope, slippage.	Severe: slope, slippage.	Severe: small stones, droughty, slope.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
FcC: Fairpoint	Moderate: slope, large stones.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell, large stones.	Severe: slope.	Moderate: slope, frost action, shrink-swell.	Severe: droughty.
HaD: Hagerstown	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Hd: Haymond	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding, frost action.	Severe: flooding.
HoB: Hosmer	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness.	Moderate: shrink-swell, slope.	Severe: frost action.	Slight.
JoA: Johnsburg	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
MaB: Markland	Moderate: too clayey, wetness.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
McC3: Markland	Moderate: too clayey, wetness, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: slope.
MdA: Martinsville	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell.	Moderate: frost action, shrink-swell.	Slight.
MgA: McGary	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, shrink-swell.	Moderate: wetness.
NeE: Negley	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Nm: Newark	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding.
No: Nolin	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Severe: flooding.
PaC2: Parke	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
PaD2: Parke	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
PeB: Pekin	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness, slope.	Severe: low strength, frost action.	Slight.
PkB: Pike	Slight	Slight	Slight	Moderate: slope.	Severe: low strength, frost action.	Slight.
UhD*. Udorthents						
Up*: Udorthents.						
Pits.						
Wa: Wakeland	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Severe: flooding.
WeB: Wellston	Moderate: depth to rock.	Slight	Moderate: depth to rock.	Moderate: slope.	Severe: frost action.	Slight.
WeC2: Wellston	Moderate: depth to rock, slope.	Moderate: slope.	Moderate: depth to rock, slope.	Severe: slope.	Severe: frost action.	Moderate: slope.
WeD2, WeD3: Wellston	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, frost action.	Severe: slope.
WgG*: Wellston	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, frost action.	Severe: slope.
Berks	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
WlD*: Wellston	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: frost action, slope.	Severe: slope.
Ebal	Severe: slope.	Severe: shrink-swell, slope.	Severe: shrink-swell, slope.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell, slope.	Severe: slope.
WnE*: Wellston	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, frost action.	Severe: slope.
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
WpD*:						
Wellston---------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, frost action.	Severe: slope.
Udorthents.						
Wr---------------- Wilbur	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding, frost action.	Severe: flooding.
Wt---------------- Wirt	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
ZaB--------------- Zanesville	Moderate: depth to rock, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: slope, wetness.	Severe: low strength.	Slight.
ZaC2, ZaC3-------- Zanesville	Moderate: slope, wetness, depth to rock.	Moderate: slope, wetness.	Severe: wetness.	Severe: slope.	Severe: low strength.	Moderate: slope.
ZnB*:						
Zanesville-------	Moderate: depth to rock, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: slope, wetness.	Severe: low strength.	Slight.
Udorthents.						
ZnC*:						
Zanesville-------	Moderate: slope, wetness, depth to rock.	Moderate: slope, wetness.	Severe: wetness.	Severe: slope.	Severe: low strength.	Moderate: slope.
Udorthents.						
Zp---------------- Zipp	Severe: ponding.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: low strength, ponding, shrink-swell.	Severe: ponding.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Ab: Abscota	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage, too sandy.	Severe: flooding, seepage.	Poor: seepage, too sandy.
AvC2*:					
Alvin	Slight	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Fair: thin layer.
Chelsea	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy, seepage.
AvE*:					
Alvin	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: slope.
Chelsea	Severe: slope, poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy, slope.	Severe: seepage, slope.	Poor: too sandy, slope, seepage.
Ba: Bartle	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Severe: wetness.	Poor: wetness.
Bk: Birds	Severe: flooding, ponding, percs slowly.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Poor: ponding.
Bo: Bonnie	Severe: flooding, ponding, percs slowly.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Poor: ponding.
Bu: Burnside	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, depth to rock, wetness.	Severe: flooding, wetness.	Poor: small stones.
CaB: Camden	Slight	Moderate: seepage, slope.	Severe: seepage.	Slight	Fair: too clayey.
CnB: Cincinnati	Severe: wetness, percs slowly.	Moderate: slope.	Moderate: wetness, too clayey.	Moderate: wetness.	Fair: too clayey, wetness.
CrC: Crider	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
FbD: Fairpoint	Severe: percs slowly, slope, slippage.	Severe: slope.	Severe: slope, slippage.	Severe: slope.	Poor: small stones, slope.
FcC: Fairpoint	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey, large stones.	Moderate: slope.	Poor: small stones.
HaD: Hagerstown	Severe: slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
Hd: Haymond	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Good.
HoB: Hosmer	Severe: wetness, percs slowly.	Moderate: slope.	Moderate: wetness, too clayey.	Moderate: wetness.	Fair: too clayey, wetness.
JoA: Johnsburg	Severe: wetness, percs slowly.	Slight	Severe: depth to rock, wetness.	Severe: wetness.	Poor: wetness.
MaB: Markland	Severe: wetness, percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
McC3: Markland	Severe: wetness, percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
MdA: Martinsville	Slight	Severe: seepage.	Severe: seepage.	Slight	Fair: thin layer.
MgA: McGary	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
NeE: Negley	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: slope.
Nm: Newark	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
No: Nolin	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey.
PaC2: Parke	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
PaD2: Parke	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
PeB------------------ Pekin	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
PkB------------------ Pike	Slight-----------	Moderate: seepage, slope.	Severe: seepage.	Slight-----------	Fair: too clayey.
UhD*. Udorthents					
Up*: Udorthents.					
Pits.					
Wa------------------- Wakeland	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
WeB------------------ Wellston	Moderate: depth to rock, percs slowly.	Moderate: seepage, depth to rock, slope.	Severe: depth to rock.	Moderate: depth to rock.	Fair: depth to rock, too clayey.
WeC2----------------- Wellston	Moderate: depth to rock, percs slowly, slope.	Severe: slope.	Severe: depth to rock.	Moderate: depth to rock, slope.	Fair: depth to rock, too clayey, slope.
WeD2, WeD3---------- Wellston	Severe: slope.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Poor: slope.
WgG*:					
Wellston-----------	Severe: slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.
Berks--------------	Severe: slope, depth to rock.	Severe: slope, seepage, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage, depth to rock.	Poor: slope, small stones, area reclaim.
Gilpin-------------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Poor: slope, area reclaim, thin layer.
WlD*:					
Wellston-----------	Severe: slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.
Ebal---------------	Severe: wetness, percs slowly, slope.	Severe: slope, wetness.	Severe: depth to rock, too clayey, slope.	Severe: slope.	Poor: slope.
WnE*:					
Wellston-----------	Severe: slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
WnE*:					
Gilpin	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Poor: slope, area reclaim, thin layer.
WpD*:					
Wellston	Severe: slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.
Udorthents.					
Wr Wilbur	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
Wt Wirt	Severe: flooding.	Severe: seepage, flooding.	Severe: seepage, flooding.	Severe: flooding, seepage.	Good.
ZaB Zanesville	Severe: percs slowly, wetness.	Severe: wetness.	Severe: depth to rock.	Moderate: depth to rock, wetness.	Fair: too clayey, area reclaim.
ZaC2, ZaC3 Zanesville	Severe: percs slowly, wetness.	Severe: slope, wetness.	Severe: depth to rock.	Moderate: depth to rock, slope, wetness.	Fair: slope, too clayey, area reclaim.
ZnB*:					
Zanesville	Severe: percs slowly, wetness.	Severe: wetness.	Severe: depth to rock.	Moderate: depth to rock, wetness.	Fair: too clayey, area reclaim.
Udorthents.					
ZnC*:					
Zanesville	Severe: percs slowly, wetness.	Severe: slope, wetness.	Severe: depth to rock.	Moderate: depth to rock, slope, wetness.	Fair: slope, too clayey, area reclaim.
Udorthents.					
Zp Zipp	Severe: ponding, percs slowly.	Slight	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Ab------------------- Abscota	Good	Probable	Improbable: too sandy.	Poor: too sandy.
AvC2*:				
Alvin	Good	Probable	Improbable: too sandy.	Fair: too sandy.
Chelsea	Good	Probable	Improbable: too sandy.	Fair: too sandy.
AvE*:				
Alvin	Poor: slope.	Probable	Improbable: too sandy.	Poor: slope.
Chelsea	Poor: slope.	Probable	Improbable: too sandy.	Poor: slope.
Ba------------------- Bartle	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Bk------------------- Birds	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Bo------------------- Bonnie	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Bu------------------- Burnside	Fair: depth to rock, thin layer, large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: small stones, area reclaim.
CaB------------------ Camden	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
CnB------------------ Cincinnati	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones.
CrC------------------ Crider	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
FbD------------------ Fairpoint	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
FcC------------------ Fairpoint	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
HaD: Hagerstown	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Hd: Haymond	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
HoB: Hosmer	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
JoA: Johnsburg	Fair: area reclaim, low strength, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
MaB, McC3: Markland	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
MdA: Martinsville	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
MgA: McGary	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
NeE: Negley	Poor: slope.	Probable	Probable	Poor: small stones, slope.
Nm: Newark	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
No: Nolin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
PaC2: Parke	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
PaD2: Parke	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
PeB: Pekin	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
PkB: Pike	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
UhD*. Udorthents				
Up*: Udorthents.				
Pits.				

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Wa-------------------- Wakeland	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
WeB, WeC2, WeD2, WeD3- Wellston	Fair: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
WgG*:				
Wellston-------------	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Berks----------------	Poor: slope, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
Gilpin---------------	Poor: thin layer, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
WlD*:				
Wellston-------------	Fair: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Ebal-----------------	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
WnE*:				
Wellston-------------	Fair: depth to rock, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Gilpin---------------	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
WpD*:				
Wellston-------------	Fair: depth to rock, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Udorthents.				
Wr-------------------- Wilbur	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Wt-------------------- Wirt	Good----------------	Improbable: excess fines.	Improbable: excess fines.	Good.
ZaB, ZaC2, ZaC3------- Zanesville	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
ZnB*, ZnC*:				
Zanesville-----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
ZnB*, ZnC*: Udorthents.				
Zp------------------- Zipp	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
Ab: Abscota	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Droughty.
AvC2*:						
Alvin	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Soil blowing	Favorable.
Chelsea	Severe: seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Droughty.
AvE*:						
Alvin	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, soil blowing.	Slope.
Chelsea	Severe: slope, seepage.	Severe: piping, seepage.	Severe: no water.	Deep to water	Slope, too sandy, soil blowing.	Slope, droughty.
Ba: Bartle	Moderate: seepage.	Moderate: piping, wetness.	Severe: no water.	Percs slowly, frost action.	Erodes easily, wetness, rooting depth.	Wetness, erodes easily, rooting depth.
Bk: Birds	Slight	Severe: ponding.	Severe: slow refill.	Ponding, flooding, frost action.	Erodes easily, ponding.	Wetness, erodes easily.
Bo: Bonnie	Slight	Severe: ponding.	Severe: slow refill.	Ponding, flooding, frost action.	Erodes easily, ponding.	Wetness, erodes easily.
Bu: Burnside	Moderate: seepage, depth to rock.	Severe: large stones.	Moderate: deep to water, slow refill, large stones.	Deep to water	Large stones, erodes easily.	Large stones, erodes easily.
CaB: Camden	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
CnB: Cincinnati	Moderate: seepage, slope.	Severe: thin layer.	Severe: no water.	Percs slowly, frost action, slope.	Erodes easily, wetness.	Erodes easily, rooting depth.
CrC: Crider	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Slope	Slope.
FbD: Fairpoint	Severe: slope, slippage.	Severe: piping.	Severe: no water.	Deep to water	Slope, large stones, erodes easily.	Large stones, slope, erodes easily.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
FcC--------------- Fairpoint	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, large stones, erodes easily.	Large stones, slope, erodes easily.
HaD--------------- Hagerstown	Severe: slope.	Moderate: hard to pack.	Severe: no water.	Deep to water	Slope----------	Slope.
Hd---------------- Haymond	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
HoB--------------- Hosmer	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Percs slowly, frost action, slope.	Erodes easily, wetness.	Erodes easily, rooting depth.
JoA--------------- Johnsburg	Moderate: seepage, depth to rock.	Severe: piping.	Severe: no water.	Percs slowly, frost action.	Erodes easily, wetness, rooting depth.	Wetness, erodes easily, rooting depth.
MaB--------------- Markland	Moderate: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Erodes easily, percs slowly.	Erodes easily, percs slowly.
McC3-------------- Markland	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
MdA--------------- Martinsville	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
MgA--------------- McGary	Slight---------	Severe: wetness.	Severe: slow refill.	Percs slowly---	Erodes easily, wetness, percs slowly.	Wetness, erodes easily.
NeE--------------- Negley	Severe: seepage, slope.	Moderate: thin layer.	Severe: no water.	Deep to water	Slope----------	Slope.
Nm---------------- Newark	Moderate: seepage.	Severe: piping, wetness.	Moderate: slow refill.	Flooding, frost action.	Erodes easily, wetness.	Wetness, erodes easily.
No---------------- Nolin	Severe: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Deep to water	Erodes easily	Erodes easily.
PaC2, PaD2-------- Parke	Severe: slope.	Slight---------	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
PeB--------------- Pekin	Moderate: seepage, slope.	Severe: piping.	Severe: slow refill.	Percs slowly, frost action, slope.	Erodes easily, wetness.	Erodes easily, rooting depth.
PkB--------------- Pike	Moderate: seepage, slope.	Moderate: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
UhD*. Udorthents						
Up*: Udorthents.						

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
Up*: Pits.						
Wa: Wakeland	Moderate: seepage.	Severe: piping, wetness.	Moderate: slow refill.	Flooding, frost action.	Erodes easily, wetness.	Wetness, erodes easily.
WeB: Wellston	Moderate: seepage, depth to rock, slope.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
WeC2, WeD2, WeD3: Wellston	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
WgG*: Wellston	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
Berks	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Depth to rock, slope, large stones.	Droughty, depth to rock, slope.
Gilpin	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock, large stones.	Slope, depth to rock, large stones.
WlD*: Wellston	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
Ebal	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope, erodes easily, percs slowly.	Slope, erodes easily, rooting depth.
WnE*: Wellston	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
Gilpin	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock, large stones.	Slope, depth to rock, large stones.
WpD*: Wellston	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
Udorthents.						
Wr: Wilbur	Moderate: seepage.	Severe: piping, wetness.	Moderate: slow refill.	Flooding, frost action.	Erodes easily, wetness.	Erodes easily.
Wt: Wirt	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Soil blowing	Favorable.
ZaB: Zanesville	Moderate: depth to rock, seepage.	Severe: piping.	Severe: no water.	Percs slowly, slope.	Erodes easily, wetness, rooting depth.	Erodes easily, rooting depth.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
ZaC2, ZaC3: Zanesville	Moderate: depth to rock, seepage.	Severe: piping.	Severe: no water.	Percs slowly, slope.	Slope, erodes easily, wetness.	Slope, erodes easily, rooting depth.
ZnB*:						
Zanesville	Moderate: depth to rock, seepage.	Severe: piping.	Severe: no water.	Percs slowly, slope.	Erodes easily, wetness, rooting depth.	Erodes easily, rooting depth.
Udorthents.						
ZnC*:						
Zanesville	Moderate: depth to rock, seepage.	Severe: piping.	Severe: no water.	Percs slowly, slope.	Slope, erodes easily, wetness.	Slope, erodes easily, rooting depth.
Udorthents.						
Zp: Zipp	Slight	Severe: ponding.	Severe: slow refill.	Ponding, percs slowly.	Ponding, percs slowly.	Wetness, percs slowly.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Ab------------- Abscota	0-8	Loamy sand-------	SM	A-2-4, A-3	0	95-100	95-100	50-75	15-30	<20	NP-4
	8-60	Loamy sand, loamy fine sand, sand.	SP, SM, SP-SM	A-2-4, A-1, A-3	0	95-100	95-100	45-75	3-30	<20	NP-4
AvC2*:											
Alvin-----------	0-12	Loamy fine sand	SM	A-2	0	100	100	50-75	15-30	<20	NP-4
	12-70	Very fine sandy loam, sandy loam, sandy clay loam.	SM, SC, CL, ML	A-2, A-4, A-6	0	100	100	90-100	20-80	15-38	NP-13
	70-80	Stratified sandy loam to fine sand.	SM, SP, SP-SM	A-2, A-3	0-5	95-100	90-100	70-95	4-35	<20	NP-4
Chelsea---------	0-30	Loamy fine sand, fine sand.	SM, SP-SM	A-2-4	0	100	100	65-80	10-35	---	NP
	30-80	Fine sand, sand, loamy sand.	SP, SM, SP-SM	A-3, A-2-4	0	100	100	65-80	3-15	---	NP
AvE*:											
Alvin-----------	0-12	Loamy fine sand	SM	A-2	0	100	100	50-75	15-30	<20	NP-4
	12-42	Very fine sandy loam, sandy loam, sandy clay loam.	SM, SC, CL, ML	A-2, A-4, A-6	0	100	100	65-100	20-80	15-38	NP-13
	42-80	Stratified sandy loam to fine sand.	SM, SP, SP-SM	A-2, A-3	0-5	95-100	90-100	70-95	4-35	<20	NP-4
Chelsea---------	0-29	Loamy fine sand	SM, SP-SM	A-2-4	0	100	100	65-80	10-35	---	NP
	29-80	Fine sand, sand, loamy sand.	SP, SM, SP-SM	A-3, A-2-4	0	100	100	65-80	3-15	---	NP
Ba------------- Bartle	0-10	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	85-100	65-90	20-35	5-15
	10-24	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
	24-53	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	90-100	70-95	30-45	10-25
	53-80	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	70-95	30-45	10-25
Bk------------- Birds	0-6	Silt loam--------	CL	A-4, A-6	0	100	95-100	90-100	80-100	24-34	8-15
	6-60	Silt loam--------	CL	A-4, A-6	0	100	95-100	90-100	80-100	24-34	8-15
Bo------------- Bonnie	0-9	Silt loam--------	CL	A-4, A-6	0	100	100	95-100	90-100	27-34	8-12
	9-60	Silt loam--------	CL	A-4, A-6	0	100	100	95-100	90-100	27-34	8-12
Bu------------- Burnside	0-16	Loam-------------	ML, CL, CL-ML	A-4	0-10	100	100	80-95	75-95	20-35	2-10
	16-42	Very channery loam, flaggy sandy loam, very gravelly loam.	SC, GC, SM, GM	A-2, A-4	10-60	35-80	30-60	30-50	26-45	<20	NP-10
	42	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--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	
CaB-------------- Camden	0-10	Silt loam--------	CL, ML, CL-ML	A-4, A-6	0	100	100	95-100	90-100	20-35	3-15
	10-33	Silt loam, silty clay loam.	CL	A-6	0	100	100	95-100	90-100	25-40	15-25
	33-62	Clay loam, loam, silt loam.	ML, CL	A-4, A-6	0-5	90-100	85-100	60-95	50-90	20-40	3-15
	62-80	Stratified sandy loam to silt loam.	SM, SC, ML, CL	A-2, A-4	0-5	90-100	80-100	50-80	20-60	<25	3-10
CnB-------------- Cincinnati	0-7	Silt loam--------	ML, CL	A-4, A-6	0	100	100	90-100	80-100	25-40	3-16
	7-23	Silty clay loam, loam, silt loam.	CL	A-6, A-4	0	95-100	90-100	90-100	70-100	25-40	8-15
	23-80	Clay loam, loam, silty clay loam.	CL, CL-ML	A-6, A-4	0	95-100	85-95	75-90	65-80	25-40	6-20
CrC-------------- Crider	0-8	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	95-100	90-100	85-100	25-35	4-12
	8-37	Silt loam, silty clay loam.	CL, ML, CL-ML	A-7, A-6, A-4	0	100	95-100	90-100	85-100	25-42	4-20
	37-80	Silty clay, clay, silty clay loam.	CL, CH	A-7, A-6	0-5	85-100	75-100	70-100	60-100	35-65	15-40
FbD-------------- Fairpoint	0-6	Shaly silt loam	CL, CL-ML, SC, GC	A-4, A-6, A-2	5-15	55-90	45-85	40-85	30-75	20-40	4-18
	6-60	Gravelly clay loam, very shaly silty clay loam.	GC, CL, CL-ML, SC	A-4, A-6, A-7, A-2	15-30	55-75	25-65	20-65	15-60	25-50	4-24
FcC-------------- Fairpoint	0-6	Shaly silty clay loam.	CL, SC	A-6, A-7	0-5	80-100	55-60	50-55	40-55	35-50	12-24
	6-60	Shaly silty clay loam, very shaly silt loam.	GC, CL, CL-ML, SC	A-4, A-6, A-7, A-2	15-30	55-75	25-65	20-65	15-60	25-50	4-24
HaD-------------- Hagerstown	0-13	Silt loam--------	CL, CL-ML	A-4, A-6, A-7	0-15	85-100	80-100	80-100	70-95	25-50	5-25
	13-60	Clay, silty clay, silty clay loam.	CH, CL	A-7, A-6	0-5	85-100	80-100	75-100	75-95	30-70	15-40
Hd--------------- Haymond	0-9	Silt loam--------	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
	9-59	Silt loam--------	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
	59-70	Fine sandy loam, silt loam, loam.	ML, SM	A-4	0	95-100	90-100	80-100	35-90	27-36	4-10
HoB-------------- Hosmer	0-8	Silt loam--------	ML, CL-ML, CL	A-4	0	100	100	90-100	70-90	<25	3-10
	8-26	Silt loam, silty clay loam.	CL, CL-ML, ML	A-4, A-6	0	100	100	90-100	70-95	25-35	5-15
	26-80	Silt loam, silty clay loam, silty clay.	CL, CL-ML, ML	A-4, A-6	0	100	100	90-100	70-95	20-50	5-25
JoA-------------- Johnsburg	0-13	Silt loam--------	CL, ML	A-4, A-6	0	100	100	90-100	70-95	30-40	5-15
	13-23	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	85-95	35-50	20-30
	23-42	Loam, silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0-5	95-100	90-95	85-95	60-85	20-35	5-15
	42-70	Loam, sandy loam, silt loam.	CL, SC, CL-ML, SM-SC	A-4, A-6	5-10	90-95	85-90	60-90	35-70	20-30	5-15

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
MaB-------------- Markland	0-5	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
	5-35	Silty clay, clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	90-95	45-60	19-32
	35-60	Stratified clay to silty clay loam.	CL, CH, ML, MH	A-7	0	100	100	90-100	75-95	40-55	15-25
McC3------------- Markland	0-3	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	30-45	10-20
	3-27	Silty clay, clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	90-95	45-60	19-32
	27-60	Stratified clay to silty clay loam.	CL, CH, ML, MH	A-7	0	100	100	90-100	75-95	40-55	15-25
MdA-------------- Martinsville	0-9	Loam-------------	CL, CL-ML, ML	A-4	0	100	85-100	75-100	65-90	<25	3-8
	9-58	Fine sandy loam, loam, sandy clay loam.	SM-SC, CL-ML, CL, SC	A-2, A-4, A-6	0	95-100	85-100	55-95	30-75	20-30	5-11
	58-80	Stratified sand to silt loam.	SM, SM-SC, CL-ML	A-4, A-2-4, A-1	0	95-100	85-100	45-95	10-75	<25	NP-8
MgA-------------- McGary	0-7	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	70-95	30-45	15-25
	7-60	Silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	90-100	46-58	24-32
NeE-------------- Negley	0-9	Silt loam, loam	ML, CL-ML, CL	A-4, A-6	0	85-100	75-100	70-90	55-85	25-40	4-15
	9-80	Loam, clay loam, gravelly sandy loam.	SM, ML	A-4, A-2, A-6, A-7	0-5	70-95	50-90	35-80	20-60	25-45	3-17
Nm--------------- Newark	0-13	Silt loam--------	ML, CL, CL-ML	A-4	0	95-100	90-100	80-100	55-95	<32	NP-10
	13-32	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	95-100	90-100	85-100	70-98	22-42	3-20
	32-60	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6, A-7	0-3	75-100	70-100	65-100	55-95	22-42	3-20
No--------------- Nolin	0-11	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	95-100	90-100	80-100	25-40	5-18
	11-70	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	100	95-100	85-100	75-100	25-46	5-23
PaC2, PaD2------- Parke	0-6	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	90-100	70-100	20-35	7-15
	6-34	Silty clay loam, silt loam.	CL	A-6, A-4	0	95-100	95-100	90-100	80-100	25-40	7-15
	34-80	Sandy clay loam, loam, sandy loam.	SC, CL	A-2, A-6, A-4	0-3	90-100	85-95	55-90	30-60	25-35	7-15
PeB-------------- Pekin	0-12	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	85-100	65-100	20-30	5-15
	12-24	Silt loam, silty clay loam.	CL	A-6	0	100	100	90-100	70-100	25-40	10-20
	24-58	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	88-98	65-90	25-35	5-15
	58-70	Stratified fine sandy loam to silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	80-95	50-85	20-40	5-15

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
PkB--------------- Pike	0-14	Silt loam--------	CL	A-4, A-6	0	100	100	90-100	80-95	25-35	8-15
	14-42	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	95-100	85-100	80-90	30-45	10-25
	42-80	Loam, silt loam, sandy clay loam.	CL, SC	A-6, A-2-6	0	80-90	70-90	60-90	30-80	20-35	10-20
UhD*. Udorthents											
Up*: Udorthents.											
Pits.											
Wa---------------- Wakeland	0-7	Silt loam--------	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
	7-60	Silt loam--------	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
WeB, WeC2, WeD2-- Wellston	0-6	Silt loam--------	ML	A-4	0	95-100	90-100	85-100	70-95	25-35	3-10
	6-48	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0-5	75-100	70-100	60-95	60-90	25-40	5-20
	48-60	Silt loam, loam, channery loam.	CL-ML, CL, SC, SM-SC	A-4, A-6	0-10	65-90	65-90	60-90	40-65	20-35	5-15
WeD3------------- Wellston	0-5	Silt loam--------	ML	A-4	0	95-100	90-100	85-100	70-95	25-35	3-10
	5-40	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0-5	75-100	70-100	60-95	60-90	25-40	5-20
	40-60	Silt loam, loam, channery loam.	CL-ML, CL, SC, SM-SC	A-4, A-6	0-10	65-90	65-90	60-90	40-65	20-35	5-15
WgG*: Wellston---------	0-3	Silt loam--------	ML	A-4	0	95-100	90-100	85-100	70-95	25-35	3-10
	3-42	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0-5	75-100	70-100	60-95	60-90	25-40	5-20
	42-60	Silt loam, loam, channery loam.	CL-ML, CL, SC, SM-SC	A-4, A-6	0-10	65-90	65-90	60-90	40-65	20-35	5-15
Berks------------	0-2	Channery silt loam.	GM, ML, GC, SC	A-2, A-4	0-30	50-80	45-70	40-60	30-55	25-36	5-10
	2-38	Channery loam, very channery loam, channery silt loam.	GM, SM, GC, SC	A-1, A-2, A-4	0-30	40-80	35-70	25-60	20-45	25-36	5-10
	38	Weathered bedrock	---	---	---	---	---	---	---	---	---
Gilpin-----------	0-4	Channery silt loam.	GC, SC, CL, CL-ML	A-2, A-4, A-6	0-30	50-90	45-85	35-75	30-70	20-40	4-15
	4-30	Channery silt loam, shaly silt loam, channery silty clay loam.	GC, SC, CL, CL-ML	A-2, A-4, A-6	0-30	50-95	45-90	35-85	30-80	20-40	4-15
	30-36	Channery loam, very channery silt loam, very shaly silty clay loam.	GC, GM-GC	A-1, A-2, A-4, A-6	0-35	25-55	20-50	15-45	15-40	20-40	4-15
	36	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
WlD*:											
Wellston--------	0-12	Silt loam--------	ML	A-4	0	95-100	90-100	85-100	70-95	25-35	3-10
	12-36	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0-5	75-100	70-100	60-95	60-90	25-40	5-20
	36-60	Silt loam, loam, channery loam.	CL-ML, CL, SC, SM-SC	A-4, A-6	0-10	65-90	65-90	60-90	40-65	20-35	5-15
Ebal------------	0-5	Silt loam--------	CL-ML, CL	A-4, A-6	0	95-100	95-100	85-100	70-90	25-35	5-15
	5-24	Channery silty clay, very channery clay, channery clay.	CL, CH, GC	A-7	3-15	60-70	50-70	45-70	40-65	40-55	20-30
	24-70	Clay, shaly clay	CH	A-7	0-3	95-100	70-100	55-100	55-95	60-75	35-45
WnE*:											
Wellston--------	0-6	Silt loam--------	ML	A-4	0	95-100	90-100	85-100	70-95	25-35	3-10
	6-49	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0-5	75-100	70-100	60-95	60-90	25-40	5-20
	49-60	Silt loam, loam, channery loam.	CL-ML, CL, SC, SM-SC	A-4, A-6	0-10	65-90	65-90	60-90	40-65	20-35	5-15
Gilpin----------	0-4	Channery silt loam.	GC, SC, CL, CL-ML	A-2, A-4, A-6	0-30	50-90	45-85	35-75	30-70	20-40	4-15
	4-31	Channery loam, channery silt loam, silty clay loam.	GC, SC, CL, CL-ML	A-2, A-4, A-6	0-30	50-95	45-90	35-85	30-80	20-40	4-15
	31-39	Channery loam, very channery silt loam, very shaly silty clay loam.	GC, GM-GC	A-1, A-2, A-4, A-6	0-35	25-55	20-50	15-45	15-40	20-40	4-15
	39	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
WpD*:											
Wellston--------	0-1	Silt loam--------	ML	A-4	0	95-100	90-100	85-100	70-95	25-35	3-10
	1-39	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0-5	75-100	70-100	60-95	60-90	25-40	5-20
	39-55	Silt loam, loam, channery loam.	CL-ML, CL, SC, SM-SC	A-4, A-6	0-10	65-90	65-90	60-90	40-65	20-35	5-15
	55	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Udorthents.											
Wr--------------- Wilbur	0-6	Silt loam--------	ML, CL-ML	A-4	0	100	100	90-100	70-90	<25	3-7
	6-60	Silt loam--------	ML, CL-ML	A-4	0	100	100	90-100	70-90	<25	3-7
Wt--------------- Wirt	0-6	Fine sandy loam	SM, SM-SC, ML, CL-ML	A-4	0	95-100	90-100	65-85	35-55	<25	NP-6
	6-60	Silt loam, loam, fine sandy loam.	CL-ML, ML	A-4	0	95-100	90-100	70-100	40-90	<25	3-7
ZaB, ZaC2-------- Zanesville	0-5	Silt loam--------	CL-ML, CL, ML	A-4, A-6	0	95-100	95-100	90-100	80-100	25-40	4-15
	5-30	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	95-100	95-100	90-100	80-100	25-40	5-20
	30-44	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	0-3	90-100	85-100	80-100	60-100	20-40	2-20
	44-60	Sandy clay loam, clay loam, channery loam.	SC, CL, SM, GM	A-6, A-4, A-2, A-1-b	0-10	65-100	50-100	40-100	20-85	20-40	2-20

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
ZaC3------------- Zanesville	0-1	Silt loam--------	CL-ML, CL, ML	A-4, A-6	0	95-100	95-100	90-100	80-100	25-40	4-15
	1-20	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	95-100	95-100	90-100	80-100	25-40	5-20
	20-39	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	0-3	90-100	85-100	80-100	60-100	20-40	2-20
	39-70	Sandy clay loam, clay loam, channery sandy clay loam.	SC, CL, SM, GM	A-6, A-4, A-2, A-1-b	0-10	65-100	50-100	40-100	20-85	20-40	2-20
ZnB*, ZnC*: Zanesville------	0-1	Silt loam--------	CL-ML, CL, ML	A-4, A-6	0	95-100	95-100	90-100	80-100	25-40	4-15
	1-30	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	95-100	95-100	90-100	80-100	25-40	5-20
	30-48	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	0-3	90-100	85-100	80-100	60-100	20-40	2-20
	48-55	Sandy clay loam, clay loam, channery sandy clay loam.	SC, CL, SM, GM	A-6, A-4, A-2, A-1-b	0-10	65-100	50-100	40-100	20-85	20-40	2-20
	55	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Udorthents.											
Zp--------------- Zipp	0-10	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	90-95	35-50	15-25
	10-47	Silty clay-------	CL, CH	A-7	0	100	100	95-100	90-95	45-60	25-35
	47-60	Silty clay-------	CL, CH	A-7	0	100	100	90-100	75-95	45-60	25-35

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
Ab-----Abscota	0-8	0-10	1.20-1.60	6.0-20	0.07-0.09	6.1-7.8	Low	0.17	5	1	.5-3
	8-60	0-10	1.25-1.60	6.0-20	0.05-0.11	6.1-8.4	Low	0.17			
AvC2*:											
Alvin	0-12	5-10	1.50-1.70	6.0-20	0.10-0.12	5.1-6.5	Low	0.17	5	2	.5-1
	12-70	15-18	1.45-1.65	0.6-6.0	0.12-0.20	4.5-6.5	Low	0.24			
	70-80	3-10	1.55-1.75	2.0-6.0	0.05-0.13	5.1-7.8	Low	0.24			
Chelsea	0-30	8-15	1.50-1.55	6.0-20	0.10-0.15	5.6-7.3	Low	0.17	5	2	.5-1
	30-80	5-10	1.55-1.70	6.0-20	0.06-0.08	5.1-7.3	Low	0.17			
AvE*:											
Alvin	0-12	5-10	1.50-1.70	6.0-20	0.10-0.12	5.1-6.5	Low	0.17	5	2	.5-1
	12-42	5-18	1.45-1.65	0.6-6.0	0.12-0.20	4.5-6.5	Low	0.24			
	42-80	3-10	1.55-1.75	2.0-6.0	0.05-0.13	5.1-7.8	Low	0.24			
Chelsea	0-29	8-15	1.50-1.55	6.0-20	0.10-0.15	5.6-7.3	Low	0.17	5	2	.5-1
	29-80	5-10	1.55-1.70	6.0-20	0.06-0.08	5.1-7.3	Low	0.17			
Ba-----Bartle	0-10	15-26	1.30-1.45	0.6-2.0	0.20-0.24	5.1-7.3	Low	0.43	4	5	1-3
	10-24	22-35	1.40-1.60	0.6-2.0	0.20-0.22	4.5-5.5	Low	0.43			
	24-53	22-35	1.60-1.80	<0.06	0.06-0.08	4.5-5.5	Low	0.43			
	53-80	22-35	1.40-1.60	0.2-0.6	0.15-0.18	5.1-7.3	Low	0.43			
Bk-----Birds	0-6	15-25	1.20-1.40	0.2-0.6	0.22-0.24	5.6-7.8	Low	0.43	5	6	1-3
	6-60	18-27	1.40-1.60	0.2-0.6	0.20-0.22	5.1-7.8	Low	0.43			
Bo-----Bonnie	0-9	18-27	1.20-1.40	0.6-2.0	0.22-0.24	4.5-7.3	Low	0.43	5	6	1-3
	9-60	18-27	1.40-1.60	0.2-0.6	0.20-0.22	4.5-5.5	Low	0.43			
Bu-----Burnside	0-16	20-27	1.20-1.40	0.6-2.0	0.22-0.24	4.5-6.0	Low	0.37	4	5	1-2
	16-42	15-25	1.40-1.60	0.6-2.0	0.06-0.12	5.6-7.3	Low	0.37			
	42	---	---	---	---	---	-------------	----			
CaB-----Camden	0-10	14-27	1.15-1.35	0.6-2.0	0.22-0.24	5.1-7.3	Low	0.37	5	6	1-2
	10-33	22-35	1.35-1.55	0.6-2.0	0.16-0.20	5.1-7.3	Moderate	0.37			
	33-62	18-30	1.45-1.65	0.6-2.0	0.11-0.22	5.6-7.3	Low	0.37			
	62-80	5-20	1.55-1.75	0.6-6.0	0.11-0.22	5.6-8.4	Low	0.37			
CnB-----Cincinnati	0-7	15-25	1.30-1.50	0.6-2.0	0.22-0.24	4.5-7.3	Low	0.37	4	6	1-3
	7-23	22-35	1.45-1.65	0.6-2.0	0.15-0.19	4.5-7.3	Low	0.37			
	23-80	24-35	1.60-1.85	0.06-0.6	0.08-0.12	4.5-6.5	Moderate	0.37			
CrC-----Crider	0-8	15-27	1.20-1.40	0.6-2.0	0.19-0.23	5.1-7.3	Low	0.32	5	6	2-4
	8-37	18-35	1.20-1.45	0.6-2.0	0.18-0.23	5.1-7.3	Low	0.28			
	37-80	30-60	1.20-1.55	0.6-2.0	0.12-0.18	4.5-6.5	Moderate	0.28			
FbD-----Fairpoint	0-6	18-27	1.40-1.55	0.6-2.0	0.09-0.18	5.6-7.3	Low	0.37	5	6	<.5
	6-60	18-35	1.60-1.80	0.2-0.6	0.03-0.10	5.6-7.3	Moderate	0.37			
FcC-----Fairpoint	0-6	27-40	1.40-1.65	0.2-0.6	0.12-0.18	5.6-7.3	Moderate	0.43	3	6	.5-2
	6-60	18-35	1.60-1.80	0.2-0.6	0.03-0.10	5.6-7.3	Moderate	0.32			
HaD-----Hagerstown	0-13	15-27	1.20-1.40	0.6-6.0	0.16-0.24	4.5-7.3	Low	0.32	4	6	1-5
	13-60	23-60	1.20-1.60	0.6-2.0	0.10-0.24	5.1-7.3	Moderate	0.28			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodi-bility group	Organic matter
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					Pct
Hd------------------	0-9	10-18	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low------------	0.37	5	5	1-3
Haymond	9-59	10-18	1.30-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low------------	0.37			
	59-70	10-18	1.30-1.45	0.6-2.0	0.20-0.22	6.1-7.8	Low------------	0.37			
HoB-----------------	0-8	10-17	1.20-1.40	0.6-2.0	0.22-0.24	4.5-7.3	Low------------	0.43	4	5	1-3
Hosmer	8-26	24-30	1.30-1.50	0.6-2.0	0.18-0.22	4.5-5.5	Moderate------	0.43			
	26-80	16-42	1.60-1.70	<0.06	0.06-0.08	4.0-6.0	Low------------	0.43			
JoA-----------------	0-13	12-20	1.30-1.45	0.6-2.0	0.20-0.24	4.5-7.3	Low------------	0.43	3	5	1-3
Johnsburg	13-23	24-32	1.40-1.55	0.6-2.0	0.18-0.22	3.6-5.5	Moderate------	0.43			
	23-42	22-30	1.60-1.80	<0.06	0.06-0.08	3.6-5.5	Low------------	0.43			
	42-70	14-20	1.40-1.55	0.6-2.0	0.12-0.14	3.6-5.5	Low------------	0.43			
MaB-----------------	0-5	20-27	1.30-1.45	0.6-2.0	0.22-0.24	5.1-7.3	Low------------	0.43	3	5	1-3
Markland	5-35	40-55	1.55-1.70	0.06-0.2	0.11-0.13	5.1-8.4	High-----------	0.32			
	35-60	35-50	1.55-1.70	0.06-0.2	0.09-0.11	7.4-8.4	High-----------	0.32			
McC3----------------	0-3	28-40	1.35-1.50	0.2-0.6	0.18-0.20	5.1-7.3	Moderate------	0.43	2	7	1-3
Markland	3-27	40-55	1.55-1.70	0.06-0.2	0.11-0.13	5.1-7.3	High-----------	0.32			
	27-60	35-50	1.55-1.70	0.06-0.2	0.09-0.11	7.4-8.4	High-----------	0.32			
MdA-----------------	0-9	8-20	1.30-1.45	0.6-2.0	0.20-0.24	5.1-7.3	Low------------	0.37	5	5	1-3
Martinsville	9-58	15-25	1.40-1.60	0.6-2.0	0.12-0.17	5.1-6.5	Low------------	0.24			
	58-80	2-20	1.50-1.70	0.6-6.0	0.08-0.17	5.6-8.4	Low------------	0.24			
MgA-----------------	0-7	27-40	1.40-1.60	0.2-0.6	0.20-0.22	6.6-7.3	Moderate------	0.43	3	7	1-4
McGary	7-60	35-50	1.60-1.75	0.06-0.2	0.11-0.13	5.6-7.8	High-----------	0.32			
NeE-----------------	0-9	12-27	1.30-1.50	2.0-6.0	0.16-0.22	4.5-7.3	Low------------	0.32	3	5	1-3
Negley	9-80	18-35	1.30-1.60	0.6-6.0	0.10-0.16	4.5-6.5	Low------------	0.32			
Nm------------------	0-13	7-27	1.20-1.40	0.6-2.0	0.15-0.23	5.6-7.8	Low------------	0.43	5	5	1-4
Newark	13-32	18-35	1.20-1.45	0.6-2.0	0.18-0.23	5.6-7.8	Low------------	0.43			
	32-60	12-40	1.30-1.50	0.6-2.0	0.15-0.22	5.6-7.8	Low------------	0.43			
No------------------	0-11	12-35	1.20-1.40	0.6-2.0	0.18-0.23	5.6-8.4	Low------------	0.43	5	---	2-4
Nolin	11-70	18-35	1.25-1.50	0.6-2.0	0.18-0.23	5.6-8.4	Low------------	0.43			
PaC2, PaD2----------	0-6	18-27	1.25-1.40	0.6-2.0	0.22-0.24	5.1-6.5	Low------------	0.37	5	5	.5-3
Parke	6-34	22-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate------	0.37			
	34-80	18-30	1.55-1.65	0.6-2.0	0.16-0.18	4.5-5.5	Low------------	0.28			
PeB-----------------	0-12	15-26	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low------------	0.43	4	5	1-3
Pekin	12-24	25-35	1.40-1.60	0.6-2.0	0.20-0.22	4.5-5.5	Low------------	0.43			
	24-58	22-30	1.60-1.80	<0.06	0.06-0.08	4.5-5.5	Low------------	0.43			
	58-70	20-34	1.40-1.60	0.6-2.0	0.06-0.08	4.5-7.3	Low------------	0.43			
PkB-----------------	0-14	18-27	1.25-1.40	0.6-2.0	0.22-0.24	5.1-7.3	Low------------	0.37	5-4	5	.5-3
Pike	14-42	22-35	1.30-1.45	0.6-2.0	0.18-0.22	4.5-5.5	Low------------	0.37			
	42-80	18-35	1.30-1.45	0.6-2.0	0.12-0.18	4.5-5.5	Low------------	0.37			
UhD*. Udorthents											
Up*: Udorthents.											
Pits.											
Wa------------------	0-7	10-17	1.30-1.50	0.6-2.0	0.22-0.24	5.6-7.3	Low------------	0.37	5	5	1-3
Wakeland	7-60	10-17	1.30-1.50	0.6-2.0	0.20-0.22	5.6-7.3	Low------------	0.37			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
WeB, WeC2, WeD2--Wellston	0-6	13-27	1.30-1.50	0.6-2.0	0.18-0.22	5.1-6.5	Low----------	0.37	4	6	1-3
	6-48	18-35	1.30-1.65	0.6-2.0	0.17-0.21	4.5-6.0	Low----------	0.37			
	48-60	15-30	1.30-1.60	0.6-2.0	0.12-0.17	4.5-6.0	Low----------	0.37			
WeD3------------Wellston	0-5	13-27	1.30-1.50	0.6-2.0	0.18-0.22	5.1-6.5	Low----------	0.37	4	6	.5-1
	5-40	18-35	1.30-1.65	0.6-2.0	0.17-0.21	4.5-6.0	Low----------	0.37			
	40-60	15-30	1.30-1.60	0.6-2.0	0.12-0.17	4.5-6.0	Low----------	0.37			
WgG*:											
Wellston--------	0-3	13-27	1.30-1.50	0.6-2.0	0.18-0.22	5.1-6.5	Low----------	0.37	4	6	1-3
	3-42	18-35	1.30-1.65	0.6-2.0	0.17-0.21	4.5-6.0	Low----------	0.37			
	42-60	15-30	1.30-1.60	0.6-2.0	0.12-0.17	4.5-6.0	Low----------	0.37			
Berks-----------	0-2	5-23	1.20-1.50	0.6-6.0	0.08-0.12	3.6-6.5	Low----------	0.17	3	5	1-3
	2-38	5-32	1.20-1.60	0.6-6.0	0.04-0.10	3.6-6.5	Low----------	0.17			
	38	---	---	---	---	---	-------------	----			
Gilpin----------	0-4	15-27	1.20-1.40	0.6-2.0	0.12-0.16	3.6-5.5	Low----------	0.24	3	6	1-4
	4-30	18-35	1.20-1.50	0.6-2.0	0.12-0.16	3.6-5.5	Low----------	0.24			
	30-36	15-35	1.20-1.50	0.6-2.0	0.08-0.12	3.6-5.5	Low----------	0.24			
	36	---	---	---	---	---	-------------	----			
WlD*:											
Wellston--------	0-12	13-27	1.30-1.50	0.6-2.0	0.18-0.22	5.1-6.5	Low----------	0.37	4	6	1-3
	12-36	18-35	1.30-1.65	0.6-2.0	0.17-0.21	4.5-6.0	Low----------	0.37			
	36-60	15-30	1.30-1.60	0.6-2.0	0.12-0.17	4.5-6.0	Low----------	0.37			
Ebal------------	0-5	20-28	1.35-1.50	0.6-2.0	0.22-0.24	4.5-6.0	Low----------	0.37	3	5	1-3
	5-24	38-50	1.45-1.65	0.2-0.6	0.06-0.09	4.5-6.0	Moderate-----	0.28			
	24-70	55-70	1.55-1.75	<0.06	0.07-0.10	4.5-6.0	High---------	0.28			
WnE*:											
Wellston--------	0-6	13-27	1.30-1.50	0.6-2.0	0.18-0.22	5.1-6.5	Low----------	0.37	4	6	1-3
	6-49	18-35	1.30-1.65	0.6-2.0	0.17-0.21	4.5-6.0	Low----------	0.37			
	49-60	15-30	1.30-1.60	0.6-2.0	0.12-0.17	4.5-6.0	Low----------	0.37			
Gilpin----------	0-4	15-27	1.20-1.40	0.6-2.0	0.12-0.16	3.6-5.5	Low----------	0.24	3	6	1-4
	4-31	18-35	1.20-1.50	0.6-2.0	0.12-0.16	3.6-5.5	Low----------	0.24			
	31-39	15-35	1.20-1.50	0.6-2.0	0.08-0.12	3.6-5.5	Low----------	0.24			
	39	---	---	---	---	---	-------------	----			
WpD*:											
Wellston--------	0-1	13-27	1.30-1.50	0.6-2.0	0.18-0.22	5.1-6.5	Low----------	0.37	4	6	1-3
	1-39	18-35	1.30-1.65	0.6-2.0	0.17-0.21	4.5-6.0	Low----------	0.37			
	39-55	15-30	1.30-1.60	0.6-2.0	0.12-0.17	4.5-6.0	Low----------	0.37			
	55	---	---	---	---	---	-------------	----			
Udorthents.											
Wr--------------Wilbur	0-6	10-17	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.37	5	5	1-3
	6-60	10-17	1.30-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low----------	0.37			
Wt--------------Wirt	0-6	8-16	1.35-1.50	0.6-2.0	0.16-0.18	5.6-7.3	Low----------	0.24	5	3	.5-3
	6-60	10-18	1.40-1.55	0.6-2.0	0.15-0.20	5.6-7.3	Low----------	0.24			
ZaB, ZaC2--------Zanesville	0-5	12-27	1.35-1.40	0.6-2.0	0.19-0.23	4.5-5.5	Low----------	0.43	3	5	1-3
	5-30	18-35	1.35-1.45	0.6-2.0	0.17-0.22	4.5-5.5	Low----------	0.37			
	30-44	18-33	1.50-1.75	0.06-0.2	0.08-0.12	4.0-5.5	Low----------	0.37			
	44-60	20-40	1.50-1.70	0.2-2.0	0.08-0.12	4.0-5.5	Low----------	0.28			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodi-bility group	Organic matter
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					Pct
ZaC3------------- Zanesville	0-1	12-27	1.35-1.40	0.6-2.0	0.19-0.23	4.5-5.5	Low----------	0.43	3	5	.5-1
	1-20	18-35	1.35-1.45	0.6-2.0	0.17-0.22	4.5-5.5	Low----------	0.37			
	20-39	18-33	1.50-1.75	0.06-0.2	0.08-0.12	4.5-5.5	Low----------	0.37			
	39-70	20-40	1.50-1.70	0.2-2.0	0.08-0.12	4.5-5.5	Low----------	0.28			
ZnB*, ZnC*: Zanesville------	0-1	12-27	1.35-1.40	0.6-2.0	0.19-0.23	4.5-5.5	Low----------	0.43	3	5	1-3
	1-30	18-35	1.35-1.45	0.6-2.0	0.17-0.22	4.5-5.5	Low----------	0.37			
	30-48	18-33	1.50-1.75	0.06-0.2	0.08-0.12	4.5-5.5	Low----------	0.37			
	48-55	20-40	1.50-1.70	0.2-2.0	0.08-0.12	4.5-5.5	Low----------	0.28			
	55	---	---	---	---	---	-------------	----			
Udorthents.											
Zp--------------- Zipp	0-10	27-40	1.40-1.60	0.2-0.6	0.20-0.22	6.1-7.3	Moderate-----	0.28	5	7	1-3
	10-47	40-55	1.45-1.70	0.06-0.2	0.11-0.13	6.1-7.3	High---------	0.28			
	47-60	36-55	1.50-1.70	0.06-0.2	0.08-0.10	6.1-7.8	High---------	0.28			

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated]

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				
Ab---------------- Abscota	A	Frequent----	Brief-----	Mar-Jun	>6.0	---	---	>60	---	Low------	Low------	Low.
AvC2*, AvE*: Alvin------------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	High.
Chelsea----------	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Low------	Low.
Ba---------------- Bartle	D	None--------	---	---	1.0-2.0	Perched	Jan-Apr	>60	---	High-----	High-----	High.
Bk---------------- Birds	C/D	Frequent----	Long------	Mar-Jun	+.5-1.0	Apparent	Mar-Jun	>60	---	High-----	High-----	Moderate.
Bo---------------- Bonnie	C/D	Frequent----	Brief to long.	Jan-Jun	+.5-1.0	Apparent	Jan-Jun	>60	---	High-----	High-----	High.
Bu---------------- Burnside	B	Occasional	Brief-----	Mar-Jun	3.0-5.0	Apparent	Feb-Jun	40-65	Hard	Moderate	Low------	High.
CaB--------------- Camden	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Low------	Moderate.
CnB--------------- Cincinnati	C	None--------	---	---	2.5-4.0	Perched	Jan-Apr	>60	---	High-----	Moderate	High.
CrC--------------- Crider	B	None--------	---	---	>6.0	---	---	>60	---	---	Moderate	Moderate.
FbD, FcC---------- Fairpoint	C	None--------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Moderate.
HaD--------------- Hagerstown	C	None--------	---	---	>6.0	---	---	>60	Hard	Moderate	Moderate	Low.
Hd---------------- Haymond	B	Frequent----	Brief-----	Jan-May	>6.0	---	---	>60	---	High-----	Low------	Low.
HoB--------------- Hosmer	C	None--------	---	---	2.5-3.0	Perched	Mar-Apr	>60	---	High-----	Moderate	High.
JoA--------------- Johnsburg	D	None--------	---	---	1.0-3.0	Perched	Jan-Apr	48-72	Soft	High-----	High-----	High.

See footnote at end of table.

TABLE 18.--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				
MaB, McC3-------- Markland	C	None--------	---	---	3.0-6.0	Perched	Mar-Apr	>60	---	Moderate	High-----	Moderate.
MdA--------------- Martinsville	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
MgA--------------- McGary	C	Rare--------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	Moderate	High-----	Low.
NeE--------------- Negley	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	High.
Nm---------------- Newark	C	Frequent----	Brief-----	Jan-Apr	0.5-1.5	Apparent	Dec-May	>60	---	High-----	High-----	Low.
No---------------- Nolin	B	Frequent----	Brief to long.	Feb-May	3.0-6.0	Apparent	Feb-Mar	>60	---	---	Low------	Moderate.
PaC2, PaD2-------- Parke	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Moderate	High.
PeB--------------- Pekin	C	None--------	---	---	2.0-6.0	Apparent	Mar-Apr	>60	---	High-----	Moderate	High.
PkB--------------- Pike	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Low------	High.
UhD*. Udorthents												
Up*: Udorthents.												
Pits.												
Wa---------------- Wakeland	C	Frequent----	Brief-----	Jan-May	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Low.
WeB, WeC2, WeD2, WeD3------------- Wellston	B	None--------	---	---	>6.0	---	---	>40	Hard	High-----	Moderate	High.
WgG*: Wellston---------	B	None--------	---	---	>6.0	---	---	>40	Hard	High-----	Moderate	High.
Berks------------	C	None--------	---	---	>6.0	---	---	20-40	Soft	Low------	Low------	High.
Gilpin-----------	C	None--------	---	---	>6.0	---	---	20-40	Soft	Moderate	Low------	High.

See footnote at end of table.

TABLE 18.--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				
WlD*:												
Wellston----------	B	None---------	---	---	>6.0	---	---	>40	Hard	High-----	Moderate	High.
Ebal--------------	B	None---------	---	---	3.0-6.0	Perched	Nov-Mar	50-80	Soft	Moderate	High-----	High.
WnE*:												
Wellston----------	B	None---------	---	---	>6.0	---	---	>40	Hard	High-----	Moderate	High.
Gilpin------------	C	None---------	---	---	>6.0	---	---	20-40	Soft	Moderate	Low------	High.
WpD*:												
Wellston----------	B	None---------	---	---	>6.0	---	---	>40	Hard	High-----	Moderate	High.
Udorthents.												
Wr----------------- Wilbur	B	Frequent----	Brief-----	Oct-Jun	1.5-3.0	Apparent	Mar-Apr	>60	---	High-----	Moderate	Moderate.
Wt----------------- Wirt	B	Frequent----	Brief-----	Nov-Jun	>6.0	---	---	>60	---	Moderate	Low------	Moderate.
ZaB, ZaC2, ZaC3--- Zanesville	C	None---------	---	---	2.0-3.0	Perched	Dec-Apr	>40	Hard	---	Moderate	High.
ZnB*, ZnC*:												
Zanesville--------	C	None---------	---	---	2.0-3.0	Perched	Dec-Apr	>40	Hard	---	Moderate	High.
Udorthents.												
Zp----------------- Zipp	D	Rare---------	---	---	+.5-1.0	Apparent	Dec-May	>60	---	Moderate	High-----	Low.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 19.--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 that are outside the range of the series]

Soil name	Family or higher taxonomic class
Abscota	Mixed, mesic Typic Udipsamments
Alvin	Coarse-loamy, mixed, mesic Typic Hapludalfs
Bartle	Fine-silty, mixed, mesic Aeric Fragiaqualfs
Berks	Loamy-skeletal, mixed, mesic Typic Dystrochrepts
Birds	Fine-silty, mixed, nonacid, mesic Typic Fluvaquents
*Bonnie	Fine-silty, mixed, acid, mesic Typic Fluvaquents
*Burnside	Loamy-skeletal, mixed, acid, mesic Typic Udifluvents
Camden	Fine-silty, mixed, mesic Typic Hapludalfs
Chelsea	Mixed, mesic Alfic Udipsamments
Cincinnati	Fine-silty, mixed, mesic Typic Fragiudalfs
Crider	Fine-silty, mixed, mesic Typic Paleudalfs
Ebal	Fine, mixed, mesic Ultic Hapludalfs
Fairpoint	Loamy-skeletal, mixed, nonacid, mesic Typic Udorthents
Gilpin	Fine-loamy, mixed, mesic Typic Hapludults
Hagerstown	Fine, mixed, mesic Typic Hapludalfs
Haymond	Coarse-silty, mixed, nonacid, mesic Typic Udifluvents
Hosmer	Fine-silty, mixed, mesic Typic Fragiudalfs
Johnsburg	Fine-silty, mixed, mesic Aquic Fragiudults
Markland	Fine, mixed, mesic Typic Hapludalfs
Martinsville	Fine-loamy, mixed, mesic Typic Hapludalfs
McGary	Fine, mixed, mesic Aeric Ochraqualfs
*Negley	Fine-loamy, mixed, mesic Typic Paleudalfs
Newark	Fine-silty, mixed, nonacid, mesic Aeric Fluvaquents
Nolin	Fine-silty, mixed, mesic Dystric Fluventic Eutrochrepts
Parke	Fine-silty, mixed, mesic Ultic Hapludalfs
Pekin	Fine-silty, mixed, mesic Aquic Fragiudalfs
*Pike	Fine-silty, mixed, mesic Ultic Hapludalfs
Udorthents	Loamy and loamy-skeletal, mixed, mesic Typic Udorthents
Wakeland	Coarse-silty, mixed, nonacid, mesic Aeric Fluvaquents
Wellston	Fine-silty, mixed, mesic Ultic Hapludalfs
Wilbur	Coarse-silty, mixed, nonacid, mesic Aquic Udifluvents
Wirt	Coarse-loamy, mixed, nonacid, mesic Typic Udifluvents
Zanesville	Fine-silty, mixed, mesic Typic Fragiudalfs
Zipp	Fine, mixed, nonacid, mesic Typic Haplaquepts

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