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 Brown County and Part of Bartholomew County Indiana

How To Use This Soil Survey

General Soil Map

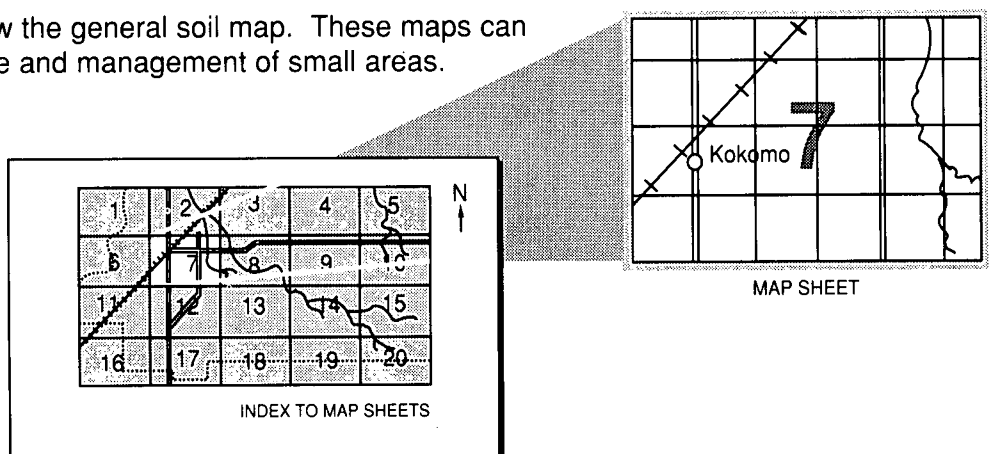
The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

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

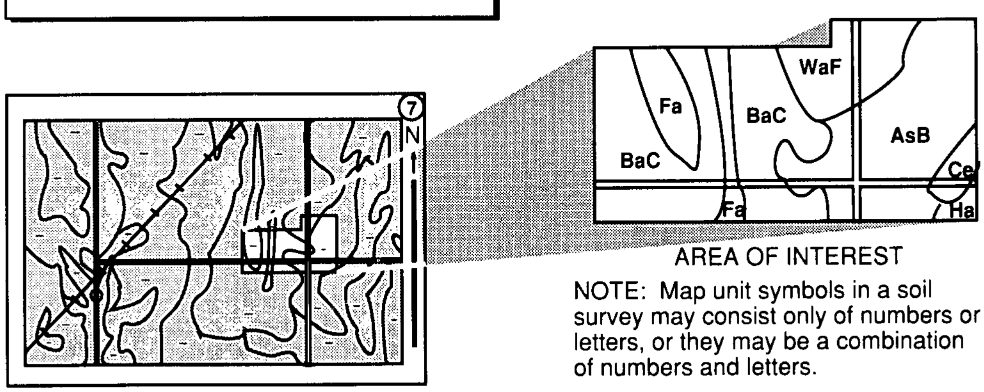
Detailed Soil Maps

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

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



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



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

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

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. 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 1984. Soil names and descriptions were approved in 1985. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1984. 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 Brown County and Bartholomew County Soil and Water Conservation Districts. Financial assistance was made available by the Brown County Commissioners.

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

Cover: A forested area in Brown County. Timber is an important natural resource in the survey area.

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Soil Series

Issued February 1990

Index to Map Units

Summary of Tables

Foreword

This soil survey contains information that can be used in land-planning programs in the survey area. 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 Brown County and part of Bartholomew County in Indiana.

Soil Survey of Brown County and Part of Bartholomew County, Indiana

By Richard A. Noble, Robert C. Wingard, Jr., and Thomas R. Ziegler,
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Fieldwork by Richard A. Noble, Robert C. Wingard, Jr., and
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Soil and Water Conservation Committee

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

This survey area is in the south-central part of Indiana. Brown County has an area of 202,490 acres, or about 316 square miles. The part of Bartholomew County that is in the survey area makes up 25,600 acres, or 40 square miles. It is in Camp Atterbury. The entire survey area extends about 20 miles from north to south and 16 miles from east to west.

Brown County was established in 1836. It was once part of Bartholomew, Monroe, and Jackson Counties. It was named after Major General Jacob Brown, a soldier in the War of 1812 (*4*). The first permanent settlers arrived in Brown County about 1820. They settled near Schooner Creek and Elkinsville. Nashville, the county seat, was founded in 1836. Other communities include Bean Blossom, Helmsburg, Trevlac, Gatesville, Spearsville, and Peoga.

In 1942, Camp Atterbury was established as a training area for the United States Army. It is currently used as a site for military training exercises. It includes a gunnery range used by the Air National Guard. About 45 percent of the camp is forested, and about 45 percent supports native grasses and weeds. These areas are used for military training. About 10 percent of the camp is used for hay and pasture.

This soil survey updates the survey of Brown County published in 1946 and the surveys of Bartholomew County published in 1947 and 1976 (*3, 7, 8*). Camp Atterbury was not included in the survey of Bartholomew County published in 1976.

General Nature of the Survey Area

This section gives general information concerning the survey area. It describes physiography, relief, and drainage; water supply; trends in population and land use; and climate.

Physiography, Relief, and Drainage

This survey area is part of the Norman Upland, a severely dissected plain consisting of long, narrow ridges, steep slopes, and narrow stream bottoms. The bedrock in this area is Mississippian in age. It consists mainly of interbedded siltstone, shale, and sandstone.

Three major ridge systems extend across Brown County in a northeast-southwest direction. Three major streams with valleys about 0.25 to 0.5 mile wide flow parallel to these ridges, in a southwest direction. These are Bean Blossom Creek, in the northern part of the county; the North Fork of Salt Creek, in the central part; and the Middle Fork of Salt Creek, in the southern part. Surface water in some areas in the eastern part of the county drains into the East Fork of the White River to the east. Surface water in a small area in the extreme northern part of the county drains into Indian Creek to the north (*7*).

Parts of the survey area were glaciated. Illinoian glacial till covers the north-central and southeastern parts of Brown County and the south-central part of Camp Atterbury. Wisconsin glacial till covers the northern part of Camp Atterbury and the northeast corner of Brown County. Meltwater from the glaciers deposited stratified outwash and lacustrine material. These deposits occur as terraces adjacent to flood plains along the major stream valleys. Wisconsin loess covers most of the nearly level to moderately sloping uplands in the survey area.

The highest elevation in the survey area is about 1,058 feet above sea level. It is on Weed Patch Hill, in Brown County State Park. The lowest elevation is about 538 feet above sea level. It is at the normal pool line of the Monroe Reservoir, in the southwestern part of Brown County.

Water Supply

Several rural water systems serve most areas in Brown County. Water is obtained from ponds, wells, or cisterns. In many areas, the water from wells is too salty for drinking or the recharge rate is so slow that residents rely on ponds for their water supply. Many suitable pond sites are available throughout the county.

Trends in Population and Land Use

Brown County has a population of about 13,000. The population increased by about 45 percent during the period 1960 to 1980. It is expected to be about 17,000 by the year 2000 (*5*).

Because of the slope, most of the survey area is not suitable for cultivated crops and remains forested. Logging and Christmas tree production are important parts of the local economy (fig. 1). About 50 percent of Brown County is owned by the federal and state governments. Some of these areas include the Hoosier National Forest, Yellowwood State Forest, Brown County State Park, Monroe Reservoir, and the T.C. Steele Memorial. The extent of privately owned woodland and cropland has been decreasing as more land is being developed for urban and recreational uses.

Climate

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

The survey area is cold in winter and hot in summer. Winter precipitation, frequently snow, results in a good accumulation of soil moisture by spring and thus minimizes summer drought on most soils. The normal annual precipitation is adequate for all of the crops that are suited to the temperature and growing season in the survey area.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Columbus 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 22 degrees. The lowest temperature on record, which occurred at Columbus on February 2, 1951, is -15 degrees. In summer the average temperature is 75 degrees, and the average daily maximum temperature is 85 degrees. The highest recorded temperature, which occurred at Columbus on July 15, 1954, is 104 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 (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 40.2 inches. Of this, 22.9 inches, or about 57 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 17 inches. The heaviest 1-day rainfall during the period of record was 4.53 inches at Columbus on May 24, 1952. Thunderstorms occur on about 45 days each year.

The average seasonal snowfall is about 16 inches. The greatest snow depth at any one time during the period of record was 9 inches. On the average, 10 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 southwest. Average windspeed is highest, 12 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

Figure 1.—An area of Stonehead soils used for Christmas trees.

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

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

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

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 associations.

Soil Descriptions

1. Berks-Wellston-Trevlac Association

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

This association consists of soils on ridges and side slopes in the uplands. Slopes range from 6 to 70 percent.

This association makes up about 69 percent of the survey area. It is about 30 percent Berks soils, 24 percent Wellston soils, 15 percent Trevlac soils, and 31 percent minor soils (fig. 2).

The moderately deep Berks soils are on side slopes. Typically, the surface layer is very dark grayish brown very channery silt loam. The subsurface layer is yellowish brown very channery silt loam. The subsoil is light yellowish brown very channery silt loam in the upper part and yellowish brown extremely channery silt loam in the lower part. Weathered siltstone, sandstone, and shale bedrock is at a depth of about 27 inches.

The deep Wellston soils are on the upper parts of side slopes and ridges. Typically, the surface layer is very dark grayish brown silt loam. The subsurface layer is yellowish brown silt loam. The subsoil is yellowish brown silty clay loam in the upper part and yellowish brown very channery silt loam in the lower part. Weathered siltstone, sandstone, and shale bedrock is at a depth of about 51 inches.

The moderately deep Trevlac soils are on side slopes and ridges. Typically, the surface layer is very dark grayish brown silt loam. The subsurface layer is yellowish brown silt loam. The subsoil is yellowish brown silt loam in the upper part and yellowish brown very channery and extremely channery silt loam in the lower part. Weathered siltstone, sandstone, and shale bedrock is at a depth of about 36 inches.

Minor in this association are the Beanblossom, Tilsit, Stonehead, Gilpin, Cincinnati, and Hickory soils. The moderately well drained Beanblossom soils are on narrow flood plains between ridges. The moderately well drained, gently sloping Tilsit soils are on ridgetops. The moderately well drained Stonehead and well drained Gilpin soils are on the upper parts of side slopes and ridges. The well drained Cincinnati and Hickory soils are on ridgetops and side slopes, mainly in the northern part of the survey area.

This association is used mainly as woodland. A few small areas on broad ridgetops are used for cultivated crops or for hay and pasture. The major soils are fairly well suited to woodland and poorly suited to cultivated crops, hay and pasture, urban uses, and recreational uses. The slope, the hazard of erosion, and the depth to bedrock are the main management concerns.

2. Stendal-Haymond-Steff Association

Deep, nearly level, somewhat poorly drained to well drained soils formed in silty alluvial deposits; on flood plains

This association is on flood plains along the major streams and rivers in the survey area. Slopes range from 0 to 2 percent.

This association makes up about 7 percent of the survey area. It is about 26 percent Stendal soils, 25 percent Haymond soils, 20 percent Steff soils, and 29 percent minor soils (fig. 3).

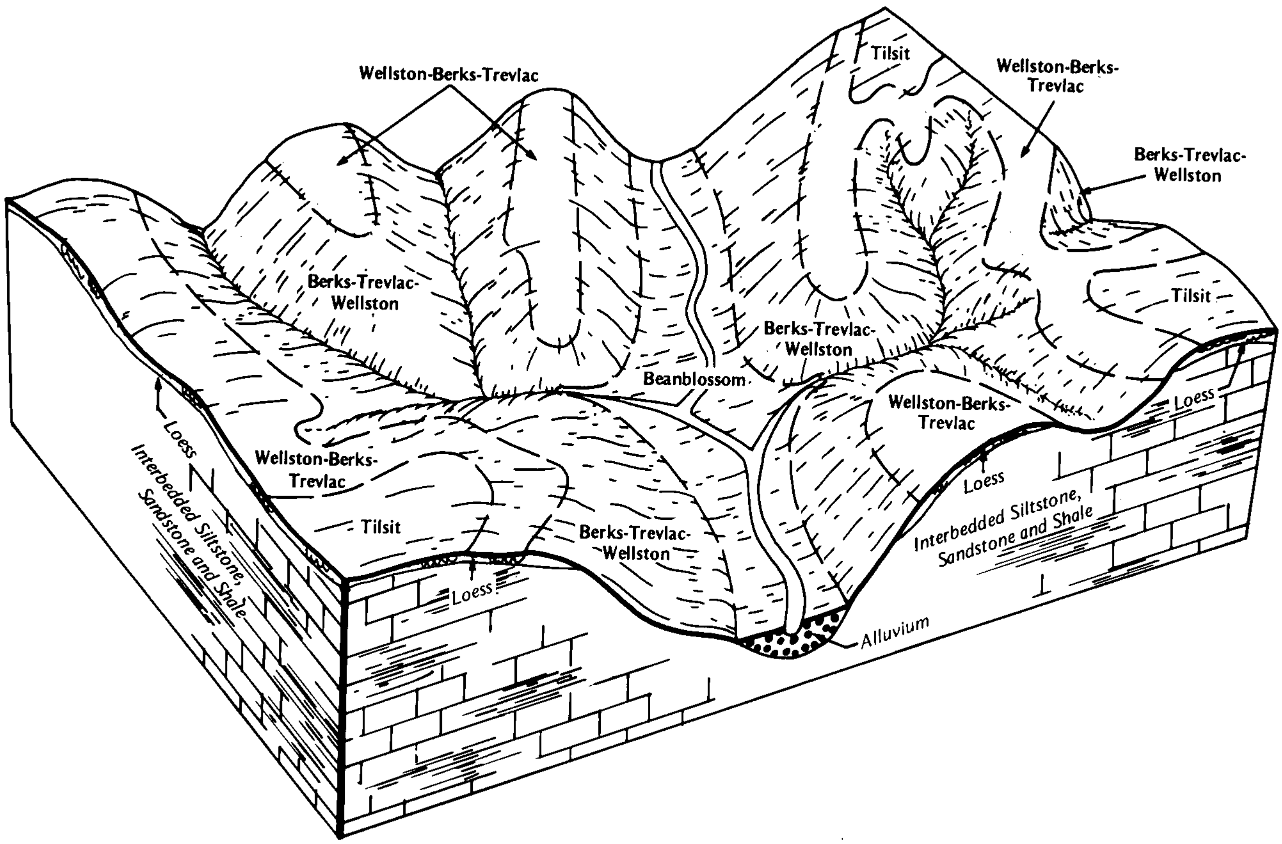

Figure 2.—Pattern of soils and parent material in the Berks-Wellston-Trevlac association.

The somewhat poorly drained Stendal soils are on broad flood plains adjacent to side slopes. Typically, the surface layer and subsurface layer are brown, mottled silt loam. The substratum is light gray, mottled silt loam.

The well drained Haymond soils are adjacent to streams on the flood plains. Typically, the surface layer is brown silt loam. The subsoil is yellowish brown silt loam. The substratum is yellowish brown silt loam and loam.

The moderately well drained Steff soils are on broad flood plains. Typically, the surface layer is brown silt loam. The subsoil is yellowish brown and pale brown, mottled silt loam. The substratum is light brownish gray and brown, mottled silt loam.

Minor in this association are the Beanblossom, Pekin, Bartle, and Wilbur soils. The moderately well drained Beanblossom soils are on narrow flood plains. The moderately well drained Pekin and the somewhat poorly drained Bartle soils are on terraces adjacent to the flood plains. The moderately well drained Wilbur soils are on broad flood plains, mainly in the northern part of the survey area.

This association is used mainly for cultivated crops. A few small areas are used for hay and pasture. The major soils are well suited to cultivated crops; fairly well suited to hay and pasture, woodland, and extensive recreational areas; and poorly suited to urban uses and intensive recreational uses. Flooding and wetness are the main management concerns.

3. Stonehead-Trevlac-Berks Association

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

This association consists of soils on ridges and side slopes in the uplands. Slopes range from 6 to 70 percent.

This association makes up about 5 percent of the survey area. It is about 50 percent Stonehead soils, 15 percent Trevlac soils, 10 percent Berks soils, and 25 percent minor soils.

The deep, moderately well drained, moderately sloping and strongly sloping Stonehead soils are on the upper

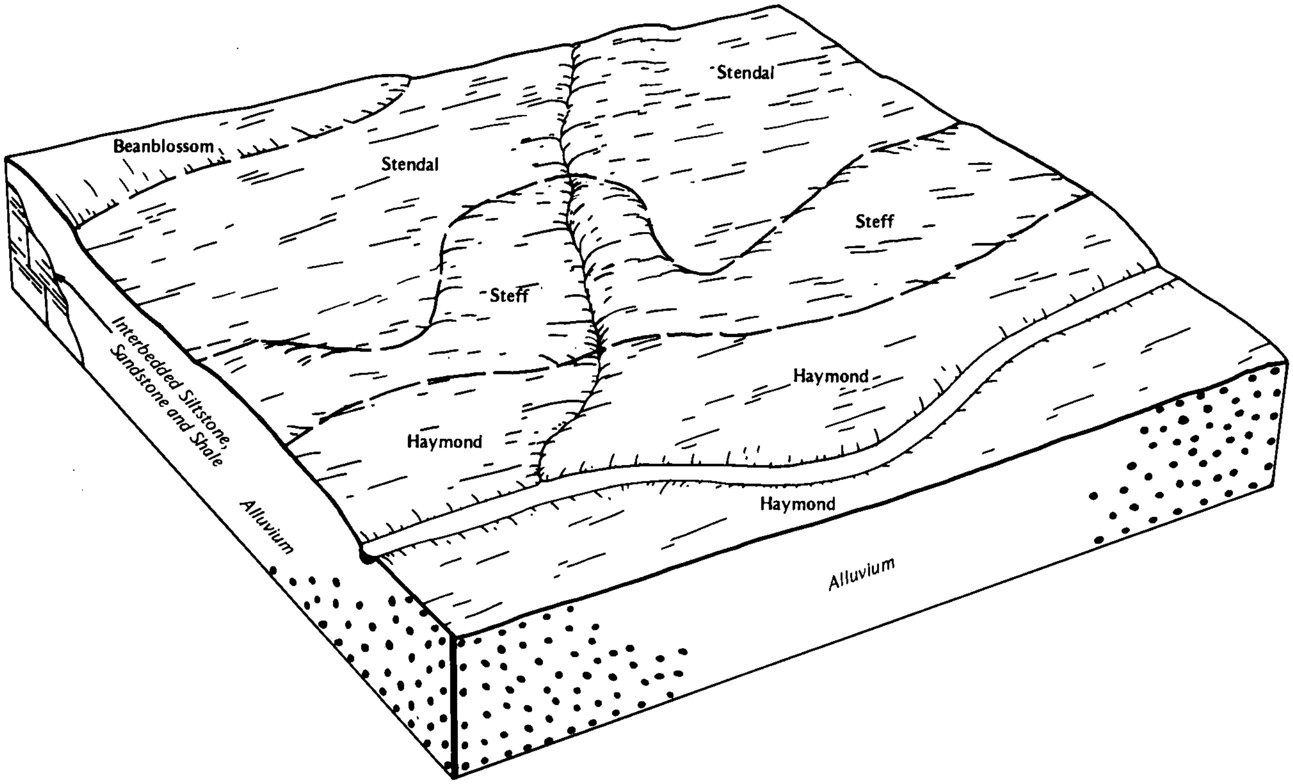

Figure 3.—Pattern of soils and parent material in the Stendal-Haymond-Steff association.

parts of side slopes and ridges. Typically, the surface layer is dark yellowish brown silt loam. The subsoil is yellowish brown silt loam and silty clay loam in the upper part, yellowish red channery silty clay in the next part, and light olive brown shaly silty clay loam in the lower part. Weathered siltstone and shale bedrock is at a depth of about 68 inches.

The moderately deep, well drained, moderately sloping to very steep Trevlac soils are on the upper parts of side slopes and ridges. Typically, the surface layer is very dark grayish brown silt loam. The subsurface layer is yellowish brown silt loam. The subsoil is yellowish brown silt loam in the upper part and yellowish brown very channery and extremely channery silt loam in the lower part. Weathered siltstone, sandstone, and shale bedrock is at a depth of about 36 inches.

The moderately deep, well drained, moderately sloping to very steep Berks soils are on side slopes. Typically, the surface layer is very dark grayish brown very channery silt loam. The subsurface layer is yellowish brown very channery silt loam. The subsoil is light yellowish brown very channery silt loam in the upper part and yellowish brown extremely channery silt loam in the lower part. Weathered siltstone, sandstone, and shale bedrock is at a depth of about 36 inches.

Minor in this association are the moderately well drained Tilsit and well drained Cincinnati soils on ridgetops, the well drained Bonnell and Gilpin soils on side slopes and narrow ridges, and the moderately well drained Beanblossom soils on narrow flood plains.

This association is used mainly as woodland. A few small areas on broad ridgetops are used for cultivated crops or for hay and pasture. The major soils are well suited to woodland, fairly well suited to hay and pasture and to extensive recreational areas, and poorly suited to cultivated crops, urban uses, and intensive recreational uses. The slope, the hazard of erosion, and the depth to bedrock are the main management concerns.

4. Pekin-Chetwynd-Bartle Association

Deep, nearly level to very steep, somewhat poorly drained to well drained soils formed in silty and loamy deposits; on terraces

This association consists of soils on ridgetops and side slopes on terraces along streams. Slopes range from 0 to 50 percent.

This association makes up about 6 percent of the survey area. It is about 41 percent Pekin soils, 25 percent Chetwynd soils, 12 percent Bartle soils, and 22 percent minor soils.

The Pekin soils are moderately well drained and are moderately sloping or gently sloping. Typically, the surface layer is dark yellowish brown silt loam. The subsoil is yellowish brown silt loam in the upper part and a fragipan of yellowish brown and light yellowish brown, mottled silt loam in the lower part. The substratum is yellowish brown, stratified sandy loam and gravelly sandy loam.

The Chetwynd soils are well drained and are strongly sloping to very steep. Typically, the surface layer is very dark grayish brown loam. The subsurface layer is yellowish brown loam. The upper part of the subsoil is yellowish brown and strong brown loam and clay loam. The next part is yellowish red loam and gravelly loam. The lower part is strong brown gravelly sandy loam that has thin strata of loamy sand. The substratum is strong brown gravelly sandy loam that has thin strata of loamy sand.

The Bartle soils are somewhat poorly drained and are nearly level and gently sloping. Typically, the surface layer is dark brown silt loam. The subsoil is pale brown, mottled silt loam in the upper part; a fragipan of yellowish brown, mottled silty clay loam and silt loam in the next part; and yellowish brown, mottled silt loam and silty clay loam in the lower part.

Minor in this association are the well drained Haymond, moderately well drained Steff and Wilbur, and somewhat poorly drained Stendal soils on flood plains and the well drained Hickory soils on side slopes, mainly in the northern part of the survey area.

This association is used mainly as woodland. A few small areas adjacent to flood plains are used for cultivated crops, and a few small areas are used for hay and pasture. The major soils are well suited to woodland, fairly well suited to hay and pasture and to extensive recreational areas, and poorly suited to cultivated crops, urban uses, and intensive recreational uses. The slope and the hazard of erosion are the main management concerns.

5. Hickory-Cincinnati-Rossmoyne Association

Deep, gently sloping to very steep, well drained and moderately well drained soils formed in loess and in the underlying loamy and silty glacial drift and till; on uplands

This association consists of soils on ridgetops and side slopes in the loess-covered uplands. Slopes range from 2 to 70 percent.

This association makes up about 10 percent of the survey area. It is about 40 percent Hickory soils, 25 percent Cincinnati soils, 6 percent Rossmoyne soils, and 29 percent minor soils (fig. 4).

The well drained, strongly sloping to very steep Hickory soils are on side slopes and narrow ridgetops. Typically, the surface layer is very dark grayish brown silt loam. The subsurface layer is yellowish brown silt loam. The subsoil is strong brown and brown clay loam and loam. The substratum is yellowish brown loam.

The well drained, moderately sloping Cincinnati soils are on narrow ridgetops and side slopes. Typically, the surface layer is dark yellowish brown silt loam. The subsoil is yellowish brown silt loam and silty clay loam in the upper part; a fragipan of yellowish brown, mottled silt loam in the next part; and strong brown, mottled silty clay loam and clay in the lower part.

The moderately well drained, gently sloping Rossmoyne soils are on ridgetops and short, convex side slopes. Typically, the surface layer is dark brown silt loam. The subsoil is yellowish brown silt loam in the upper part; a fragipan of yellowish brown, mottled silt loam in the next part; and yellowish brown and brown, mottled silt loam in the lower part.

Minor in this association are the well drained Wellston and Trevlac soils on ridgetops and side slopes; the somewhat poorly drained, nearly level Avonburg soils on wide ridgetops; and the well drained Haymond and moderately well drained Steff and Wilbur soils on flood plains.

This association is used mainly as woodland. A few small areas of the gently sloping and moderately sloping soils are used for cultivated crops or for hay and pasture. The major soils are well suited to hay and pasture and to woodland, fairly well suited to cultivated crops and extensive recreational areas, and poorly suited to urban uses and intensive recreational uses. The slope and the hazard of erosion are the main management concerns.

6. Crosby-Miami-Rensselaer Association

Deep, nearly level to strongly sloping, somewhat poorly drained, well drained, and very poorly drained soils formed in loess and the underlying loamy glacial till, in glacial till, and in stratified loamy sediments; on uplands and terraces

This association consists of soils on broad flats, knolls, ridges, and side slopes on till plains and terraces. Slopes range from 0 to 15 percent.

This association makes up about 2 percent of the survey area. It is about 35 percent Crosby soils, 17 percent Miami soils, 14 percent Rensselaer soils, and 34 percent minor soils.

The somewhat poorly drained, nearly level and gently sloping Crosby soils are on rises, low knolls, and ridges in the uplands. Typically, the surface layer is dark grayish brown silt loam. The subsoil is grayish brown and yellowish brown silt loam and silty clay loam in the upper part and dark yellowish brown and yellowish brown clay loam in the lower part. The substratum is yellowish brown loam.

The well drained, moderately sloping and strongly sloping Miami soils are on knolls, ridges, and side slopes in the uplands. Typically, the surface layer is dark brown

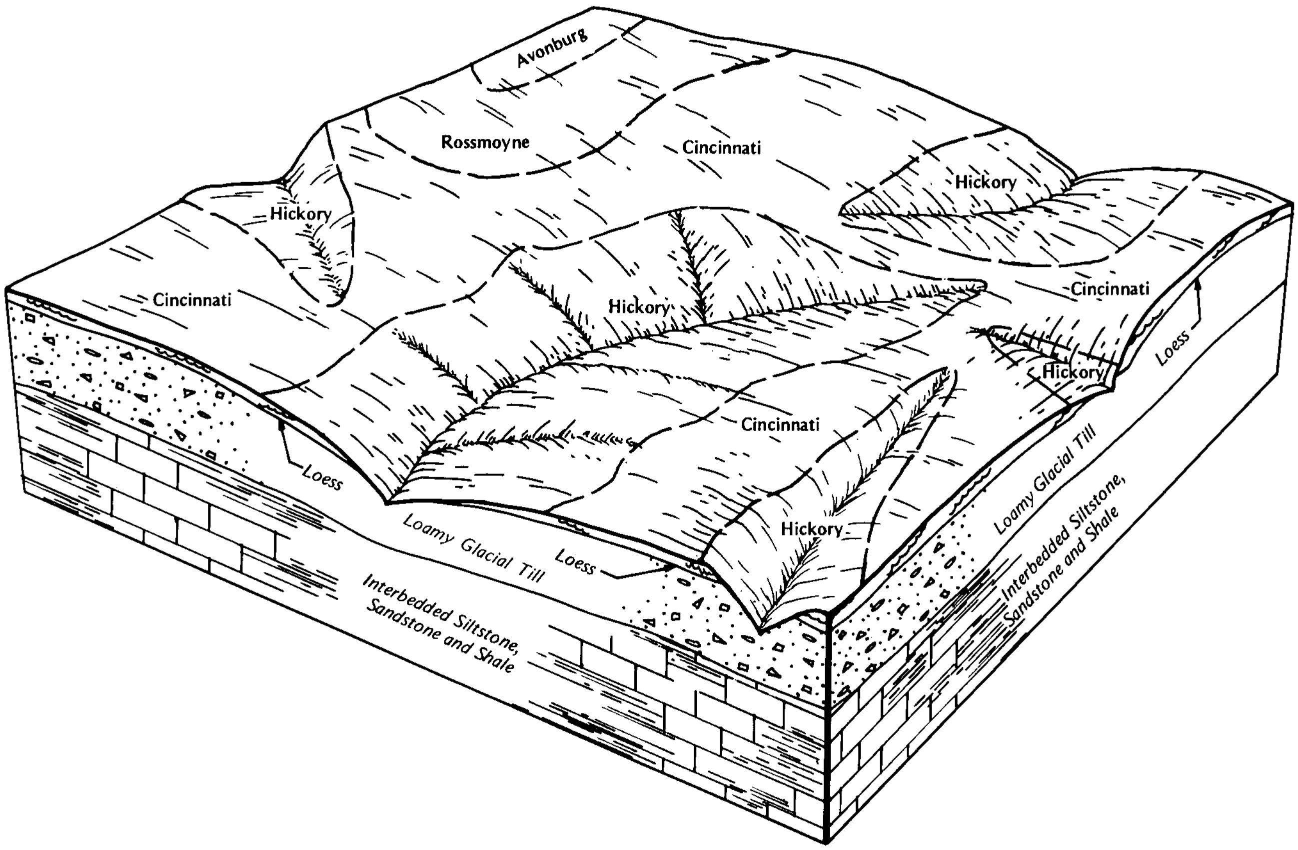

Figure 4.—Pattern of soils and parent material in the Hickory-Cincinnati-Rossmoyne association.

loam. The subsoil is yellowish brown loam and clay loam. The substratum is yellowish brown loam.

The very poorly drained, nearly level Rensselaer soils are on broad flats on outwash terraces. Typically, the surface layer is very dark gray loam. The subsurface layer is very dark gray clay loam. The subsoil is dark gray clay loam in the upper part and gray clay loam in the lower part. The substratum is grayish brown, stratified loam, sandy loam, and loamy sand.

Minor in this association are the somewhat poorly drained Whitaker soils on outwash terraces, the well drained Chagrin soils on flood plains, and the well drained Martinsville soils on stream terraces and outwash plains.

Most areas of this association are used as sites for military training or are idle. A few small areas are used for hay and pasture. The major soils are well suited to cultivated crops and to hay and pasture, fairly well suited to woodland and recreational uses, and poorly suited to urban uses. Wetness and restricted permeability are the main limitations.

7. Stonelick-Chagrin Association

Deep, nearly level, well drained soils formed in loamy alluvial deposits; on flood plains

This association is on flood plains along the Driftwood River and its tributaries. Slopes range from 0 to 2 percent.

This association makes up about 1 percent of the survey area. It is about 47 percent Stonelick soils, 42 percent Chagrin soils, and 11 percent minor soils.

The Stonelick soils are on broad flood plains along the Driftwood River. Typically, the surface layer is dark brown loam. The upper part of the substratum is dark brown and dark yellowish brown loam that has thin strata of sandy loam. The lower part is yellowish brown very gravelly coarse sand.

The Chagrin soils are on narrow flood plains. Typically, the surface layer is dark brown silt loam. The subsoil is dark yellowish brown loam. The substratum is yellowish brown sandy loam that has thin strata of loam.

Minor in this association are the somewhat poorly drained Stendal soils on narrow flood plains and the well drained Martinsville, somewhat poorly drained Whitaker, and very poorly drained Rensselaer soils on terraces adjacent to the flood plains.

Most areas of this association are used as sites for military training or are idle. A few areas are used for hay and pasture. The major soils are well suited to cultivated crops and to hay and pasture, fairly well suited to woodland and recreational uses, and poorly suited to urban uses. Flooding is the main management concern.

Broad Land Use Considerations

The soils in the survey area vary widely in their suitability for major land uses. These uses include cultivated crops, hay and pasture, woodland, and recreational development.

Approximately 7 percent of the survey area is used for cultivated crops, mainly corn and soybeans. This cropland is concentrated mainly in the Stendal-Haymond-Steff association, which is well suited to cultivated crops, and in the Hickory-Cincinnati-Rossmoyne association, which is fairly well suited. The Stendal-Haymond-Steff association is subject to flooding, mainly in winter and early spring. Also, the Stendal and Steff soils have a seasonal high water table, which can delay planting in the spring. Cultivated crops are grown on the Rossmoyne and Cincinnati soils in the Hickory-Cincinnati-Rossmoyne association. These soils are subject to erosion if they are cultivated.

No cultivated crops are grown in areas of the Stonelick-Chargin and Crosby-Miami-Rensselaer associations, which are in Camp Atterbury and are used as sites for military training activities. The Stonelick-Chagrin association is well suited to cultivated crops, but it is subject to flooding, mainly in winter and early spring. If drained, the Crosby-Miami-Rensselaer association also is well suited to cultivated crops.

Approximately 5 percent of the survey area is used for hay and pasture. The Hickory-Cincinnati-Rossmoyne, Stonelick-Chagrin, and Crosby-Miami-Rensselaer associations are well suited to grasses and legumes. In areas of the Crosby and Rensselaer soils, which have a seasonal high water table, water-tolerant grasses and legumes should be selected for planting. Flooding is a hazard on the Stonelick-Chagrin association. The Rossmoyne and Cincinnati soils are poorly suited to deep-rooted legumes because they have a fragipan in the subsoil.

The Stendal-Haymond-Steff, Stonehead-Trevlac-Berks, and Pekin-Chetwynd-Bartle associations are fairly well suited to hay and pasture. Flooding is a hazard on the Stendal-Haymond-Steff association. Also, the Stendal and Steff soils have a seasonal high water table. Erosion is a hazard on the Stonehead-Trevlac-Berks and Pekin-Chetwynd-Bartle associations. Also, a fragipan in the subsoil of the Pekin and Bartle soils restricts the growth of deep-rooted legumes. The Berks-Wellston-Trevlac association is poorly suited to hay and pasture because of the slope and the hazard of erosion.

Approximately 70 percent of the survey area is woodland. The Stonehead-Trevlac-Berks, Pekin-Chetwynd-Bartle, and Hickory-Cincinnati-Rossmoyne associations are well suited to woodland, and the Berks-Wellston-Trevlac, Stendal-Haymond-Steff, Stonelick-Chagrin, and Crosby-Miami-Rensselaer associations are fairly well suited. Wetness is a limitation in many areas of the Stendal-Haymond-Steff and Crosby-Miami-Rensselaer associations. Commercially valuable trees are less common in these areas than in areas of better drained soils. Also, they generally do not grow so rapidly. Flooding is a hazard on the Stendal-Haymond-Steff and Stonelick-Chagrin associations. The slope and the hazard of erosion are limitations on the steeper associations.

Most of the associations are poorly suited to intensive recreational uses because of the slope. Flooding is a hazard on the Stendal-Haymond-Steff and Stonelick-Chagrin associations. The Crosby-Miami-Rensselaer association is suitable for these uses, but wetness and slow permeability are limitations.

Most of the associations are suitable as sites for extensive recreational uses. Slope, flooding, and wetness are the major management concerns. The Berks-Wellston-Trevlac association is poorly suited to these uses because of the slope. Small areas that are well suited to certain types of recreational development may be available in parts of this association.

Detailed Soil Map Units

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

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

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

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

Soils of one series can differ in texture of the surface layer or of the substratum. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Hickory silt loam, 12 to 20 percent slopes, eroded, is a phase of the Hickory 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. Rensselaer-Whitaker complex 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.

The names, descriptions, and delineations of the soils identified on the detailed soil maps 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.

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

AvA—Avonburg silt loam, 0 to 2 percent slopes. This nearly level, deep, somewhat poorly drained soil is on ridgetops in the uplands. Individual areas are irregular in shape and are dominantly 5 to 60 acres in size.

In a typical profile, the surface layer is brown silt loam about 9 inches thick. The subsoil extends to a depth of about 80 inches. It is mottled. It is pale brown and light gray, friable silt loam and silty clay loam in the upper part; a fragipan of light brownish gray, very firm silty clay loam in the next part; and light brownish gray silt loam and silty clay loam in the lower part. In some areas the slope is more than 2 percent. In other areas the fragipan is loam.

Included with this soil in mapping are a few areas of poorly drained soils near the center of broad ridgetops and small areas of the moderately well drained Rossmoyne soils on side slopes and ridgetops. Included soils make up about 10 percent of the map unit.

The Avonburg soil has a moderate available water capacity. It is moderately permeable above the fragipan and very slowly permeable in the fragipan. Surface runoff is slow. The organic matter content is moderately low in the surface layer. The water table is at a depth of 1 to 3 feet during winter and early spring. Root penetration is restricted by the very firm and brittle fragipan at a depth of about 23 inches.

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

If drained, this soil is well suited to corn, soybeans, and small grain. The wetness is the major limitation. Because the fragipan restricts water movement, the soil is often saturated in winter and spring and fieldwork may be delayed. Surface and subsurface drains help to remove excess water. 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, such as orchardgrass and alsike clover, for hay and pasture. It is poorly suited to deep-rooted legumes, such as alfalfa, because root growth is restricted by the fragipan. Grazing when the soil is too wet results in surface compaction and poor tilth and reduces plant density. Proper stocking rates, rotation grazing, 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 root zone is restricted mainly to the part of the profile above the fragipan. Seedling mortality, the windthrow hazard, and plant competition are management concerns. Special planting stock and overstocking are needed. Harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Seedlings survive and grow well if competing vegetation is controlled by proper site preparation and by spraying, cutting, or girdling. Additional management practices include harvesting mature trees and excluding livestock.

Because of the wetness, this soil is severely limited as a site for dwellings. Surface and subsurface drains help to remove excess water. The soil is difficult to drain because it is nearly level and suitable outlets are not readily available. Low strength and frost action are severe limitations on sites for local roads and streets. Strengthening or replacing the base with better suited material helps to overcome these limitations. Drainage ditches along the roads help to remove excess water.

This soil is severely limited as a site for septic tank absorption fields because of the very slow permeability and the wetness. Installing perimeter subsurface drains and increasing the size of the absorption field help to overcome these limitations.

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

Ba—Bartle silt loam, 0 to 3 percent slopes. This nearly level and gently sloping, deep, somewhat poorly drained soil is on stream terraces. Individual areas are irregular in shape and are dominantly 5 to 50 acres in size.

In a typical profile, the surface layer is dark brown silt loam about 7 inches thick. The subsoil extends to a depth of about 80 inches. It is mottled. It is pale brown, friable silt loam in the upper part; a fragipan of yellowish brown, mottled, very firm and brittle silty clay loam and silt loam in the next part; and yellowish brown, firm silt loam and silty clay loam in the lower part. In places the slope is more than 3 percent.

Included with this soil in mapping are a few areas of poorly drained soils in depressions and small areas of the moderately well drained Pekin soils adjacent to drainageways and on the steeper parts of the landscape. Also included, adjacent to the flood plains, are a few low areas that are subject to rare flooding. Included soils make up about 15 percent of the map unit.

The Bartle soil has a moderate available water capacity. It is moderately permeable above the fragipan and very slowly permeable in the fragipan. Surface runoff is slow. The organic matter content is moderately low in the surface layer. The water table is at a depth of 1 to 2 feet during winter and early spring. Root penetration is restricted by the very firm and brittle fragipan at a depth of about 24 inches.

Most areas of this soil are used for cultivated crops. Some are used for hay, pasture, or woodland. Those in Camp Atterbury are used for military training activities. They support a mixture of native grasses, weeds, and trees.

This soil is well suited to corn, soybeans, and small grain. The wetness is the major limitation. Because the fragipan restricts water movement, the soil is often saturated in winter and spring and fieldwork may be delayed. Surface and subsurface drains help to remove excess water. The soil is somewhat droughty during long dry periods in 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, such as orchardgrass and alsike clover, for hay and pasture. It is poorly 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 results in surface compaction and poor tilth and reduces plant density. Proper stocking rates, rotation grazing, 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. Seedlings survive and grow well if competing vegetation is controlled by proper site preparation and by spraying, cutting, or girdling. Additional management practices include harvesting mature trees and excluding livestock.

Because of the wetness, this soil is severely limited as a site for dwellings. Surface and subsurface drains help to remove excess water. The soil is difficult to drain because it is nearly level and gently sloping and suitable outlets are not readily available. Because of frost action, the soil is severely limited as a site for local roads and streets. Drainage ditches along the roads help to remove excess water and reduce the potential for frost action.

Because of the very slow permeability and the wetness, this soil is severely limited as a site for septic tank absorption fields. Installing perimeter subsurface drains and increasing the size of the absorption field help to overcome these limitations.

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

Be—Beanblossom channery silt loam, occasionally flooded. This nearly level and gently sloping, deep, moderately well drained soil is on flood plains, alluvial fans, and colluvial benches. Individual areas are irregular in shape and are dominantly 5 to 80 acres in size.

In a typical profile, the surface layer is brown channery silt loam about 7 inches thick. The substratum is about 47 inches of yellowish brown and dark yellowish brown very channery silt loam and extremely channery loam. Weathered siltstone interbedded with sandstone and shale is at a depth of about 54 inches. In some areas, the surface layer is silt loam and the upper part of the substratum has fewer coarse fragments.

Included with this soil in mapping are a few areas of the well drained Haymond soils on the broader flood plains. These soils have fewer coarse fragments in the substratum than the Beanblossom soil. Also included are small areas of soils that are less than 40 inches deep over bedrock; colluvial soils that are more than 60 inches deep over bedrock and are in the more sloping, higher areas that are less likely to be flooded than the Beanblossom soil; areas of soils that are near the stream channel and are frequently flooded; and somewhat poorly drained soils in slight depressions. Included soils make up about 15 percent of the map unit.

The Beanblossom soil has a very low available water capacity and is moderately rapidly permeable. Surface runoff is slow. The organic matter content is moderately low in the surface layer. The water table is at a depth of 3 to 5 feet during winter and early spring.

Most areas of this soil are used for hay, pasture, or woodland. Some are used for cultivated crops. Those that are in Camp Atterbury are used for military training activities. They support a mixture of native grasses, weeds, and trees.

This soil is fairly well suited to corn, soybeans, and small grain. The very low available water capacity, the stoniness, and the flooding are management concerns. Flooding normally occurs before the major crops grown in the survey area are planted. Because they are narrow and are cut by meandering streams, some areas are too small to be cropped. Flood damage can be minimized in some areas by levees and by diversions built around the higher areas to intercept the runoff that could cause headwater flooding. 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, such as orchardgrass and red clover, for hay and pasture. Overgrazing results in 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 woodland. The flooding can delay planting and harvesting. Plant competition and the equipment limitation are management concerns. The rooting depth is somewhat restricted for black walnut and other trees that require a soil free of coarse fragments. The use of planting and logging equipment is limited during wet periods. Competing vegetation can be controlled by proper site preparation and by spraying, cutting, or girdling. Additional management practices include harvesting mature trees and excluding livestock.

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. Alternative sites should be selected. The soil is severely limited as a site for local roads and streets because of the flooding. Building the roads and streets on raised fill material helps to prevent the damage caused by floodwater.

The land capability classification is IIIw. The woodland ordination symbol is 7F.

BgF—Berks-Trevlac-Wellston complex, 20 to 70 percent slopes. These moderately steep to very steep, well drained soils are on hillsides in the uplands. The moderately deep Berks and Trevlac soils are generally on the more sloping, upper parts of the side slopes. The deep Wellston soils are generally on the less sloping, lower parts. Most areas are elongated or irregularly shaped and are several thousand acres in size. They are about 45 percent Berks soil, 20 percent Trevlac soil, and 20 percent Wellston soil. The three soils occur as areas so intricately mixed that separating them in mapping is not practical.

In a typical profile of the Berks soil, the surface layer is very dark grayish brown very channery silt loam about 2 inches thick. The subsurface layer is about 3 inches of yellowish brown very channery silt loam. The subsoil is about 22 inches thick. It is friable. The upper part is light yellowish brown very channery silt loam, and the lower part is yellowish brown extremely channery silt loam. Weathered siltstone interbedded with sandstone and shale is at a depth of 27 inches (fig. 5). In some places the slope is more than 70 percent. In other places the surface layer is flaggy or stony silt loam.

In a typical profile of the Trevlac soil, the surface layer is very dark grayish brown silt loam about 2 inches thick. The subsurface layer is about 4 inches of yellowish brown silt loam. The subsoil is about 30 inches thick. It is yellowish brown and friable. The upper part is silt loam, and the lower part is very channery and extremely

Figure 5.—Interbedded siltstone, sandstone, and shale underlying the Berks soil in the Berks-Trevlac-Wellston complex, 20 to 70 percent slopes.

channery silt loam. Weathered siltstone interbedded with sandstone and shale is at a depth of about 36 inches. In some places the slope is more than 70 percent. In other places the surface layer is channery silt loam.

In a typical profile of the Wellston soil, the surface layer is brown silt loam about 3 inches thick. The subsurface layer is about 7 inches of yellowish brown silt loam. The subsoil is about 38 inches thick. The upper part is yellowish brown, friable silt loam and firm silty clay loam, and the lower part is light olive brown, friable channery silt loam. Weathered siltstone interbedded with sandstone and shale is at a depth of about 48 inches. In some areas the slope is less than 20 percent. In other areas the underlying residuum weathered dominantly from shale and has more clay.

Included with these soils in mapping are a few areas of shallow soils and areas where bedrock is exposed. Also included are areas of the moderately well drained Stonehead soils on the upper parts of side slopes.

Included areas make up about 15 percent of the map unit.

The available water capacity is very low in the Berks soil, low in the Trevlac soil, and high in the Wellston soil. The Berks soil is moderately rapidly permeable, and the Trevlac and Wellston soils are moderately permeable. Surface runoff is very rapid on all three soils. The organic matter content is moderate in the surface layer.

Most areas of these soils are used as woodland. A few are used as pasture. Those in Camp Atterbury are used for military training activities. They support trees.

Because the slope, the surface stones, and the included rock outcrops hinder the use of standard farm equipment, these soils are generally unsuitable as cropland. They are generally unsuited to grasses and legumes for hay and pasture because of the slope and the stoniness. Pastures can be established in the less sloping areas, but finding access to them may be difficult.

These soils are fairly well suited to woodland. The erosion hazard and the equipment limitation are management concerns. Building haul roads on the contour, constructing water bars, and preserving as much understory vegetation as possible 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. Seedling mortality is a problem on the Berks soil, especially on south-facing slopes, which are more droughty than north-facing slopes.

Because of the slope, these soils are generally unsuitable as sites for dwellings and septic tank absorption fields. The slope of all three soils and frost action in the Wellston soil are severe limitations on sites for local roads and streets. Constructing the roads on the contour and land shaping help to overcome the slope. Replacing or covering the upper layers of the Wellston soil with suitable base material helps to prevent the damage caused by frost action.

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

BnD2—Bonnell loam, 12 to 20 percent slopes, eroded. This strongly sloping and moderately steep, deep, well drained soil is on narrow ridgetops and side slopes in the uplands. A few hills or shallow gullies tend to form after heavy rainfall. Individual areas are irregular in shape and are dominantly 10 to 60 acres in size.

In a typical profile, the surface layer is brown loam about 5 inches thick. It contains strong brown subsoil material. The subsoil is about 49 inches thick. The upper part is strong brown, firm and very firm clay loam and clay, and the lower part is strong brown and yellowish brown, firm clay loam and loam. The substratum to a depth of about 60 inches is yellowish brown loam. In a few areas the soil formed in sandstone, siltstone, and shale residuum. In some areas the subsoil has more sand and less clay. In a few places the surface layer is silt loam.

Included with this soil in mapping are the well drained Cincinnati soils. These soils are less sloping than the Bonnell soil. They have a slowly permeable fragipan. They are on the wider ridgetops and on the upper parts of the side slopes. Also included are severely eroded areas where all of the surface layer has been lost through erosion and small areas of soils that are moderately deep over bedrock and are on the steeper, lower parts of the side slopes. Included soils make up about 15 percent of the map unit.

The Bonnell soil has a high available water capacity and is slowly permeable. Surface runoff is rapid. The organic matter content is moderate in the surface layer.

Most areas of this soil are used as woodland. Some are used for hay and pasture. Those in Camp Atterbury are used for military training activities. They support a mixture of native grasses, weeds, and trees.

This soil is poorly suited to cultivated crops. These crops can be grown occasionally, but the hazard of erosion is very severe. Measures that help to control erosion and surface runoff are needed. A crop rotation that is dominated by grasses and legumes, a system of conservation tillage that leaves protective amounts of crop residue on the surface, and grassed waterways help to prevent excessive soil loss. The soil is well suited to a no-till cropping system. Cover crops and green manure crops help to control erosion and maintain tilth and the organic matter content.

This soil is fairly well suited to grasses and legumes, such as orchardgrass, red clover, and alfalfa, for hay and pasture. Overgrazing results in surface compaction, poor tilth, and excessive runoff and erosion 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 fairly well suited to woodland. The erosion hazard, the equipment limitation, and plant competition are management concerns. Building haul roads on the contour, constructing water bars, and preserving as much understory vegetation as possible help to control erosion. Using specialized equipment and carefully planning logging and planting activities help to overcome the equipment limitation. Competing vegetation can be controlled by proper site preparation and by spraying, cutting, or girdling. Additional management practices include harvesting mature trees and excluding livestock.

Because of the shrink-swell potential and the slope, 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 buildings should be designed so that they conform to the natural slope of the land.

Because of low strength, the shrink-swell potential, and the slope, this soil is severely limited 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. Constructing the roads on the contour and land shaping help to overcome the slope.

This soil is severely limited as a site for septic tank absorption fields because of the slope and the slow permeability. Installing the distribution lines on the contour and increasing the size of the absorption field help to overcome these limitations.

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

BpD3—Bonnell clay loam, 12 to 20 percent slopes, gullied. This strongly sloping to moderately steep, deep, well drained soil is on narrow ridgetops and side slopes in the uplands. Many small gullies have formed, and erosion has severely reduced the thickness of the surface layer. Individual areas are irregular in shape and are dominantly 10 to 60 acres in size.

In a typical profile, the surface layer is strong brown clay loam about 4 inches thick. The subsoil is about 48 inches thick. The upper part is strong brown, very firm clay, and the lower part is yellowish brown, firm clay loam. The substratum to a depth of about 60 inches is yellowish brown clay loam. In some areas the surface layer is loam. In a few areas the soil formed in sandstone, siltstone, and shale residuum. In places the subsoil has more sand or less clay.

Included with this soil in mapping are the well drained Cincinnati soils. These soils are less sloping than the Bonnell soil. They have a slowly permeable fragipan. They are on the wider ridgetops and on the upper parts of the side slopes. Also included are soils that are moderately deep over bedrock and are on the steeper, lower parts of the side slopes. Included soils make up about 15 percent of the map unit.

The Bonnell soil has a high available water capacity and is slowly permeable. Surface runoff is very rapid. The organic matter content is very low in the surface layer.

Most areas of this soil are idle. Some are used as woodland.

Because of poor tilth, the numerous gullies, and the hazard of further erosion, this soil is generally unsuited to corn, soybeans, and small grain and is poorly suited to grasses and legumes for hay and pasture. A permanent vegetative cover is needed to control erosion and surface runoff. In areas where grasses and legumes are to be established, cutting and filling can reshape the land surface so that farm machinery can be used.

This soil is fairly well suited to trees. The erosion hazard, the equipment limitation, seedling mortality, and plant competition are management concerns. Building haul roads on the contour, constructing water bars, and preserving as much understory vegetation as possible help to control erosion. Using specialized equipment and carefully planning logging and planting activities help to overcome the equipment limitation. Seedlings survive and grow well if competing vegetation is controlled by proper site preparation and by spraying, cutting, or girdling. Additional management practices include harvesting mature trees and excluding livestock.

Because of the shrink-swell potential and the slope, 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 buildings should be designed so that they conform to the natural slope of the land.

Because of low strength, the shrink-swell potential, and the slope, this soil is severely limited 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. Constructing the roads on the contour and land shaping help to overcome the slope.

This soil is severely limited as a site for septic tank absorption fields because of the slope and the slow permeability. Installing the distribution lines on the contour and increasing the size of the absorption field help to overcome these limitations.

The land capability classification is VIe. The woodland ordination symbol is 3R.

Ca—Chagrin silt loam, occasionally flooded. This nearly level, deep, well drained soil is on flood plains. Individual areas are elongated and are dominantly about 50 acres in size.

In a typical profile, the surface layer is dark brown silt loam about 4 inches thick. The subsoil is dark yellowish brown, friable loam about 36 inches thick. The substratum to a depth of about 60 inches is yellowish brown sandy loam that has thin strata of loam. In some areas the upper part of the subsoil has less clay.

Included with this soil in mapping are a few areas of somewhat poorly drained soils adjacent to the uplands, away from stream channels. These soils make up about 10 percent of the map unit.

The Chagrin soil has a high available water capacity and is moderately permeable. Surface runoff is slow. The organic matter content is moderate in the surface layer.

Most areas of this soil are in Camp Atterbury and are used for military training activities. These areas support trees or a mixture of native grasses and weeds.

This soil is well suited to row crops. Floodwater can damage the crops. 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 legumes, such as orchardgrass and red clover, for hay and pasture. Overgrazing results in surface compaction and poor tilth and reduces plant density. Proper stocking rates, rotation grazing, and timely deferment of grazing help to keep the pasture in good condition.

This soil is well suited to woodland. Plant competition is severe. The flooding can delay planting and harvesting. Competing vegetation can be controlled by proper site preparation and by spraying, cutting, or girdling. Additional management practices include harvesting mature trees and excluding livestock.

Because of the flooding, this soil is generally unsuited to dwellings and septic tank absorption fields. An alternative site should be selected. The soil is severely limited as a site for local roads and streets because of the flooding. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by floodwater.

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

CdD2—Chetwynd loam, 12 to 20 percent slopes, eroded. This strongly sloping and moderately steep, deep, well drained soil is on narrow ridgetops and side slopes on outwash terraces. A few hills or shallow gullies tend to form after heavy rainfall. Individual areas are irregular in shape and are dominantly 5 to 20 acres in size.

In a typical profile, the surface layer is dark brown loam about 7 inches thick. The subsoil is about 55 inches thick. The upper part is yellowish brown, friable loam, and the lower part is yellowish red, firm gravelly clay loam. The substratum to a depth of about 70 inches is brown, friable sandy loam. In some areas the soil formed in sandstone, siltstone, and shale residuum. In other areas it formed in outwash material that has more silt. In places it formed in glacial till.

Included with this soil in mapping are the moderately well drained Pekin soils. These soils are less sloping than the Chetwynd soil. They have a very slowly permeable fragipan. They are on the wider ridgetops and on the upper parts of the side slopes. Also included are areas of soils that are moderately deep over bedrock and are on the steeper, lower parts of the side slopes. Included soils make up about 15 percent of the map unit.

The Chetwynd soil has a high available water capacity and is moderately permeable. Surface runoff is rapid. The organic matter content is moderately low in the surface layer.

Most areas of this soil are used as woodland. Some are used for hay and pasture. Those in Camp Atterbury are used for military training activities. They support trees.

This soil is poorly suited to cultivated crops. These crops can be grown occasionally, but the hazard of erosion is very severe. Measures that help to control erosion and surface runoff are needed. A crop rotation that is dominated by grasses and legumes, a system of conservation tillage that leaves protective amounts of crop residue on the surface, and grassed waterways help to prevent excessive soil loss. Cover crops and green manure crops help to control erosion and maintain tilth and the organic matter content.

This soil is fairly well suited to grasses and legumes, such as orchardgrass, red clover, and alfalfa, for hay and pasture. Overgrazing results in surface compaction, poor tilth, and excessive runoff and erosion 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 woodland. Plant competition is moderate. It can be controlled by proper site preparation and by spraying, cutting, or girdling. Additional management practices include harvesting mature trees and excluding livestock.

Because of the slope, this soil is severely limited as a site for dwellings, septic tank absorption fields, and local roads and streets. The buildings should be designed so that they conform to the natural slope of the land. The roads should be built and the absorption fields installed on the contour. Land shaping may be needed.

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

CdF—Chetwynd loam, 20 to 50 percent slopes. This moderately steep to very steep, deep, well drained soil is on narrow ridgetops and side slopes on outwash terraces. Individual areas are irregular in shape and are dominantly 10 to 60 acres in size.

In a typical profile, 1 inch of partially decomposed leaf litter is at the surface. The surface layer is very dark grayish brown loam about 2 inches thick. The subsurface layer is yellowish brown loam about 5 inches thick. The subsoil is about 63 inches thick. In sequence downward, it is yellowish brown and strong brown, friable loam and firm clay loam; strong brown and yellowish red, firm loam; yellowish red, firm gravelly loam; and strong brown, firm and friable gravelly sandy loam. The substratum to a depth of about 80 inches is strong brown gravelly sandy loam that has strata of loamy sand. In a few areas the soil formed in sandstone, siltstone, or shale residuum. In places the subsoil and substratum have less sand and more silt.

Included with this soil in mapping are the moderately sloping Pekin soils. These soils have a very slowly permeable fragipan. They are on the wider ridgetops and on the upper parts of the side slopes. Also included are areas of soils that are moderately deep over bedrock. These soils are on the lower parts of the side slopes. Included soils make up about 15 percent of the map unit

The Chetwynd soil has a high available water capacity and is moderately permeable. Surface runoff is very rapid. The organic matter content is moderate in the surface layer.

Most areas of this soil are used as woodland. A few are used for hay and pasture. Those in Camp Atterbury are used for military training activities. They are forested.

Because the slope hinders the use of standard farm equipment, this soil is generally unsuitable as cropland. It is generally unsuited to grasses and legumes for hay and pasture because of the slope and a severe hazard of erosion.

This soil is well suited to woodland. The erosion hazard, the equipment limitation, and plant competition are concerns in managing the wooded areas. Building haul roads on the contour, constructing water bars, and preserving as much understory vegetation as possible 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. Competing vegetation can be controlled by proper site preparation and by spraying, cutting, or girdling.

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 and streets. The roads should be built on the contour where possible. They should be designed so that they conform to the topography and should be built in the less sloping areas. Cutting and filling are needed.

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

CnC2—Cincinnati silt loam, 6 to 12 percent slopes, eroded. This moderately sloping, deep, well drained soil is on ridgetops and side slopes in the uplands. A few hills and small gullies can form after heavy rainfall. Individual areas are irregular in shape and are dominantly 5 to 60 acres in size.

In a typical profile, the surface layer is dark yellowish brown silt loam about 7 inches thick. It contains yellowish brown subsoil material. The subsoil extends to a depth of about 80 inches. It is yellowish brown, friable silt loam and mottled, firm silty clay loam in the upper part; a fragipan of yellowish brown, mottled, very firm silt loam in the next part; and strong brown, mottled, firm silty clay loam and clay in the lower part. In places the surface layer is silty clay loam.

Included with this soil in mapping are a few small areas of the well drained Bonnell and Hickory and moderately well drained Rossmoyne soils. Bonnell and Hickory soils are more sloping than the Cincinnati soil and are adjacent to drainageways on side slopes and ridgetops. Rossmoyne soils are near the center of wide ridgetops. Also included are severely eroded soils on short slope breaks adjacent to drainageways and side slopes. Included soils make up about 14 percent of the map unit.

The Cincinnati soil has a moderate available water capacity. It is moderately permeable above the fragipan and slowly permeable 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 2.5 to 3.0 feet during winter and early spring. Root penetration is restricted by the very firm and brittle fragipan at a depth of about 26 inches.

Most areas of this soil are used for hay and pasture. Some are used for woodland or cultivated crops. Those in Camp Atterbury are used for military training activities. They support a mixture of native grasses, weeds, and trees.

This soil is fairly well suited to corn, soybeans, and small grain. If cultivated crops are grown, measures that help to control erosion and surface runoff are needed. A crop rotation that includes grasses and legumes, a system of conservation tillage that leaves protective amounts of crop residue on the surface, terraces, diversions, water- and sediment-control basins, and grassed waterways help to prevent excessive soil loss. The soil is well suited to a no-till cropping system. Because the very slowly permeable fragipan restricts water movement, the soil is often saturated in winter and spring and fieldwork may be 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, such as orchardgrass, and shallow-rooted legumes, such as red clover, for hay and pasture. It is poorly 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 results in 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 fairly well suited to woodland. Plant competition is moderate. It can be controlled by proper site preparation and by spraying, cutting, or girdling. Additional management practices include harvesting mature trees and excluding livestock.

Because of the slope, this soil is moderately limited as a site for dwellings without basements and is severely limited as a site for small commercial buildings. It is moderately limited as a site for dwellings with basements because of the slope and the wetness. The slope can be overcome by land grading or by designing the buildings so that they conform to the natural slope of the land. Foundation drains are needed on sites for dwellings with basements.

This soil 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. An adequate drainage system along the roads and streets helps to prevent the damage caused by frost action.

Because of the wetness and the slow permeability, this soil is severely limited as a site for septic tank absorption fields. Installing subsurface drains helps to overcome the wetness. Increasing the size of the absorption area improves the ability of the field to absorb the effluent.

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

CwB—Crosby silt loam, 1 to 5 percent slopes. This nearly level and gently sloping, deep, somewhat poorly drained soil is in the uplands. Individual areas are irregular in shape and are dominantly about 200 acres in size.

In a typical profile, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsoil is about 28 inches thick. It is grayish brown, mottled, friable silt loam in the upper part; yellowish brown, mottled, firm silty clay loam in the next part; and dark yellowish brown and yellowish brown, mottled, firm clay loam in the lower part. The substratum to a depth of about 60 inches is yellowish brown, mottled loam. In some areas the upper part of the subsoil has more clay.

Included with this soil in mapping are a few areas of very poorly drained soils in drainageways and depressions and a few small areas of the well drained Miami soils adjacent to drainageways and on the more sloping parts of the landscape. Also included are a few areas of moderately well drained soils on convex side slopes and gently sloping, small rises. Included soils make up about 15 percent of the map unit.

The Crosby soil has a high available water capacity and is slowly permeable. 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 spring.

Most areas of this soil are in Camp Atterbury and are used for military training activities. They support a mixture of native grasses, weeds, and trees.

If drained, this soil is well suited to corn, soybeans, and small grain. Wetness is a limitation. If adequate outlets are available, surface and subsurface drains can lower the water table. If cultivated crops are grown, measures that control erosion and surface runoff are needed. A crop rotation that includes grasses and legumes, a system of conservation tillage that leaves protective amounts of crop residue on the surface, terraces, diversions, water- and sediment-control basins, and grassed waterways help to prevent excessive soil loss. The soil is well suited to ridge planting. 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 legumes, such as orchardgrass and red clover, for hay and pasture. Overgrazing or grazing when the soil is too wet results in 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 well suited to woodland. Plant competition is moderate. It can be controlled by proper site preparation and by spraying, cutting, or girdling. Additional management practices include harvesting mature trees and excluding livestock.

Because of the wetness, this soil is severely limited as a site for dwellings. The buildings should be constructed without basements, and foundation drains should be installed. The soil 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. An adequate drainage system along the roads and streets helps to prevent the damage caused by frost action.

This soil is severely limited as a site for septic tank absorption fields because of the wetness and the slow permeability. Increasing the size of the absorption area improves the ability of the field to absorb the effluent. Subsurface drains are needed.

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

Hc—Haymond silt loam, frequently flooded. This nearly level, deep, well drained soil is on flood plains. Individual areas are irregular in shape and are dominantly 10 to 200 acres in size.

In a typical profile, the surface layer is brown silt loam about 8 inches thick. The subsoil is yellowish brown, friable silt loam about 35 inches thick. The substratum to a depth of about 60 inches is yellowish brown silt loam and loam. In places it has sandstone fragments.

Included with this soil in mapping are small areas of the somewhat poorly drained Stendal and moderately well drained Steff soils in the slightly lower positions on the landscape. Also included are the moderately well drained Beanblossom soils. These soils have coarse fragments throughout. They occur as narrow areas that extend into areas of the Haymond soil and are also in areas where drainageways flow out of the steeper hills in the uplands. Included soils make up about 15 percent of the map unit.

The Haymond soil has a high available water capacity and is moderately permeable. Surface runoff is slow. The organic matter content is moderate in the surface layer.

Most areas of this soil are used for cultivated crops (fig. 6). Some are used for hay and pasture or for woodland.

This soil is well suited to corn, soybeans, and small grain. Frequent flooding in the spring is the main hazard. Because of the flooding, late planting or replanting is sometimes necessary. A system of conservation tillage that leaves protective amounts of crop residue on the surface, cover crops, and green manure crops help to

Figure 6.—Corn in an area of Haymond silt loam, frequently flooded. A wooded area of Berks-Trevlac-Wellston complex, 20 to 70 percent slopes, is in the background.

maintain tilth and the organic matter content. The soil is well suited to fall plowing, spring chiseling, and a no-till cropping system.

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

This soil is well suited to woodland. Plant competition is moderate. It can be controlled by proper site preparation and by spraying, cutting, or girdling. Additional management practices include harvesting mature trees and excluding livestock.

Because of the flooding, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields. Alternative sites should be selected. The soil is severely limited as a site for local roads and streets because of the potential for frost action and the flooding. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by floodwater and frost action.

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

HkD2—Hickory silt loam, 12 to 20 percent slopes, eroded. This strongly sloping and moderately steep, deep, well drained soil is on narrow ridgetops and side slopes in the uplands. A few rills can form after heavy rainfall. Individual areas are irregular in shape and are dominantly 5 to 40 acres in size.

In a typical profile, the surface layer is brown silt loam about 6 inches thick. It contains yellowish brown subsoil material. The subsoil is about 60 inches thick. It is firm. The upper part is yellowish brown silty clay loam, and the lower part is strong brown and yellowish brown clay loam. The substratum to a depth of about 80 inches is yellowish brown loam. In some areas the soil formed in sandstone, siltstone, and shale residuum. In other areas the lower part of the subsoil and the substratum have more clay. In places the soil is severely eroded and has more clay in the surface layer.

Included with this soil in mapping are the well drained Cincinnati soils. These soils are less sloping than the Hickory soil. They have a slowly permeable fragipan. They are on the wider ridgetops and on the upper parts of the side slopes. Also included are areas of soils that are moderately deep over bedrock and are on the steeper, lower parts of the side slopes. Included soils make up about 15 percent of the map unit.

The Hickory soil has a high available water capacity and is moderately permeable. Surface runoff is rapid. The organic matter content is moderately low in the surface layer.

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

This soil is poorly suited to cultivated crops. Row crops can be grown occasionally, but the hazard of erosion is very severe. Measures that help to control erosion and surface runoff are needed. A crop rotation that is dominated by grasses and legumes, a system of conservation tillage that leaves protective amounts of crop residue on the surface, and grassed waterways help to prevent excessive soil loss. The soil is well suited to a no-till cropping system. Cover crops and green manure crops help to control erosion and maintain tilth and the organic matter content.

This soil is suited to grasses and legumes, such as orchardgrass and red clover, for hay and pasture. Overgrazing results in surface compaction, poor tilth, and excessive runoff and erosion 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 fairly well suited to woodland. The erosion hazard, the equipment limitation, and plant competition are management concerns. Building haul roads on the contour, constructing water bars, and preserving as much understory vegetation as possible help to control erosion. Competing vegetation can be controlled by proper site preparation and by spraying, cutting, or girdling. Using specialized equipment and carefully planning logging and planting activities help to overcome the equipment limitation. Additional management practices include harvesting mature trees and excluding livestock.

Because of the slope, this soil is severely limited as a site for dwellings and for septic tank absorption fields. The buildings should be designed so that they conform to the natural slope of the land. The absorption fields should be installed on the contour. Because of low strength and the slope, the soil is severely limited 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. Constructing the roads on the contour and land shaping help overcome the slope.

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

HkF—Hickory silt loam, 20 to 70 percent slopes. This moderately steep to very steep, deep, well drained soil is on side slopes in the uplands. Individual areas are irregular in shape and are dominantly 10 to 100 acres in size.

In a typical profile, the surface layer is very dark grayish brown silt loam about 2 inches thick. The subsurface layer is about 9 inches of yellowish brown silt loam. The subsoil is about 47 inches thick. It is strong brown and brown and is firm. The upper part is clay loam, and the lower part is loam. The substratum to a depth of about 70 inches is yellowish brown loam. In some areas the soil formed in sandstone, siltstone, and shale residuum. In places the lower part of the subsoil and the substratum have more clay. In a few areas carbonates are within a depth of 40 inches.

Included with this soil in mapping are the well drained Cincinnati soils. These soils are less sloping than the Hickory soil. They have a slowly permeable fragipan. They are on ridgetops and on the upper parts of the side slopes. Also included are soils that are moderately deep over bedrock and are on the lower parts of the side slopes. Included soils make up about 15 percent of the map unit.

The Hickory soil has a high available water capacity and is moderately permeable. Surface runoff is very rapid. The organic matter content is moderately low in the surface layer.

Most areas of this soil are used as woodland. A few are used for hay and pasture. Those in Camp Atterbury are used for military training activities. They support trees.

Because the slope hinders the use of standard farm equipment, this soil is generally unsuitable as cropland. It is generally unsuited to grasses and legumes for hay and pasture because of the slope and a severe hazard of erosion.

This soil is well suited to woodland. The erosion hazard and the equipment limitation are management concerns. Building haul roads on the contour, constructing water bars, and preserving as much understory vegetation as possible 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.

Because of the slope, 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 because of the slope and low strength. Constructing the roads 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 to support vehicular traffic.

The land capability classification is VIIe. The woodland ordination symbol is 5R.

MaB—Martinsville loam, 1 to 6 percent slopes. This nearly level and gently sloping, deep, well drained soil is on terraces and outwash plains. Individual areas are irregular in shape and are dominantly 10 to 100 acres in size.

In a typical profile, the surface layer is very dark grayish brown and dark brown loam about 7 inches thick. The subsoil is about 52 inches thick. In sequence downward, it is yellowish brown, friable loam; strong brown, firm clay loam and sandy clay loam; and yellowish brown, friable sandy loam and loamy sand. The substratum to a depth of about 65 inches is yellowish brown silt loam that has strata of loamy sand. In a few places the surface layer is silt loam. In some areas stratified sand and gravel are within a depth of 40 inches.

Included with this soil in mapping are areas of the somewhat poorly drained Whitaker soils in depressions and along drainageways. These soils make up about 7 percent of the map unit.

The Martinsville soil has a high available water capacity and is moderately permeable. Surface runoff is slow or medium. The organic matter content is moderately low in the surface layer.

Most areas of this soil are in Camp Atterbury and are used for military training activities. They support a mixture of native grasses, weeds, and trees. Some areas are used for hay and pasture.

This soil is well suited to corn, soybeans, and small grain. If cultivated crops are grown, measures that control erosion and surface runoff are needed. A crop rotation that includes grasses and legumes, a system of conservation tillage that leaves protective amounts of crop residue on the surface, terraces, diversions, water- and sediment-control basins, and grassed waterways help to prevent excessive soil loss. The soil is well suited to no-till and till-plant cropping systems. 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 legumes, such as orchardgrass, red clover, and alfalfa, for hay and pasture. Overgrazing results in surface compaction and poor tilth and reduces plant density. Proper stocking rates, rotation grazing, and timely deferment of grazing help to keep the pasture in good condition.

This soil is well suited to woodland. Plant competition is moderate. Seedlings survive and grow well if competing vegetation is controlled by proper site preparation or by spraying, cutting, or girdling. Additional management practices include harvesting mature trees and excluding livestock.

Because of the shrink-swell potential, this soil is moderately 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 the potential for frost action and the shrink-swell potential. 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 IIe. The woodland ordination symbol is 4A.

MnC2—Miami loam, 6 to 15 percent slopes, eroded. This moderately sloping and strongly sloping, deep, well drained soil is on narrow ridgetops and side slopes in the uplands. Rills can form after heavy rainfall. Individual areas are irregular in shape and are dominantly 10 to 60 acres in size.

In a typical profile, the surface layer is dark brown loam about 7 inches thick. It contains yellowish brown subsoil material. The subsoil is about 30 inches thick. It is yellowish brown and firm. The upper part is loam, and the lower part is clay loam. The substratum to a depth of about 60 inches is light yellowish brown loam. In a few areas the slope is 2 to 6 percent or 15 to 20 percent. In some areas the surface layer is silt loam. In a few places the substratum has stratified outwash sediments.

Included with this soil in mapping are the somewhat poorly drained Crosby and moderately well drained soils. These soils are on the lower parts of the side slopes along drainageways and on the more nearly level parts of the ridgetops. They make up about 15 percent of the map unit.

The Miami soil has a moderate available water capacity. It is moderately permeable in the subsoil and moderately slowly permeable in the substratum. Surface runoff is medium. The organic matter content is moderate in the surface layer.

Most areas of this soil are in Camp Atterbury and are used for military training activities. They support a mixture of native grasses, weeds, and trees.

This soil is fairly well suited to corn, soybeans, and small grain. If cultivated crops are grown, measures that control erosion and surface runoff are needed. A crop rotation that includes grasses and legumes, a system of conservation tillage that leaves protective amounts of crop residue on the surface, terraces, diversions, water- and sediment-control basins, and grassed waterways help to prevent excessive soil loss. The soil is well suited to no-till and till-plant cropping systems. 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 legumes, such as orchardgrass and red clover, for hay and pasture. Overgrazing results in surface compaction, poor tilth, and excessive runoff and erosion 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 woodland. Plant competition is moderate. It can be controlled by proper site preparation or by spraying, cutting, or girdling. Additional management practices include harvesting mature trees and excluding livestock.

Because of the shrink-swell potential and the slope, this soil is moderately 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 buildings should be designed so that they conform to the natural slope of the land. Because of low strength, the soil is severely limited 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.

Because of the moderately slow permeability, this soil is severely limited as a site for septic tank absorption fields. Enlarging the absorption field helps to compensate for the restricted permeability.

The land capability classification is IIIe. 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 stream terraces. Individual areas are irregular in shape and are dominantly 5 to 15 acres in size.

In a typical profile, the surface layer is dark yellowish brown silt loam about 9 inches thick. The subsoil is about 41 inches thick. It is yellowish brown, friable and firm silt loam in the upper part; a fragipan of yellowish brown and light yellowish brown, mottled, very firm and brittle silt loam in the next part; and light brownish gray, mottled, firm loam in the lower part. The substratum to a depth of about 60 inches is yellowish brown sandy loam that has thin strata of gravelly sandy loam. In places the slope is less than 2 or more than 6 percent.

Included with this soil in mapping are a few areas of the somewhat poorly drained Bartle soils on the less sloping parts of the landscape. Also included, in low areas adjacent to flood plains, are soils that are subject to rare flooding. Included soils make up about 10 percent of the map unit.

The Pekin soil has a moderate available water capacity. It is moderately permeable above the fragipan and very slowly permeable 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. Root penetration is restricted by the very firm and brittle fragipan at a depth of about 22 inches.

Most areas of this soil are used for cultivated crops. Some are used for hay, pasture, or woodland. Those in Camp Atterbury are used for military training activities. They support a mixture of native grasses, weeds, and trees.

This soil is well suited to corn, soybeans, and small grain. If cultivated crops are grown, measures that control erosion and surface runoff are needed. A crop rotation that includes grasses and legumes, a system of conservation tillage that leaves protective amounts of crop residue on the surface, terraces, diversions, water- and sediment-control basins, and grassed waterways help to prevent excessive soil loss. The soil is well suited to no-till and till-plant cropping systems. Because the fragipan restricts water movement, the soil is often saturated in winter and spring and fieldwork may be delayed. The soil is somewhat droughty during long dry periods in the summer. 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, such as orchardgrass, and shallow-rooted legumes, such as red clover, for hay and pasture. It is poorly 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 results in 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 well suited to woodland. No major hazards or limitations affect planting or harvesting.

Because of the wetness, this soil is moderately limited as a site for dwellings without basements and is severely limited as a site for dwellings with basements. Constructing the buildings on raised, well compacted fill material increases the depth to the water table. Subsurface drains help to lower the water table.

Because of low strength and the potential for frost action, this soil is severely limited 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. Constructing the roads and streets on raised, well compacted fill material and providing adequate side ditches and culverts minimize the damage caused by frost action.

This soil is severely limited as a site for septic tank absorption fields because of the wetness and the very slow permeability. Installing perimeter subsurface drains, enlarging the absorption area, and controlling the rate of flow from a holding tank improve the ability of the field to absorb the effluent.

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

PeC2—Pekin silt loam, 6 to 12 percent slopes, eroded. This moderately sloping, deep, moderately well drained soil is on ridgetops and side slopes on terraces. A few rills can form after heavy rainfall. Individual areas are irregular in shape and are dominantly 5 to 20 acres in size.

In a typical profile, the surface layer is dark yellowish brown silt loam about 8 inches thick. It contains yellowish brown subsoil material. The subsoil to a depth of about 80 inches is yellowish brown and strong brown, friable and firm silt loam in the upper part; a fragipan of yellowish brown, mottled, very firm and brittle silt loam in the next part; and yellowish brown and strong brown, mottled, firm silt loam and loam in the lower part. In places the surface layer is silty clay loam.

Included with this soil in mapping are a few small areas of the well drained Chetwynd soils adjacent to drainageways and on the side slopes. Also included are the somewhat poorly drained Bartle soils near the center of wide ridgetops and severely eroded soils on the short slope breaks adjacent to drainageways and terraces. Included soils make up about 10 percent of the map unit.

The Pekin soil has a moderate available water capacity. It is moderately permeable above the fragipan and very slowly permeable 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 6 feet during winter and early spring. Root penetration is restricted by the very firm and brittle fragipan at a depth of about 22 inches.

Most areas of this soil are used for hay and pasture. Some are used for woodland or cultivated crops. Those in Camp Atterbury are used for military training activities. They support a mixture of native grasses, weeds, and trees.

This soil is fairly well suited to corn, soybeans, and small grain. If cultivated crops are grown, measures that control erosion and surface runoff are needed. A crop rotation that includes grasses and legumes, a system of conservation tillage that leaves protective amounts of crop residue on the surface, terraces, diversions, water- and sediment-control basins, and grassed waterways help to prevent excessive soil loss. The soil is well suited to no-till and till-plant cropping systems. Because the fragipan restricts water movement, the soil is often saturated in winter and spring and fieldwork may be delayed. The soil is somewhat droughty during long dry periods in the summer. 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, such as orchardgrass, and shallow-rooted legumes, such as red clover, for hay and pasture. It is poorly 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 results in 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 well suited to woodland. No major hazards or limitations affect planting or harvesting.

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. Constructing the buildings on raised, well compacted fill material increases the depth to the water table. Subsurface drains help to lower the water table. The buildings should be designed so that they conform to the natural slope of the land.

Because of low strength and the potential for frost action, this soil is severely limited 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. Constructing the roads and streets on raised, well compacted fill material and providing adequate side ditches and culverts minimize the damage caused by frost action.

This soil is severely limited as a site for septic tank absorption fields because of the wetness and the very slow permeability. Installing perimeter subsurface drains, enlarging the absorption area, and controlling the rate of flow from a holding tank improve the ability of the field to absorb the effluent.

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

Re—Rensselaer-Whitaker complex. These nearly level, deep soils are on outwash terraces. The very poorly drained Rensselaer soil is generally on broad flats and in depressional areas. It is subject to ponding. The somewhat poorly drained Whitaker soil is generally in the slightly higher areas and near terrace breaks along bottom land. Most areas are irregular in shape and are about 250 acres in size. They are about 60 percent Rensselaer soil and 25 percent Whitaker soil. The two soils occur as areas so intricately mixed that separating them in mapping is not practical.

In a typical profile of the Rensselaer soil, the surface layer is very dark gray loam about 8 inches thick. The subsurface layer is about 3 inches of very dark gray clay loam. The subsoil is dark gray and gray, mottled, firm clay loam about 31 inches thick. The substratum to a depth of about 60 inches is grayish brown, mottled, stratified loam, sandy loam, and loamy sand. In some areas the surface layer is silt loam.

In a typical profile of the Whitaker soil, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsoil is about 33 inches thick. It is mottled. It is dark grayish brown, friable silt loam in the upper part; dark yellowish brown, firm clay loam in the next part; and yellowish brown, firm silty clay loam and clay loam in the lower part. The substratum to a depth of about 60 inches is yellowish brown, mottled, stratified loam, sandy loam, and loamy sand. In some areas the subsoil is dominantly gray. In places the surface layer is loam.

Included with these soils in mapping are a few areas of the well drained Martinsville soils. These included soils are in the more sloping areas along drainageways and on the terrace breaks adjacent to bottom land. Also included, in low areas adjacent to flood plains, are soils that are subject to rare flooding. Included soils make up about 15 percent of the map unit.

The Rensselaer and Whitaker soils have a high available water capacity and are moderately permeable. Surface runoff is very slow or slow. The organic matter content is high in the surface layer of the Rensselaer soil and moderate in the surface layer of the Whitaker soil. The Rensselaer soil has a water table above or near the surface, mainly in the winter and spring. The Whitaker soil has a water table at a depth of 1 to 3 feet in winter and early spring.

Most areas of these soils are in Camp Atterbury and are used for military training activities. They support a mixture of native grasses, weeds, and trees. A few areas are used for hay or pasture.

If drained, these soils are well suited to corn, soybeans, and small grain. The wetness is the major limitation. Surface and subsurface drains help to remove excess water. 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. The soils are well suited to fall chiseling and a till-plant cropping system.

These soils are well suited to grasses and legumes for hay and pasture. A drainage system is needed. Overgrazing or grazing when the soils are too wet results in surface compaction and poor tilth and reduces plant density. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

These soils are well suited to trees. The equipment limitation, seedling mortality, the windthrow hazard, and plant competition are management concerns. Because of the wetness, planting and harvesting equipment should be used only when the soils are 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 reduce the windthrow hazard. Competing vegetation can be controlled by proper site preparation or by spraying, cutting, or girdling. Additional management practices include harvesting mature trees and excluding livestock.

Because of the ponding and the wetness, these soils are generally unsuitable as sites for dwellings and for septic tank absorption fields. They are severely limited as sites for local roads because of low strength, the ponding, and the potential for frost action. Strengthening or replacing the base with better suited material improves the ability of the roads to support vehicular traffic. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts minimize the damage caused by ponding and frost action.

The land capability classification is IIw. The woodland ordination symbol assigned to the Rensselaer soil is 5W, and that assigned to the Whitaker soil is 4A.

RoB2—Rossmoyne silt loam, 2 to 6 percent slopes, eroded. This gently sloping, deep, moderately well drained soil is on narrow ridgetops and short, convex side slopes in the uplands. A few rills can form after heavy rainfall. Individual areas are irregular in shape and are dominantly 5 to 50 acres in size.

In a typical profile, the surface layer is about 9 inches of dark brown silt loam. It contains yellowish brown subsoil material. The subsoil extends to a depth of about 80 inches. It is yellowish brown, friable silt loam in the upper part; a fragipan of yellowish brown, mottled, very firm and brittle silt loam in the next part; and yellowish brown and brown, mottled, firm and friable silt loam in the lower part. In a few small areas, the slope is less than 2 or more than 6 percent.

Included with this soil in mapping are a few small areas of the somewhat poorly drained Avonburg soils. These soils are in the less sloping areas near the center of the ridgetops. Also included are small areas of the well drained Cincinnati soils on the side slopes and ridgetops. Included soils make up about 10 percent of the map unit.

The Rossmoyne soil has a moderate available water capacity. It is moderately permeable above the fragipan and slowly permeable 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 1.5 to 3.0 feet during winter and early spring. Root penetration is restricted by the very firm and brittle fragipan at a depth of about 22 inches.

Most areas of this soil are used for cultivated crops. Some are used for hay, pasture, or woodland. Those in Camp Atterbury are used for military training activities. They support a mixture of native grasses, weeds, and trees.

This soil is well suited to corn, soybeans, and small grain. If cultivated crops are grown, measures that control erosion and surface runoff are needed. A crop rotation that includes grasses and legumes, a system of conservation tillage that leaves protective amounts of crop residue on the surface, terraces, diversions, water- and sediment-control basins, and grassed waterways help to prevent excessive soil loss. The soil is well suited to no-till and till-plant cropping systems. Because the fragipan restricts water movement, the soil is often saturated in winter and spring and fieldwork may be delayed. The soil is somewhat droughty during long dry periods in the summer. 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, such as orchardgrass, and shallow-rooted legumes, such as red clover, for hay and pasture. It is poorly 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 results in 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 fairly well suited to woodland. The root zone is limited mainly to the part of the profile above the fragipan. Seedling mortality, the windthrow hazard, and plant competition are management concerns. 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 reduce the windthrow hazard. Competing vegetation can be controlled by proper site preparation or by spraying, cutting, or girdling. Additional management practices include harvesting mature trees and excluding livestock.

Because of the wetness and the shrink-swell potential, this soil is moderately 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. Subsurface drains help to lower the water table.

Because of low strength and the potential for frost action, this soil is severely limited 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. Providing adequate side ditches and culverts help to prevent the damage caused by frost action.

This soil is severely limited as a site for septic tank absorption fields because of the wetness and the slow permeability. Enlarging the absorption field helps to compensate for the restricted permeability. Perimeter subsurface drains help to lower the water table.

The land capability classification is IIe. The woodland ordination symbol is 3D.

Sf—Steff silt loam, frequently flooded. This nearly level, deep, moderately well drained soil is on flood plains. It is frequently flooded for brief periods (fig. 7). Individual areas are irregular in shape and are 10 to 40 acres in size.

In a typical profile, the surface layer is brown silt loam about 10 inches thick. The subsoil is yellowish brown and pale brown, mottled, friable silt loam about 19 inches thick. The substratum to a depth of about 60 inches is light brownish gray and brown, mottled silt loam. In some areas the subsoil has more clay. In places the upper part of the soil is more acid.

Included with this soil in mapping are a few areas of the well drained Haymond soils. These soils are in the slightly higher areas adjacent to drainageways. Also included are small areas of the somewhat poorly drained Stendal soils. These soils are in concave areas on the lower parts of the landscape. Included soils make up about 15 percent of the map unit.

The Steff soil has a very high available water capacity and is moderately permeable. 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 in winter and spring.

Most areas of this soil are used for cultivated crops. Some are used for hay and pasture. Those in Camp Atterbury are used for military training activities. They support a mixture of native grasses, weeds, and trees.

This soil is well suited to cultivated crops. Frequent flooding in the spring can damage the crops. Because of the flooding, late planting or replanting is sometimes necessary. 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. The soil is well suited to spring plowing or spring chiseling.

This soil is well suited to grasses, such as orchardgrass, and shallow-rooted legumes, such as red clover, for hay and pasture. Overgrazing or grazing when the soil is too wet results in surface compaction and poor tilth and reduces plant density. Proper stocking rates, rotation grazing, 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 severe. It can be controlled by proper site preparation or by spraying, cutting, or girdling. Additional management practices include harvesting mature trees and excluding livestock.

Because of the flooding, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields. Alternative sites should be selected. Because of the potential for frost action and the flooding, the soil is severely limited as a site for local roads and streets. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by frost action and floodwater.

Figure 7.—An area of Steff silt loam, frequently flooded.

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

St—Stendal silt loam, frequently flooded. This nearly level, deep, somewhat poorly drained soil is on flood plains. It is frequently flooded for brief periods. Individual areas are irregular in shape and are 10 to 100 acres in size.

In a typical profile, the surface layer is brown, mottled silt loam about 8 inches thick. The subsurface layer also is brown, mottled silt loam. It is about 5 inches thick. The substratum to a depth of about 60 inches is light gray, mottled, friable silt loam. In some areas it has more clay. In other areas the soil has coarse fragments throughout.

Included with this soil in mapping are a few areas of poorly drained soils on the lower parts of the landscape. Also included are areas of the moderately well drained Steff and well drained Haymond soils, generally at the slightly higher elevations and adjacent to drainageways. Included soils make up about 15 percent of the map unit.

The Stendal soil has a very high available water capacity and is moderately permeable. 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 in winter and spring.

Most areas of this soil are used for cultivated crops. Some are used for hay and pasture. Those in Camp Atterbury are used for military training activities. They support a mixture of native grasses, weeds, and trees.

If drained, this soil is well suited to cultivated crops. Frequent flooding in the spring and the wetness are the major management concerns. Floodwater can damage the crops. As a result, late planting or replanting is sometimes necessary. In adequately drained areas, a conservation cropping system that is dominated by row crops is used. Surface and subsurface drains are needed. 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. The soil is well suited to a system of planting on ridges that follow the direction of natural drainage or streamflow.

This soil is well suited to grasses, such as orchardgrass, and shallow-rooted legumes, such as red clover, for hay and pasture. It is poorly suited to deep-rooted legumes, such as alfalfa, because of the wetness. Overgrazing or grazing when the soil is too wet results in surface compaction and poor tilth and reduces plant density. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is well suited to water-tolerant trees. Plant competition and the equipment limitation are management concerns. The frequent flooding and the seasonal wetness can delay planting and harvesting. Competing vegetation can be controlled by proper site preparation or by spraying, cutting, or girdling. Additional management practices include harvesting mature trees and excluding livestock.

Because of the flooding, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields. Alternative sites should be selected. Because of the flooding and the potential for frost action, the soil is severely limited as a site for local roads. Constructing the roads on raised, well compacted fill material, strengthening or replacing the base with better suited material, and providing adequate side ditches and culverts minimize the damage caused by floodwater and frost action and improve the ability of the roads to support vehicular traffic.

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

Sv—Stendal silt loam, frequently flooded, very long duration. This nearly level, deep, somewhat poorly drained soil is on flood plains. It is in low areas adjacent to the headwaters of Lake Lemon and the Monroe Reservoir. These areas are not flooded when the lakes are at normal pool levels but are inundated for long periods when the pool levels increase. Individual areas are irregular in shape and are 10 to 100 acres in size.

In a typical profile, the surface layer is dark grayish brown silt loam about 10 inches thick. The substratum to a depth of about 60 inches is gray and light gray silt loam. In some areas it has more clay.

Included with this soil in mapping are areas of poorly drained soils on the lower parts of the landscape. Also included are areas of the moderately well drained Beanblossom soils, generally at the slightly higher elevations adjacent to the uplands. Included soils make up about 15 percent of the map unit.

The Stendal soil has a very high available water capacity and is moderately permeable. 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 in winter and spring.

Most areas are used as wildlife habitat. This soil is generally unsuited to cultivated crops and to hay and pasture because of the flooding and the wetness.

This soil is poorly suited to woodland. Plant competition, the equipment limitation, seedling mortality, and the windthrow hazard are management concerns. The use of planting and logging equipment is limited during wet periods. Because of the seedling mortality rate, special planting stock and overstocking are needed. The windthrow hazard can be reduced by harvest methods that do not isolate the remaining trees or leave them widely spaced. Competing vegetation can be controlled by proper site preparation or by spraying, cutting, or girdling. Additional management practices include harvesting mature trees and excluding livestock.

Because of the flooding, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields. Alternative sites should be selected. Because of the flooding and the potential for frost action, the soil is severely limited as a site for local roads. Constructing the roads on raised, well compacted fill material, strengthening or replacing the base with better suited material, and providing adequate side ditches and culverts minimize the damage caused by floodwater and frost action.

The land capability classification is Vw. The woodland ordination symbol is 3W.

SwC2—Stonehead silt loam, 6 to 10 percent slopes, eroded. This moderately sloping, deep, moderately well drained soil is on narrow ridgetops and side slopes in the uplands. A few rills can form after heavy rainfall. Individual areas are elongated or irregularly shaped and are dominantly 10 to 100 acres in size.

In a typical profile, the surface layer is dark yellowish brown silt loam about 6 inches thick. It contains yellowish brown subsoil material. The subsoil is about 62 inches thick. The upper part is yellowish brown, friable silt loam; the next part is yellowish brown, mottled, firm silty clay loam; and the lower part is yellowish brown, yellowish red, and light olive brown, mottled, very firm and firm silty clay, channery silty clay, shaly silty clay loam, and very shaly silt loam. Soft siltstone and shale bedrock is at a depth of about 68 inches. In places the depth to bedrock is less than 40 inches. In some areas the soil formed in material weathered dominantly from siltstone and has less clay in the lower part of the subsoil. In a few places the surface layer is silty clay loam.

Included with this soil in mapping are the moderately well drained Tilsit soils in the less sloping areas near the center of wide ridgetops. These soils have a slowly permeable fragipan. Also included are the moderately deep, well drained Trevlac soils on the more sloping, lower parts of the side slopes. Included soils make up about 10 percent of the map unit.

The Stonehead soil has a moderate available water capacity. It is moderately permeable in the upper part of the subsoil and slowly permeable in the lower part. Surface runoff is rapid. The organic matter content is moderate in the surface layer. The water table is at a depth of 2.0 to 3.5 feet during winter and early spring.

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

This soil is fairly well suited to corn, soybeans, and small grain. If cultivated crops are grown, measures that control erosion and surface runoff are needed. A crop rotation that includes grasses and legumes, a system of conservation tillage that leaves protective amounts of crop residue on the surface, terraces, diversions, water- and sediment-control basins, and grassed waterways help to prevent excessive soil loss. The soil is well suited to a no-till cropping system. 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 legumes, such as orchardgrass and red clover, for hay and pasture. Overgrazing or grazing when the soil is too wet results in surface compaction, poor tilth, and excessive runoff and erosion 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 woodland. Plant competition is moderate. It can be controlled by proper site preparation or by spraying, cutting, or girdling. Additional management practices include harvesting mature trees and excluding livestock.

Because of the wetness and the slope, 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. A foundation drainage system lowers the water table. The buildings should be designed so that they conform to the natural slope of the land. Land shaping is needed in some areas.

Because of low strength and the potential for frost action, this soil is severely limited as a site for local roads and streets. Constructing the roads and streets on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by low strength and frost action.

This soil is severely limited as a site for septic tank absorption fields because of the wetness and the slow permeability. Perimeter drains are needed. Enlarging the absorption area and controlling the rate of flow from a holding tank improve the ability of the field to absorb the effluent.

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

SwD3—Stonehead silt loam, 10 to 20 percent slopes, gullied. This moderately sloping to moderately steep, deep, moderately well drained soil is on side slopes and narrow ridgetops in the uplands. The landscape has been radically altered by erosion and gullying. Individual areas are irregular in shape and are dominantly 5 to 40 acres in size.

In a typical profile, the surface layer is dark yellowish brown silt loam about 3 inches thick. The subsoil is about 41 inches thick. The upper part is yellowish brown, firm silty clay loam, and the lower part is strong brown, mottled, very firm silty clay. Soft siltstone and shale bedrock is at a depth of about 44 inches. In places the soil is less than 40 inches deep over bedrock and has more shale, sandstone, and siltstone fragments in the subsoil. In some areas the soil formed in material weathered dominantly from siltstone and has less clay in the lower part of the subsoil.

Included with this soil in mapping are areas of the moderately well drained Tilsit soils near the center of wide ridgetops. These soils have a slowly permeable fragipan. They make up about 10 percent of the map unit.

The Stonehead soil has a moderate available water capacity. It is moderately permeable in the upper part of the subsoil and slowly permeable in the lower part. Surface runoff is very rapid. The organic matter content is low in the surface layer. The water table is at a depth of 2.0 to 3.5 feet in winter and spring.

Most areas of this soil are used as wildlife habitat. They commonly support shrubs, weeds, and wild grasses between gullies, but many areas support very little vegetation. Some areas are being reforested.

Because of a severe hazard of erosion and the numerous gullies, this soil is generally unsuitable for corn, soybeans, and small grain and is poorly suited to grasses and legumes for hay and pasture. A permanent vegetative cover is needed to control erosion and surface runoff. In areas where grasses and legumes are to be established, cutting and filling can reshape the land surface so that farm machinery can be used.

This soil is fairly well suited to trees. The erosion hazard, the equipment limitation, and plant competition are management concerns. Planting pine trees stabilizes the soil material and helps to control erosion. Crawler tractors and rubber-tired skidders cannot be operated safely over the gullies. 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. Competing vegetation can be controlled by proper site preparation or by spraying, cutting, or girdling. Additional management practices include harvesting mature trees and excluding livestock.

Because of the slope, this soil is severely limited as a site for dwellings without basements. It is severely limited for dwellings with basements because of the slope and the wetness. If the plant cover is removed and the surface is disturbed, soil slippage is a hazard. Diversions between lots and retaining walls may be needed. Surface and subsurface drains help to remove excess water. The buildings should be designed so that they conform to the natural slope of the land. In areas where it is close to the surface, bedrock should be excavated when basements are constructed.

Because of low strength, the slope, and the potential for frost action, this soil is severely limited 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. Replacing or covering the upper soil layers with suitable base material helps to prevent the damage caused by frost action. Land shaping is necessary.

This soil is severely limited as a site for septic tank absorption fields because of the wetness, the slow permeability, and the slope. Installing interceptor subsurface drains and enlarging the absorption area improve the ability of the field to absorb the effluent. Installing the absorption field on the contour helps to overcome the slope. The depth to bedrock is a limitation in some areas. The cost of overcoming this limitation is prohibitive.

The land capability classification is VIe. The woodland ordination symbol is 5R.

SxD2—Stonehead-Trevlac silt loams, 10 to 20 percent slopes, eroded. These moderately sloping to moderately steep soils are on side slopes and narrow ridgetops in the uplands. The deep, moderately well drained Stonehead soil is generally on the less sloping, wider ridgetops and on the upper parts of the side slopes. The moderately deep, well drained Trevlac soil is generally on the narrower ridgetops and on the lower parts of the side slopes. A few rills can form after heavy rainfall. Most areas are long and narrow and are 10 to 100 acres in size. They are about 60 percent Stonehead soil and 30 percent Trevlac soil. The two soils occur as areas so intricately mixed that separating them in mapping is not practical.

In a typical profile of the Stonehead soil, the surface layer is dark yellowish brown silt loam about 6 inches thick. The subsoil is about 48 inches thick. It is yellowish brown. The upper part is firm silty clay loam, and the lower part is mottled, very firm silty clay and very channery silty clay loam. Soft siltstone and shale bedrock is at a depth of about 54 inches. In some areas the soil formed dominantly in siltstone residuum and has less clay in the lower part of the subsoil. In places the surface layer is silty clay loam.

In a typical profile of the Trevlac soil, the surface layer is yellowish brown silt loam about 5 inches thick. The subsoil is about 24 inches thick. It is yellowish brown. The upper part is friable channery loam, and the lower part is firm very shaly silty clay loam. Fractured siltstone interbedded with sandstone and shale is at a depth of about 29 inches. In some areas the subsoil has fewer shale, sandstone, and siltstone fragments. In other areas the surface layer is silty clay loam. In places the slope is less than 10 percent.

Included with these soils in mapping are a few areas of the moderately well drained Tilsit soils near the center of the wider ridgetops. These included soils have a slowly permeable fragipan. They make up about 10 percent of the map unit.

The Stonehead soil has a moderate available water capacity. It is moderately permeable in the upper part of the subsoil and slowly permeable in the lower part. The Trevlac soil has a low available water capacity and is moderately permeable. Surface runoff is very rapid on both soils. The organic matter content is moderate in the surface layer. The Stonehead soil has a water table at a depth of 2.0 to 3.5 feet in winter and spring.

Most areas of these soils are used as wildlife habitat. Many are used as woodland. Some are used for hay and pasture. A few are used for cultivated crops.

These soils are poorly suited to cultivated crops. Row crops can be grown occasionally, but the hazard of erosion is very severe. Measures that control erosion and surface runoff are needed. A crop rotation that is dominated by grasses and legumes, a system of conservation tillage that leaves protective amounts of crop residue on the surface, and grassed waterways help to prevent excessive soil loss. The soils are well suited to a no-till cropping system. Cover crops and green manure crops help to control erosion and maintain tilth and the organic matter content.

These soils are fairly well suited to grasses and legumes, such as orchardgrass and red clover, for hay and pasture. Overgrazing results in surface compaction, poor tilth, and excessive runoff and erosion and reduces plant density. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

These soils are fairly well suited to woodland. The erosion hazard, the equipment limitation, and plant competition are management concerns. Building haul roads on the contour, constructing water bars, and preserving as much understory vegetation as possible help to control erosion. Because of the slope, operating some logging and planting equipment is difficult. Using specialized equipment and carefully planning logging and planting activities help to overcome the equipment limitation. Competing vegetation can be controlled by proper site preparation and by spraying, cutting, or girdling. Additional management practices include harvesting mature trees and excluding livestock.

Because of the slope, these soils are severely limited as sites for dwellings. The Stonehead soil also is severely limited by the wetness. In areas where the surface of the Stonehead soil has been disturbed, soil slippage is a hazard. Installing foundation drains helps to overcome the wetness. The slope can be overcome by grading. Also, the buildings can be designed so that they conform to the natural slope of the land. If dwellings with basements are constructed, excavation of bedrock is needed in some areas.

These soils are severely limited as sites for local roads and streets because of the slope. The Stonehead soil also is severely limited by low strength and frost action. An adequate drainage system along the roads and streets helps to prevent the damage caused by frost action. Grading the site and constructing the roads on the contour 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.

Because of the slope, these soils are severely limited as sites for septic tank absorption fields. The slow permeability and wetness of the Stonehead soil and the depth to bedrock in the Trevlac soil also are severe limitations. Increasing the size of the absorption field and installing interceptor subsurface drains help to compensate for the restricted permeability and wetness of the Stonehead soil. Installing the absorption field on the contour helps to overcome the slope. The cost of overcoming the limited depth to bedrock in the Trevlac soil generally is prohibitive.

The land capability classification is IVe. The woodland ordination symbol assigned to the Stonehead soil is 5R, and that assigned to the Trevlac soil is 4R.

Sy—Stonelick loam, gravelly substratum, frequently flooded. This nearly level, deep, well drained soil is on flood plains. Areas are irregular in shape and are dominantly about 1,000 acres in size.

In a typical profile, the surface layer is dark brown loam about 7 inches thick. The upper part of the substratum is dark brown and dark yellowish brown loam. The lower part to a depth of about 60 inches is yellowish brown very gravelly coarse sand. In some areas the upper part of the substratum has less clay and more sand. In a few areas the surface layer is dark or is silt loam or sandy loam. In places the depth to free carbonates is more than 20 inches.

Included with this soil in mapping are a few areas of somewhat poorly drained soils in depressions. These soils make up about 10 percent of the map unit.

The Stonelick soil has a moderate available water capacity. It is moderately rapidly permeable in the upper part and is very rapidly permeable in the lower part of the substratum. Surface runoff is slow. The organic matter content is moderately low in the surface layer.

Most areas of this soil are in Camp Atterbury and are used for military training activities. They support a mixture of native grasses, weeds, and trees. Some areas are used for hay or pasture.

This soil is well suited to cultivated crops. Floodwater can damage the crops. Also, the soil is somewhat droughty during extended dry periods. 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. The soil is well suited to spring chiseling and spring plowing.

This soil is well suited to grasses, such as orchardgrass, and shallow-rooted legumes, such as red clover, for hay and pasture. Overgrazing results in surface compaction and poor tilth and reduces plant density. Proper stocking rates, rotation grazing, and timely deferment of grazing help to keep the pasture in good condition.

This soil is well suited to woodland. Plant competition is moderate. The frequent flooding can delay planting and harvesting. Competing vegetation can be controlled by proper site preparation or by spraying, cutting, or girdling. Additional management practices include harvesting mature trees and excluding livestock.

Because of the flooding, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields. Alternative sites should be selected. The soil is severely limited as a site for local roads because of the flooding. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by floodwater.

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

TlB—Tilsit silt loam, 2 to 6 percent slopes. This gently sloping, deep, moderately well drained soil is on the tops of ridges in the uplands. Individual areas are irregular in shape and are dominantly 5 to 50 acres in size.

In a typical profile, the surface layer is very dark grayish brown silt loam about 4 inches thick. The subsurface layer is about 5 inches of brown silt loam. The subsoil extends to a depth of about 64 inches. It is dark yellowish brown and yellowish brown, friable silt loam and firm silty clay loam in the upper part; a fragipan of yellowish brown, mottled, very firm and brittle silt loam in the next part; and yellowish brown, mottled, firm channery silt loam in the lower part. Interbedded siltstone, shale, and sandstone bedrock is at a depth of about 64 inches. In a few places the slope is more than 6 percent. In some areas the subsoil has more clay.

Included with this soil in mapping are a few areas of somewhat poorly drained soils on the less sloping parts of the landscape and in slight depressions. Also included are areas of the well drained Wellston and moderately well drained Stonehead soils on side slopes. Included soils make up about 12 percent of the map unit.

The Tilsit soil has a moderate available water capacity. It is moderately permeable above the fragipan and slowly permeable 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 1.5 to 2.5 feet during winter and early spring. Root penetration is restricted by the very firm and brittle fragipan at a depth of about 30 inches.

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

This soil is well suited to corn, soybeans, and small grain. If cultivated crops are grown, measures that control erosion and surface runoff are needed. A crop rotation that includes grasses and legumes, a system of conservation tillage that leaves protective amounts of crop residue on the surface, diversions, terraces, water- and sediment-control basins, and grassed waterways help to prevent excessive soil loss. The soil is well suited to the no-till and till-plant cropping systems. Because the fragipan restricts water movement, the soil is often saturated in winter and spring and fieldwork may be delayed. The soil is somewhat droughty during long dry periods in the summer. 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, such as orchardgrass, and shallow-rooted legumes, such as red clover, for hay and pasture. It is poorly 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 results in 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 well suited to woodland. The root zone is limited mainly to the part of the profile above the fragipan. Plant competition is moderate. It can be controlled by proper site preparation or by spraying, cutting, or girdling. Additional management practices include harvesting mature trees and excluding livestock.

Because of the wetness, this soil is moderately limited as a site for dwellings without basements and is severely limited as a site for dwellings with basements. A foundation drainage system lowers the water table. Constructing the buildings on raised, well compacted fill material increases the depth to the water table. Because of low strength, the soil is severely limited 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.

This soil is severely limited as a site for septic tank absorption fields because of the wetness and the slow permeability. Perimeter drains are needed. Enlarging the absorption area and controlling the rate of flow from a holding tank improve the ability of the field to absorb the effluent.

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

Ud—Udorthents, loamy. These nearly level to moderately sloping, deep to shallow, well drained to somewhat poorly drained soils are in disturbed areas on uplands, terraces, and flood plains. Most areas have been cut, built up, or leveled. In some areas cutting and filling have resulted in a smoother, less sloping surface suitable for the construction of airstrips, parking lots, shopping centers, and training areas in Camp Atterbury. In some areas where cuts have been made, the original soil material has been transported to other areas, where it has been used in the construction of dams or has been used as fill material on building sites.

The soil in a filled area is a mixture of the surface layer and material from the subsoil and substratum of different soils. The texture is silt loam, loam, silty clay loam, and clay loam. Gravel and fragments of sandstone, siltstone, and shale are in some areas. In an area where deep cuts have been made, the exposed material is interbedded sandstone, siltstone, and shale or is glacial till.

Included with these soils in mapping are small areas of soils on short, steep slopes. Also included are a few small areas of undisturbed soils and some filled areas that consist of nonsoil material. Included areas make up about 15 percent of the map unit.

These soils have a low to high available water capacity and are very slowly permeable to moderately permeable. Surface runoff is very slow to rapid. The organic matter content is low or very low in the surface layer.

Most areas are used as wildlife habitat. They support little or no vegetation. Some areas are being reforested. These soils are generally unsuitable for corn, soybeans, and small grain and for hay and pasture. Onsite investigation is needed to determine the feasibility of any farm use. A permanent vegetative cover is needed to control erosion.

Onsite investigation is needed if these soils are to be used as sites for buildings, septic tank absorption fields, or local roads and streets. The depth to bedrock could be a problem. Soil properties vary. As a result, engineering test data should be collected. Because of the erosion hazard on building sites, a protective plant cover should be restored as soon as possible after construction.

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

WaD—Wellston-Berks-Trevlac complex, 6 to 20 percent slopes. These moderately sloping to moderately steep, well drained soils are on side slopes and narrow ridgetops in the uplands. The deep Wellston soil is generally on the less sloping ridgetops and on the upper parts of the side slopes. The moderately deep Berks and Trevlac soils are generally on narrow ridgetops and on the lower parts of the side slopes. Most areas are long and narrow and are several thousand acres in size. They are about 45 percent Wellston soil, 23 percent Berks soil, and 22 percent

Trevlac soil. The three soils occur as areas so intricately mixed that separating them in mapping is not practical.

In a typical profile of the Wellston soil, the surface layer is very dark grayish brown silt loam about 3 inches thick. The subsurface layer is about 4 inches of yellowish brown silt loam. The subsoil is about 44 inches thick. The upper part is yellowish brown, firm silty clay loam, and the lower part is yellowish brown, mottled, friable very channery silt loam. Weathered siltstone interbedded with sandstone and shale is at a depth of about 51 inches. In some areas the surface layer is silty clay loam. In other areas the lower part of the subsoil formed in material weathered from shale and has more clay.

In a typical profile of the Berks soil, the surface layer is very dark grayish brown channery silt loam about 3 inches thick. The subsurface layer is about 5 inches of yellowish brown channery silt loam. The subsoil is yellowish brown, friable very channery and extremely flaggy silt loam about 19 inches thick. Weathered siltstone interbedded with sandstone and shale is at a depth of about 27 inches. In a few areas the surface layer is silt loam.

In a typical profile of the Trevlac soil, the surface layer is very dark grayish brown silt loam about 2 inches thick. The subsurface layer is about 8 inches of light yellowish brown silt loam. The subsoil is yellowish brown, friable very channery and extremely flaggy silt loam about 27 inches thick. Weathered siltstone interbedded with sandstone and shale is at a depth of about 37 inches. In some areas the subsoil has fewer siltstone, sandstone, and shale fragments.

Included with these soils in mapping are a few small areas of the moderately well drained Tilsit soils near the center of wide ridgetops. These included soils have a fragipan. Also included are severely eroded areas where all of the surface layer has been removed. Included soils make up about 10 percent of the map unit.

The Wellston soil has a high available water capacity and is moderately permeable. The Berks soil has a very low available water capacity and is moderately rapidly permeable. The Trevlac soil has a low available water capacity and is moderately permeable. Surface runoff is rapid on all three soils. The organic matter content is moderate in the surface layer.

Most areas of these soils are used as woodland (fig. 8). Some are used for hay, pasture, or cultivated crops.

These soils are poorly suited to cultivated crops. Row crops can be grown occasionally, but the hazard of erosion is very severe. Measures that help to control erosion and surface runoff are needed. A crop rotation that is dominated by grasses and legumes, a system of conservation tillage that leaves protective amounts of crop residue on the surface, contour farming, and grassed waterways help to prevent excessive soil loss. The soils are well suited to a no-till cropping system. Cover crops and green manure crops help to control erosion and maintain tilth and the organic matter content.

These soils are fairly well suited to grasses and legumes for hay and pasture. Overgrazing results in surface compaction, poor tilth, and excessive runoff and erosion and reduces plant density. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

These soils are well suited to woodland. Seedling mortality is a management concern on the Berks soil. Seedling mortality rates are highest on south-facing slopes, which are more droughty than north-facing slopes. Special planting stock and overstocking are needed. Plant competition is moderate on the Wellston soil. It can be controlled by proper site preparation or by spraying, cutting, or girdling. Additional management practices include harvesting mature trees and excluding livestock.

Because of the slope, these soils are severely limited as sites for dwellings. Also, the Berks soil is limited by the depth to bedrock. Land shaping is necessary in some areas. The buildings should be designed so that they conform to the natural slope of the land. The bedrock underlying the Berks soil should be excavated when basements are constructed.

Because of the slope, these soils are severely limited as sites for local roads and streets. The potential for frost action in the Wellston soil also is a limitation. Replacing or covering the upper soil layers with suitable base material helps to prevent the damage caused by frost action. Constructing the roads on the contour helps to overcome the slope. Land shaping is necessary in some areas.

These soils are severely limited as sites for septic tank absorption fields because of the slope. The depth to bedrock in the Berks and Trevlac soils is an additional limitation. Installing the absorption field on the contour helps to overcome the slope. The cost of overcoming the depth to bedrock generally is prohibitive.

The land capability classification is IVe. The woodland ordination symbol assigned to the Wellston soil is 4A, that assigned to the Berks soil is 4F, and that assigned to the Trevlac soil is 4A.

WeC2—Wellston-Gilpin silt loams, 6 to 20 percent slopes, eroded. These moderately sloping to moderately steep, well drained soils are on side slopes and ridgetops in the uplands. The deep Wellston soil is generally on the less sloping ridgetops and on the upper parts of the side slopes. The moderately deep Gilpin soil is generally on the narrower ridgetops and on the lower parts of the side slopes. A few rills can form after heavy rainfall. Most areas are long and irregularly shaped and are several thousand acres in size. They are about 50 percent Wellston soil and 35 percent Gilpin soil. The two soils occur as areas so intricately mixed that separating them in mapping is not practical.

Figure 8.—A wooded area of Wellston-Berks-Trevlac complex, 6 to 20 percent slopes.

In a typical profile of the Wellston soil, the surface layer is dark yellowish brown silt loam about 5 inches thick. It has pockets of yellowish brown subsoil material. The subsoil is about 47 inches thick. It is yellowish brown. The upper part is friable silt loam, the next part is firm silty clay loam, and the lower part is mottled, friable very channery silt loam. Weathered siltstone interbedded with sandstone and shale is at a depth of about 52 inches. In some areas a thin layer of glacial till overlies the residuum or bedrock. In other areas the lower part of the subsoil formed in material weathered dominantly from shale and has more clay.

In a typical profile of the Gilpin soil, the surface layer is dark yellowish brown silt loam about 6 inches thick. The subsoil is yellowish brown and strong brown, friable channery and very channery silt loam about 30 inches thick. Weathered siltstone interbedded with sandstone and shale is at a depth of about 36 inches. In some areas the subsoil has fewer siltstone, sandstone, and shale fragments. In other areas the surface layer is channery silt loam.

Included with this soil in mapping are a few small areas of the moderately well drained Tilsit soils near the center of wide ridgetops. These included soils have a fragipan. Also included are severely eroded areas where all of the surface layer has been removed. Included soils make up about 15 percent of the map unit.

The available water capacity is high in the Wellston soil and low in the Gilpin soil. Both soils are moderately permeable. Surface runoff is rapid. The organic matter content is moderate in the surface layer.

Most areas of these soils are used as woodland. Some are used for hay, pasture, or cultivated crops.

These soils are poorly suited to cultivated crops. Row crops can be grown occasionally, but the hazard of erosion is very severe. Measures that help to control erosion and surface runoff are needed. A crop rotation that is dominated by grasses and legumes, a system of conservation tillage that leaves protective amounts of crop residue on the surface, and grassed waterways help to prevent excessive soil loss. The soils are well suited to a no-till cropping system. Cover crops and green manure crops help to control erosion and maintain tilth and the organic matter content.

These soils are fairly well suited to grasses and legumes, such as orchardgrass and red clover, for hay and pasture. Overgrazing results in surface compaction, poor tilth, and excessive runoff and erosion and reduces plant density. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

These soils are well suited to woodland. Plant competition is moderate. It can be controlled by proper site preparation or by spraying, cutting, or girdling. Additional management practices include harvesting mature trees and excluding livestock.

Because of the slope, these soils are severely limited as sites for dwellings. The depth to bedrock in the Gilpin soil also is a limitation on sites for dwellings with basements. The slope should be modified by land grading, or the buildings should be designed so that they conform to the natural slope of the land. The bedrock underlying the Gilpin soil should be excavated when basements are constructed.

Because of the slope, these soils are severely limited as sites for local roads and streets. The potential for frost action also is a limitation. Replacing or covering the upper soil layers with suitable base material helps to prevent the damage caused by frost action. Constructing the roads on the contour and land shaping help to overcome the slope.

These soils are severely limited as sites for septic tank absorption fields because of the slope. The depth to bedrock in the Gilpin soil is an additional limitation. Installing the absorption field on the contour helps to overcome the slope. The cost of overcoming the depth to bedrock generally is prohibitive.

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

Wt—Wilbur silt loam, frequently flooded. This nearly level, deep, moderately well drained soil is on flood plains. It is frequently 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 dark brown silt loam about 8 inches thick. The substratum to a depth of 60 inches is silt loam. The upper part is dark yellowish brown, and the lower part is yellowish brown and grayish brown and is mottled. In some areas the control section has more clay.

Included with this soil in mapping are the somewhat poorly drained Stendal soils in concave areas on the lower parts of the landscape. Also included, generally adjacent to drainageways, are soils that have a higher content of sand and gravel in the substratum than the Wilbur soil. Included soils make up about 15 percent of the map unit.

The Wilbur soil has a very high available water capacity and is moderately permeable. 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 in winter and spring.

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

This soil is well suited to cultivated crops. Frequent flooding in the spring can damage the crops. As a result, late planting or replanting is sometimes necessary. 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. The soil is well suited to spring plowing and spring chiseling.

This soil is well suited to grasses, such as orchardgrass, and shallow-rooted legumes, such as ladino clover, for hay and pasture. Overgrazing or grazing when the soil is too wet results in surface compaction and poor tilth and reduces plant density. Proper stocking rates, rotation grazing, 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 flooding can delay planting and harvesting. Plant competition is moderate. It can be controlled by proper site preparation or by spraying, cutting, or girdling. Additional management practices include harvesting mature trees and excluding livestock.

Because of the flooding, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields. Alternative sites should be selected. Because of the flooding and the potential for frost action, the soil is severely limited as a site for local roads and streets. Constructing the roads and streets on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by floodwater and frost action.

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

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 28,575 acres in the survey area, or 12.5 percent of the total acreage, meets the soil requirements for prime farmland. Scattered areas of this land are throughout the survey area, but most are in associations 5 and 6, which are described under the heading "General Soil Map Units."

A recent trend in land use in some parts of the survey area 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

Darrell K. Lambert, district conservationist, and Harold L. Thompson, conservation agronomist, Soil Conservation Service, helped prepare this section.

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

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

In 1978, about 31,108 acres in Brown County was farmland (*12*). Of this total, 9,506 acres was harvested cropland, 5,983 acres was used for hay and pasture, and 188 acres was used for specialty crops, such as tobacco and truck crops. A total of 11,314 acres of the farmland was used as woodland. The remaining 4,117 acres was pastured, was used as sites for dwellings, local roads, or ponds, or was idle land.

About 2,700 acres of Camp Atterbury is used for hay and pasture. The rest is wooded or is idle land. Cultivated crops are not grown in this camp. Unique management concerns, including explosive devices, affect use and management of the soils.

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

Erosion is a major management concern on about 25 percent of the cropland and pasture in the survey area. It is a hazard if the slope is more than 2 percent.

Loss of topsoil through erosion reduces the productivity of the soil. As the original surface layer is eroded away and the subsoil is mixed into the plow layer, much of the organic matter is lost and the level of fertility is lowered. The subsoil of most of the soils in the survey area has a higher content of clay and a lower content of organic matter than the original surface layer. Because of the increase in content of clay, the plow layer stays wet longer after rains and fieldwork is delayed. Also, the plow layer tends to be cloddy and is a poor seedbed. Seedling emergence is hindered by crusting. More fuel is required to operate tillage equipment on clayey soils. Loss of the surface layer also reduces the depth of the root zone and lowers the available water capacity.

Erosion can result in sedimentation of subsurface drains, streams, and rivers. Streams and rivers that are choked by sediment flood more often. The sediment is the main pollutant, by volume, of lakes and streams. It contains chemical fertilizers and pesticides, which reduce water quality for municipal use, for recreation, and for fish and wildlife.

The primary cause of soil erosion is the impact of raindrops on the surface. The force of raindrops hitting bare ground dislodges soil particles and moves them downslope. The surface becomes compacted and sealed. As a result, the rate of water infiltration is reduced and the rate of runoff, which carries soil particles away, is increased. A good vegetative cover helps to prevent the damage caused by the impact of the raindrops and reduces the runoff rate.

Some measures that provide a protective cover are conservation tillage, cover crops, stripcropping, a crop rotation that includes grasses and legumes, and crop residue management. These measures can be applied on most of the soils in the survey area. They are the most cost effective means of controlling erosion.

Conservation tillage includes a variety of tillage systems that retain protective amounts of crop residue on the surface throughout the year. Examples are no-tillage, strip tillage, and stubble mulching. Conservation tillage systems help to control soil blowing and water erosion, maintain or improve tilth, increase the rate of water infiltration, and provide food and cover for wildlife. They are best suited to well drained soils that have a slope of less than 12 percent and that dry out and warm up quickly in the spring. Examples are Cincinnati and Martinsville soils. Conservation tillage requires a high level of management. Herbicides and insecticides are needed for weed and pest control.

Grassed waterways intercept runoff and reduce the susceptibility to gully erosion. A permanent cover of grasses helps to control erosion in the waterway. Drainage tile generally is installed along one side of the waterway to remove excess subsurface water.

Diversions and parallel tile-outlet terraces help to control erosion and prevent the flooding of lowlands by reducing the length of the slopes and by diverting water to a safe outlet. Diversions carry water into grassed waterways, which extend to suitable outlets. Tile-outlet terraces are constructed across the slope. They temporarily store water behind the terraces. The water enters an inlet pipe and then runs through a subsurface drain to a suitable outlet. These structures are most practical on deep, gently sloping and moderately sloping soils that are susceptible to erosion.

Grade stabilization structures are used in conjunction with some surface drains and open ditches. They reduce the grade and thus prevent excessive water velocity by lowering the water safely from one level to another.

Erosion control is adequate if it prevents the reduction of soil productivity. In many areas a single measure or structure is not adequate. A combination of two or more erosion-control practices may be needed. Many factors, such as soil type, drainage class, steepness of slope, length of slope, and amount of rainfall, should be considered.

Information about the design of erosion-control practices for each kind of soil can be obtained from the Brown County or Bartholomew County Soil and Water Conservation District or the local office of the Soil Conservation Service.

Wetness is a major problem on about 16 percent of the cropland and pasture in the survey area. Most of the somewhat poorly drained soils, such as Avonburg and Bartle soils, can be adequately drained by surface drainage systems. Land smoothing and grading can result in the removal of most surface water. These soils have a fragipan at a depth of about 30 inches. As a result, tile systems generally are not effective.

Small areas of wetter soils that dry out more slowly are included with many of the well drained soils in mapping. Some random subsurface tile can drain these wet areas if an adequate outlet is available.

Fertility is determined by reaction and by the amount of nutrients available for plant growth. Natural fertility varies, depending on the physical and chemical properties of the soils. Applications of fertilizer and lime increase the amount of nutrients available to plants and raise the pH level of the soil. Reaction ranges from strongly acid to slightly acid in most soils in the survey area. On all soils additions of fertilizer and lime should be based on the results of soil tests, the needs of the crop, and the expected level of yields. The Cooperative Extension Service can help in determining the kinds and amounts of fertilizer and lime to be applied.

Tilth is an important factor affecting the preparation of a seedbed, the germination of seeds, and the infiltration of water into the soil. The content of organic matter in the soil affects tilth. In areas where tilth is poor, preparing a good seedbed is difficult. The soils in these areas are cloddy, tend to dry out slowly and become hard as they dry, and have poor soil structure. Because of the poor soil structure, a surface crust can form after periods of heavy rainfall. This crusting reduces the rate of water infiltration and increases the runoff rate. Germinating seeds cannot easily break through the crusted surface. Tilth can be improved by adding crop residue, manure, or other organic material to the soil. Applying a system of conservation tillage and working the soil when moisture conditions are favorable minimize the damage to soil structure. Fall plowing does not improve the tilth of most soils in the survey area. It increases the hazard of erosion.

Weeds can be controlled by applications of herbicide. The action of chemical herbicides is affected by the soil type. The organic matter content of the soil affects the ability of many chemicals to control weeds. Some chemicals deteriorate slowly on clayey soils and can cause crop damage during the following year. Information about how the chemicals react can be obtained from the Cooperative Extension Service.

Forage crops are well suited to the soils and climate in the survey area. Alfalfa and red clover are commonly grown on the well drained soils, such as Wellston, Gilpin, and Haymond soils. The grasses grown for hay and pasture include bluegrass, orchardgrass, bromegrass, timothy, and tall fescue.

Good pasture management helps to maintain forage production. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Pasture rotation, proper stocking rates, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

Specialty crops are of limited commercial importance in the survey area. A few areas are used for tobacco, sweet corn, tomatoes, blueberries, nursery plants, and fruit trees. Deep, well drained soils, such as Wellston and Martinsville soils, are well suited to most specialty crops.

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 rangeland, for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit (*10*). 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, rangeland, 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

Michael D. Warner, forester, Soil Conservation Service, and Patrick C. Merchant, soil scientist, Forest Service, helped prepare this section.

About 68 percent of the acreage in Brown County is forested. Approximately 50 percent of this woodland is owned by private individuals and 50 percent by various state and federal agencies. The woodland commonly occurs as strongly sloping to very steep upland soils that formed in material weathered from siltstone, sandstone, and shale bedrock. It is extensive in all parts of the county, except for the north-central and southwestern parts, which are used dominantly for cultivated crops.

Several saw mills and logging enterprises are based in Brown County. The county also has several commercial Christmas tree farms. Local saw mills use logs in the production of lumber and pallets. Much of the timber, however, is transported to saw mills outside of Brown County. Black walnut and white oak are of major importance in the production of veneer.

About 45 percent of Camp Atterbury is forested. Because the camp is a military installation, extensive areas have unique management concerns that hinder the use and management of the woodland. Some timber is harvested for commercial uses.

Upland oaks, yellow-poplar, black walnut, and pin oak are the principal tree species grown on the woodland in the survey area. Other common species are beech, maple, ash, black cherry, hickory, and introduced conifers, such as eastern redcedar and pine. Upland oaks are dominant on the well drained upland soils. Yellow-poplar generally grows on the lower parts of steep slopes, on cool aspects (north- and northeast-facing slopes), and in coves. Black walnut is sensitive to soil conditions. It grows best on deep, well drained, nearly neutral soils that are moist and fertile. It favors sites that are along narrow streams or on north- and northeast-facing slopes. It grows well in coves. Pin oak grows on poorly drained soils on uplands, terraces, and flood plains.

Woodland productivity is directly influenced by the physical and chemical properties of the soil. Examples are available water capacity, depth of the root zone, thickness of the surface layer, texture, consistence, slope, fertility, reaction, and depth to the water table.

Tree growth also is influenced by aspect and the position of the soils on the landscape. Aspect is the direction in which a slope faces. North- and east-facing slopes are more productive than south- and west-facing slopes. The north and east aspects have lower soil temperatures and more soil moisture than the south and west aspects, which are more exposed to direct sunlight and to the prevailing wind. Landscape position also is important. The lower side slopes, for example, receive more moisture and are generally deeper over bedrock than the upper side slopes.

Woodland productivity can be increased through the application of erosion-control measures and other good management techniques. Heavy cutting of the timber and poor logging practices have resulted in severe erosion and gullying in some areas. Special measures, such as building haul roads on the contour, yarding the logs uphill with a cable, and preserving as much understory vegetation as possible, help to control erosion. Constructing water bars and revegetating disturbed areas also help to control erosion. Adequate site preparation and spraying, cutting, or girdling help to control competing vegetation.

A significant part of the woodland in Brown County is being grazed. Grazing increases the hazard of erosion, kills young trees, damages roots, and adversely affects the leaf litter. It also compacts the soil and consequently reduces the rate of tree growth. Excluding livestock from the woodland can increase the production of trees.

Tables 8 and 9 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. Table 8 lists the ordination symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

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

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

Erosion hazard is the probability that damage will occur as a result of site preparation and cutting where the soil is exposed along roads, skid trails, fire lanes, and log-handling areas. Forests that have been burned or overgrazed 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, or topographic conditions. The factors used in rating the soils for seedling mortality are texture of the surface layer, depth to a seasonal high water table and the length of the period when the water table is high, rock fragments in the surface layer, effective rooting depth, and slope aspect. A rating of *slight* indicates that seedling mortality is not likely to be a problem under normal conditions. Expected mortality is less than 25 percent. A rating of *moderate* indicates that some problems from seedling mortality can be expected. Extra precautions are advisable. Expected mortality is 25 to 50 percent. A rating of *severe* indicates that seedling mortality is a serious problem. Extra precautions are important. Replanting may be necessary. Expected mortality is more than 50 percent.

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

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

The *volume*, a number, is the yield likely to be produced by the most important trees. This number, expressed as cubic feet per acre per year, indicates the amount of fiber produced on a fully stocked, even-aged, unmanaged stand.

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

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

In table 9, *slight, moderate,* and *severe* indicate the degree of the major soil limitations that affect the use of forestry equipment.

Haul roads are access roads leading from log landings to primary or surfaced roads. Generally, the haul roads are not paved or graveled. The ratings indicate the degree and kind of limitations affecting the location of these roads. A rating of *slight* indicates that no serious limitations affect the location, construction, and maintenance of the roads or the season of use. A rating of *moderate* is used for limitations that can be overcome by routine construction techniques. Construction and maintenance costs are higher than those expected on soils rated slight, or the season of use is somewhat limited. A rating of *severe* is used for limitations that can be overcome by special techniques, which may be expensive. Construction costs, maintenance costs, or both are high, or the season of use may by seriously restricted.

Log landings are areas where logs are assembled for transportation. Considerable soil compaction can be expected in these areas. Areas that require little or no site preparation are desirable sites for landings. The ratings indicate the degree and kind of limitations affecting the location of log landings. The chief characteristics considered in the ratings are wetness, flooding, stoniness, slope, depth to hard bedrock, and soil texture. A rating of *slight* indicates that no serious limitations affect the location of the landings, the season of use, or the reestablishment of forest vegetation on the site. A rating of *moderate* indicates a somewhat limited season of use or a limitation that can be overcome by a drainage system, by grading, by cutting and filling, or by other kinds of site preparation. Reestablishing forest vegetation generally is more difficult than on soils rated slight. A rating of *severe* indicates a very limited season of use or a limitation that can be overcome by special techniques, which may be expensive. The risk of environmental damage may be significant. Reestablishing forest vegetation is very difficult or impossible.

Skid trails and logging areas include sites where some or all of the trees are being cut. Skid trails, which generally are within the logging area, are roads or trails over which the logs are dragged or hauled from the stump to a log landing. Rubber-tired equipment is commonly used in these areas. In some areas using other types of log-moving equipment minimizes the site limitations. The chief characteristics considered in the ratings are wetness, flooding, stoniness, texture, and slope. A rating of *slight* indicates that few or no limitations affect the kind of equipment or the season of use. A rating of *moderate* indicates that some limitations affect the kind of equipment, the season of use, or both. A rating of *severe* indicates that special equipment or logging techniques are needed or that the season of use is very limited.

Site preparation and planting are mechanized activities. The ratings are based on limitations that affect efficient equipment operation and the effects of equipment use on the site. It is assumed that operating techniques do not displace or remove topsoil from the site or result in channels where runoff can concentrate. The chief characteristics considered in the ratings are wetness, flooding, stoniness, content of coarse fragments, depth to hard bedrock, texture, and slope. A rating of *slight* indicates that few or no limitations affect the kind of equipment or the season of use. A rating of *moderate* indicates that some limitations affect the kind of equipment, the season of use, or both. The use of equipment can result in damage to the site. A rating of *severe* indicates that special equipment or logging techniques are needed or that the season of use is very limited.

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 10 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 10 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

Recreation has a major influence on the economy of the survey area. Tourism is a major industry. Many private and public recreational developments are throughout Brown County. Brown County State Park, Yellowwood State Forest, the Hoosier National Forest, and a number of private camps are examples of areas that have been developed for recreational uses. Monroe Reservoir and Lake Lemon offer opportunities for boating, fishing, and swimming. Other recreational activities in the survey area include hiking, camping, hunting, sightseeing, and downhill and cross-country skiing (fig. 9).

Planning facilities for outdoor recreation is important because the demand for such facilities is likely to increase significantly in the future (*6*). Continued development of recreational enterprises is likely in Brown County. Hunting areas, shooting preserves, improved picnic areas, camping areas, ski areas, golf courses, and areas for fishing and other aquatic sports are likely to be developed in the future.

The soils of the survey area are rated in table 11 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 11, 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

Figure 9.—Snow skiing in an area of Berks-Trevlac-Wellston complex, 20 to 70 percent slopes.

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 11 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 14 and interpretations for dwellings without basements and for local roads and streets in table 13.

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 12, 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, soybeans, 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 redtop, timothy, orchardgrass, lespedeza, 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, lambsquarters, pokeweed, and broom sedge.

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

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, wild millet, arrowhead, buttonbush, willow, 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, meadowlark, field sparrow, cottontail, killdeer, woodchuck, and red fox.

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

Habitat for wetland wildlife consists of marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, 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, 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 13 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 14 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 14 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 14 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 14 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

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

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

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

Construction Materials

Table 15 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 15, 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 16 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 soil blowing or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

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

Soil Properties

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

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

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

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

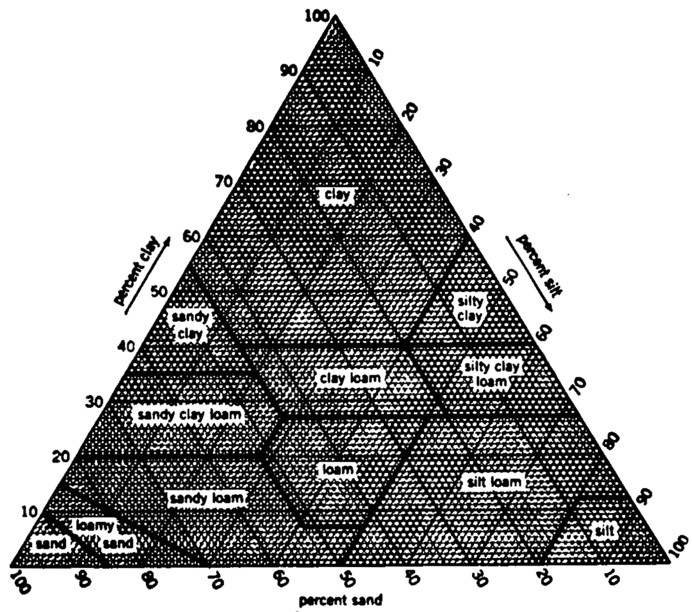

Figure 10.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

Engineering Index Properties

Table 17 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 18 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

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

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

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 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 soil blowing in cultivated areas. The groups indicate the susceptibility to soil blowing. 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 soil blowing 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 soil blowing are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control soil blowing 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 soil blowing 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 soil blowing.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 18, 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 19 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 19, 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 19 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 19 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 19.

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 (*11*). 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 20 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 substratum can differ within a series.

Soil Series and Their Morphology

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

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the *Soil Survey Manual* (*9*). Many of the technical terms used in the descriptions are defined in *Soil Taxonomy* (*11*). 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."

Avonburg Series

The Avonburg series consists of deep, somewhat poorly drained soils on the tops of ridges in the uplands. These soils formed in loess and the underlying silty drift. They have a fragipan. Permeability is moderate above the fragipan and very slow in the fragipan. Slopes range from 0 to 2 percent.

Avonburg soils are similar to Bartle soils and are commonly adjacent to Cincinnati and Rossmoyne soils. Bartle soils formed in silty alluvium on stream terraces. Cincinnati and Rossmoyne soils have fewer grayish mottles in the upper part of the subsoil than the

Avonburg soils. They are in the more sloping areas on ridgetops and side slopes.

A typical pedon of Avonburg silt loam, 0 to 2 percent slopes, in a cultivated field; 1,420 feet west and 1,600 feet south of the northeast corner of sec. 25, T. 10 N., R. 2 E.

Ap—0 to 9 inches; brown (10YR 5/3) silt loam, light gray (10YR 7/2) dry; moderate medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

Bt—9 to 16 inches; pale brown (10YR 6/3) silt loam; many coarse faint light gray (10YR 7/2) and common medium distinct yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; friable; many fine roots; thin discontinuous light brownish gray (10YR 6/2) clay films on faces of peds; strongly acid; clear smooth boundary.

Btg—16 to 23 inches; light gray (10YR 7/2) silty clay loam; common medium faint pale brown (10YR 6/3) and distinct yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; friable; thin continuous light brownish gray (10YR 6/2) clay films on faces of peds; thin continuous light gray (10YR 7/2) silt coatings on vertical faces of peds; very strongly acid; clear smooth boundary.

Btxg1—23 to 33 inches; light brownish gray (10YR 6/2) silty clay loam; common medium distinct yellowish brown (10YR 5/8) mottles; moderate very coarse prismatic structure parting to moderate medium subangular blocky; very firm; brittle; thin continuous light brownish gray (10YR 6/2) clay films on faces of peds; thin continuous light gray (10YR 7/2) silt coatings on vertical faces of peds and silty clay loam fillings between prisms; very strongly acid; gradual smooth boundary.

2Btxg2—33 to 52 inches; light brownish gray (10YR 6/2) silty clay loam; many coarse prominent strong brown (7.5YR 5/8) mottles; moderate very coarse prismatic structure parting to moderate medium subangular blocky; very firm; brittle; about 2 percent gravel; thin continuous light gray (10YR 7/1) clay films on faces of peds; thin discontinuous light gray (10YR 7/2) silt coatings on vertical faces of peds and silty clay loam fillings between prisms; very strongly acid; gradual wavy boundary.

2Btg1—52 to 66 inches; light brownish gray (10YR 6/2) silt loam; many coarse prominent strong brown (7.5YR 5/8) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; about 2 percent gravel; thin continuous light gray (10YR 7/1) clay films on faces of peds; few medium black (N 2/0) accumulations of iron and manganese oxide; very strongly acid; gradual wavy boundary.

2Btg2—66 to 80 inches; light brownish gray (10YR 6/2) silty clay loam; common medium distinct yellowish brown (10YR 5/6) and light yellowish brown (10YR 6/4) mottles; weak coarse subangular blocky structure; friable; about 2 percent gravel; thin discontinuous gray (10YR 5/1) clay films on faces of peds and as linings in channels; very strongly acid.

The thickness of the solum ranges from 80 to 96 inches. The depth to the fragipan ranges from 21 to 30 inches.

The Ap horizon has value of 4 or 5 and chroma of 2 or 3. The Bt horizon has value of 5 to 7 and chroma of 2 to 6. The Btxg horizon has hue of 7.5YR or 10YR, value of 5 or 6, and chroma of 1 to 6. It is silt loam or silty clay loam.

Bartle Series

The Bartle series consists of deep, somewhat poorly drained soils on stream terraces. These soils formed in silty alluvial deposits. They have a fragipan. Permeability is moderate above the fragipan and very slow in the fragipan. Slopes range from 0 to 3 percent.

Bartle soils are similar to Avonburg soils and are commonly adjacent to Pekin soils. Avonburg soils have glacial drift in the lower part of the solum. They are in the uplands. Pekin soils have fewer grayish mottles in the upper part of the subsoil than the Bartle soils. They are in the more sloping areas along terrace breaks and drainageways.

A typical pedon of Bartle silt loam, 0 to 3 percent slopes, in a hay field; 1,440 feet east and 440 feet north of the southwest corner of sec. 20, T. 9 N., R. 2 E.

Ap—0 to 7 inches; dark brown (10YR 4/3) silt loam, light gray (10YR 7/2) dry; moderate medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

Bt—7 to 24 inches; pale brown (10YR 6/3) silt loam; many coarse faint light gray (10YR 7/2) mottles; weak medium subangular blocky structure; friable; many fine and medium roots; thin patchy light brownish gray (10YR 6/2) and pale brown (10YR 6/3) clay films on faces of peds; very strongly acid; clear wavy boundary.

Btx1—24 to 34 inches; yellowish brown (10YR 5/6) silty clay loam; many medium distinct light brownish gray (10YR 6/2) and common medium distinct strong brown (7.5YR 5/8) mottles; moderate very coarse prismatic structure parting to moderate medium subangular blocky; very firm; brittle; few fine roots between prisms; thin continuous light brownish gray (10YR 6/2) and brown (7.5YR 5/4) clay films on faces of peds; common medium black (N 2/0) accumulations of iron and manganese oxide; very strongly acid; clear wavy boundary.

Btx2—34 to 58 inches; yellowish brown (10YR 5/6) silt loam; common coarse distinct light gray (10YR 7/2) mottles; moderate very coarse prismatic structure parting to moderate very thick platy; very firm; brittle; thin discontinuous brown (7.5YR 5/4) clay films on faces of peds; thin discontinuous light brownish gray (10YR 6/2) silt coatings between prisms; few medium black (N 2/0) accumulations of iron and manganese oxide; very strongly acid; gradual wavy boundary.

B't1—58 to 65 inches; yellowish brown (10YR 5/6) silt loam; common coarse distinct light brownish gray (10YR 6/2) and common coarse faint yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; firm; thin discontinuous light brownish gray (10YR 6/2) clay films on faces of peds; few fine black (N 2/0) accumulations of iron and manganese oxide; strongly acid; gradual wavy boundary.

B't2—65 to 80 inches; yellowish brown (10YR 5/6) silty clay loam that has strata of silt loam; common medium distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; firm; thin discontinuous light brownish gray (10YR 6/2) clay films on faces of peds; slightly acid.

The solum ranges from 60 to 100 inches in thickness. The depth to the fragipan ranges from 24 to 36 inches.

The Ap horizon has value of 4 or 5 and chroma of 2 or 3. The Bt horizon has value of 5 or 6 and chroma of 1 to 4. It is silt loam or silty clay loam. The Btx horizon has value of 5 to 7 and chroma of 1 to 6 and has mottles with higher chroma. It is silty clay loam, silt loam, or loam.

Beanblossom Series

The Beanblossom series consists of deep, moderately well drained, moderately rapidly permeable soils on flood plains, alluvial fans, and colluvial benches. These soils formed in very channery or extremely channery alluvium or colluvium. Slopes range from 1 to 3 percent.

Beanblossom soils are commonly adjacent to Haymond and Stendal soils. The adjacent soils have only a few coarse fragments throughout. They are on the broader flood plains.

A typical pedon of Beanblossom channery silt loam, occasionally flooded, in a walnut plantation; 2,175 feet west and 50 feet north of the southeast corner of sec. 4, T. 8 N., R. 2 E.

Ap—0 to 7 inches; brown (10YR 4/3) channery silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; common fine and medium roots; about 27 percent sandstone fragments as much as 3 inches long; strongly acid; abrupt smooth boundary.

C1—7 to 17 inches; yellowish brown (10YR 5/4) very channery silt loam; weak fine subangular blocky structure; friable; common fine and medium roots; thin discontinuous brown (10YR 4/3) organic coatings on faces of peds; about 45 percent sandstone fragments as much as 3 inches long; strongly acid; clear smooth boundary.

C2—17 to 26 inches; yellowish brown (10YR 5/4) extremely channery loam; weak fine subangular blocky structure; friable; few fine roots; thin patchy brown (10YR 4/3) organic coatings on faces of peds; about 80 percent sandstone fragments as much as 3 inches long; medium acid; clear smooth boundary.

C3—26 to 32 inches; yellowish brown (10YR 5/4) extremely channery loam; massive; friable; few coarse roots; about 80 percent sandstone fragments as much as 3 inches long; medium acid; clear smooth boundary.

C4—32 to 44 inches; yellowish brown (10YR 5/4) extremely channery loam; common fine faint yellowish brown (10YR 5/6) mottles; massive; friable; about 77 percent sandstone fragments as much as 3 inches long; medium acid; clear smooth boundary.

C5—44 to 54 inches; dark yellowish brown (10YR 4/4) extremely channery loam; common medium distinct yellowish brown (10YR 5/6) and few fine distinct light gray (10YR 7/2) mottles; massive; about 75 percent sandstone fragments as much as 3 inches long; slightly acid; abrupt smooth boundary.

Cr—54 inches; fractured siltstone interbedded with sandstone and shale.

The depth to bedrock ranges from 40 to 60 inches. The A horizon has value of 3 or 4 and chroma of 2 or 3. The C horizon has value of 4 or 5 and chroma of 3 or 4. It is the very channery or extremely channery analogs of loam or silt loam.

Berks Series

The Berks series consists of moderately deep, well drained, moderately rapidly permeable soils on uplands. These soils formed in material weathered from interbedded siltstone, sandstone, and shale bedrock. Slopes range from 6 to 70 percent.

Berks soils are similar to Gilpin and Trevlac soils and are commonly adjacent to Wellston soils. Gilpin and Trevlac soils have an argillic horizon. Wellston soils have an argillic horizon and are more than 40 inches deep over bedrock. They are in the slightly higher areas.

A typical pedon of Berks very channery silt loam, in a wooded area of Berks-Trevlac-Wellston complex, 20 to 70 percent slopes; 2,600 feet south and 125 feet west of the northeast corner of sec. 35, T. 9 N., R. 2 E.

Oe—1 inch to 0; roots and partially decomposed leaves.

A—0 to 2 inches; very dark grayish brown (10YR 3/2) very channery silt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; many fine roots; about 45 percent siltstone fragments as much as 10 inches long; extremely acid; clear smooth boundary.

E—2 to 5 inches; yellowish brown (10YR 5/4) very channery silt loam; moderate medium granular structure; friable; many fine roots; about 45 percent siltstone fragments as much as 10 inches long; extremely acid; clear wavy boundary.

BE—5 to 10 inches; light yellowish brown (10YR 6/4) very channery silt loam; weak fine subangular blocky structure; friable; many fine and medium roots; about 35 percent siltstone fragments as much as 3 inches long; very strongly acid; clear wavy boundary.

Bw—10 to 19 inches; yellowish brown (10YR 5/6) extremely channery silt loam; weak medium subangular blocky structure; friable; common fine roots; about 75 percent siltstone fragments as much as 6 inches long; very strongly acid; clear smooth boundary.

BC—19 to 27 inches; yellowish brown (10YR 5/6) extremely channery silt loam; structure obscured by coarse fragments; friable; common fine roots; about 85 percent siltstone fragments as much as 6 inches long; very strongly acid; clear smooth boundary.

Cr—27 inches; fractured siltstone interbedded with sandstone and shale.

The thickness of the solum ranges from 20 to 40 inches. It corresponds with the depth to bedrock.

The A horizon has value of 3 or 4 and chroma of 2 or 3. The B horizon has hue of 2.5Y or 10YR and value and chroma of 4 to 6. It is channery, very channery, extremely channery, flaggy, or very flaggy silt loam.

Bonnell Series

The Bonnell series consists of deep, well drained, slowly permeable soils on uplands. These soils formed in glacial till. Slopes range from 12 to 20 percent.

Bonnell soils are similar to Chetwynd and Hickory soils and are commonly adjacent to Cincinnati soils. Chetwynd and Hickory soils have less clay in the control section than the Bonnell soils. Also, Chetwynd soils formed in stratified outwash sediments. Cincinnati soils have a fragipan. They are on the upper parts of side slopes and on the wider ridgetops.

A typical pedon of Bonnell loam, 12 to 20 percent slopes, eroded, in an idle field; 1,975 feet west and 900 feet south of the northeast corner of sec. 5, T. 7 N., R. 4 E.

Ap—0 to 5 inches; brown (10YR 4/3) loam, pale brown (10YR 6/3) dry; pockets of strong brown (7.5YR 5/6) subsoil material; moderate medium granular structure; friable; many medium roots; strongly acid; abrupt smooth boundary.

Bt1—5 to 10 inches; strong brown (7.5YR 5/6) clay loam; moderate medium subangular blocky structure; firm; many fine and medium roots; thin continuous brown (7.5YR 5/4) clay films on faces of peds; very strongly acid; clear smooth boundary.

Bt2—10 to 21 inches; strong brown (7.5YR 5/6) clay; moderate coarse prismatic structure parting to moderate medium angular blocky; very firm; common fine roots; thin continuous brown (7.5YR 5/4) clay films on faces of peds; very strongly acid; clear wavy boundary.

Bt3—21 to 38 inches; strong brown (7.5YR 5/6) clay loam; moderate coarse prismatic structure parting to moderate medium angular blocky; very firm; common fine roots; thin continuous brown (7.5YR 5/4) clay films on faces of peds; common medium black (N 2/0) iron and manganese oxide stains; very strongly acid; gradual wavy boundary.

Bt4—38 to 43 inches; strong brown (7.5YR 5/6) clay loam; moderate coarse prismatic structure parting to moderate medium angular blocky; firm; few fine roots; thin discontinuous brown (7.5YR 5/4) clay films on faces of peds; common medium black (N 2/0) iron and manganese oxide stains; mildly alkaline; gradual wavy boundary.

BCt—43 to 54 inches; yellowish brown (10YR 5/4) loam; common medium distinct strong brown (7.5YR 5/6) mottles; moderate medium angular blocky structure; firm; thin discontinuous yellowish brown (10YR 5/4) clay films on faces of peds; strong effervescence; moderately alkaline; gradual wavy boundary.

C—54 to 60 inches; yellowish brown (10YR 5/4) loam; few medium faint yellowish brown (10YR 5/6) mottles; massive; firm; strong effervescence; moderately alkaline.

The solum ranges from 50 to 80 inches in thickness. The Ap horizon has chroma of 3 or 4. The Bt horizon has hue of 7.5YR or 10YR and chroma of 4 to 6. It is clay or clay loam.

Chagrin Series

The Chagrin series consists of deep, well drained, moderately permeable soils on flood plains. These soils formed in loamy alluvial deposits. Slopes range from 0 to 2 percent.

Chagrin soils are similar to Haymond and Stonelick soils. Haymond soils have less clay and sand in the control section than the Chagrin soils. Stonelick soils are less acid in the control section than the Chagrin soils.

A typical pedon of Chagrin silt loam, occasionally flooded, in an idle field; 300 feet west and 200 feet south of the center of sec. 1, T. 10 N., R. 4 E.

Ap—0 to 4 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; many fine and medium roots; neutral; clear smooth boundary.

Bw1—4 to 14 inches; dark yellowish brown (10YR 4/4) loam; moderate fine subangular blocky structure; friable; common medium roots; thin continuous dark brown (10YR 4/3) organic coatings on faces of peds; neutral; gradual smooth boundary.

Bw2—14 to 21 inches; dark yellowish brown (10YR 4/4) loam; moderate fine and medium subangular blocky structure; friable; common medium roots; thin continuous dark brown (10YR 4/3) organic coatings on faces of peds; neutral; gradual smooth boundary.

Bw3—21 to 40 inches; dark yellowish brown (10YR 4/4) loam; weak coarse subangular blocky structure; friable; few coarse roots; thin discontinuous dark brown (10YR 4/3) organic coatings on faces of peds; neutral; gradual smooth boundary.

C—40 to 60 inches; yellowish brown (10YR 5/4) sandy loam that has thin strata of loam; massive; friable; few medium roots; neutral.

The solum is 36 to 48 inches thick. The A horizon has value of 3 or 4 and chroma of 2 or 3. The Bw horizon is silt loam, loam, or sandy loam.

Chetwynd Series

The Chetwynd series consists of deep, well drained, moderately permeable soils on outwash terraces. These soils formed in stratified, loamy outwash. Slopes range from 12 to 50 percent.

Chetwynd soils are similar to Bonnell and Hickory soils and are commonly adjacent to Pekin soils. Bonnell and Hickory soils formed in glacial till. Pekin soils have a fragipan. They formed in silty and loamy alluvium on stream terraces.

A typical pedon of Chetwynd loam, 20 to 50 percent slopes, in a wooded area; 2,050 feet north and 725 feet east of the southwest corner of sec. 32, T. 10 N., R. 2 E.

Oe—1 inch to 0; partially decomposed leaf litter.

A—0 to 2 inches; very dark grayish brown (10YR 3/2) loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; many fine and medium roots; medium acid; clear wavy boundary.

E—2 to 7 inches; yellowish brown (10YR 5/4) loam; weak thin platy structure parting to moderate medium subangular blocky; friable; many fine and medium roots; about 5 percent gravel; strongly acid; clear smooth boundary.

Bt1—7 to 14 inches; yellowish brown (10YR 5/6) loam; moderate medium prismatic structure parting to moderate medium subangular blocky; friable; many fine and medium roots; thin discontinuous yellowish brown (10YR 5/4) clay films on faces of peds; about 10 percent gravel; strongly acid; clear smooth boundary.

Bt2—14 to 21 inches; strong brown (7.5YR 5/6) clay loam; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; common fine and medium roots; thin discontinuous brown (7.5YR 5/4) clay films on faces of peds; about 5 percent gravel; strongly acid; clear wavy boundary.

Bt3—21 to 31 inches; strong brown (7.5YR 5/6) loam; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; fine roots; thin discontinuous brown (7.5YR 5/4) clay films on faces of peds; about 10 percent gravel; strongly acid; gradual smooth boundary.

Bt4—31 to 40 inches; yellowish red (5YR 5/8) loam; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; thin discontinuous strong brown (7.5YR 5/6) clay films on faces of peds; about 13 percent gravel; strongly acid; gradual smooth boundary.

Bt5—40 to 56 inches; yellowish red (5YR 5/8) gravelly loam; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; thin discontinuous strong brown (7.5YR 5/6) clay films on faces of peds; about 20 percent gravel; strongly acid; gradual smooth boundary.

Bt6—56 to 61 inches; strong brown (7.5YR 5/8) gravelly sandy loam that has thin strata of yellowish brown (10YR 5/6) loamy sand; moderate medium subangular blocky structure; firm; thin discontinuous strong brown (7.5YR 5/6) clay films on faces of peds; about 25 percent gravel; strongly acid; gradual smooth boundary.

BC—61 to 70 inches; strong brown (7.5YR 5/6) gravelly sandy loam that has thin strata of yellowish brown (10YR 5/6) loamy sand; moderate medium subangular blocky structure; friable; about 25 percent gravel; medium acid; gradual smooth boundary.

C—70 to 80 inches; strong brown (7.5YR 5/6) gravelly sandy loam that has thin strata of yellowish brown (10YR 5/6) loamy sand; massive; friable; about 15 percent gravel; medium acid.

The A and E horizons are silt loam or loam. The A horizon has value of 3 or 4 and chroma of 2 or 3. The E horizon has value of 4 or 5. The Bt horizon has hue of 10YR, 7.5YR, or 5YR and chroma of 4 to 8. It is dominantly loam, clay loam, sandy loam, or the gravelly analogs of these textures.

Cincinnati Series

The Cincinnati series consists of deep, well drained soils on uplands. These soils formed in loess and in the underlying glacial drift. They have a fragipan. Permeability is moderate above the fragipan and slow in the fragipan. Slopes range from 6 to 12 percent.

Cincinnati soils are similar to Pekin, Rossmoyne, and Tilsit soils and are commonly adjacent to Avonburg, Bonnell, and Hickory soils. Pekin soils formed in silty and loamy alluvial deposits on stream terraces. Rossmoyne soils are shallower to grayish mottles than the Cincinnati soils. Tilsit soils formed in loess and in the underlying material weathered from sandstone, siltstone, and shale bedrock. Avonburg soils have a subsoil that is grayer than that of the Cincinnati soils. They are in nearly level areas on ridgetops. Bonnell and Hickory soils do not have a fragipan. They are on the more sloping, lower parts of side slopes.

A typical pedon of Cincinnati silt loam, 6 to 12 percent slopes, eroded, in an idle field; 300 feet west and 550 feet north of the center of sec. 28, T. 10 N., R. 3 E.

Ap—0 to 7 inches; dark yellowish brown (10YR 4/4) silt loam, light yellowish brown (10YR 6/4) dry; pockets of yellowish brown (10YR 5/4) subsoil material; weak fine and medium granular structure; friable; many medium roots; very strongly acid; clear smooth boundary.

Bt1—7 to 13 inches; yellowish brown (10YR 5/4) silt loam; moderate medium subangular blocky structure; friable; common medium roots; thin discontinuous yellowish brown (10YR 5/4) clay films on faces of peds; very strongly acid; clear smooth boundary.

Bt2—13 to 20 inches; yellowish brown (10YR 5/6) silty clay loam; few fine distinct very pale brown (10YR 7/3) mottles; moderate medium subangular blocky structure; firm; common fine roots; thin continuous yellowish brown (10YR 5/4) clay films on faces of peds; very strongly acid; clear smooth boundary.

Bt3—20 to 26 inches; yellowish brown (10YR 5/6) silty clay loam; few fine distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; firm; few fine roots; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds; thin discontinuous very pale brown (10YR 7/3) silt coatings on faces of peds; very strongly acid; clear wavy boundary.

Btx1—26 to 36 inches; yellowish brown (10YR 5/6) silt loam; common medium distinct light brownish gray (10YR 6/2) mottles; moderate very coarse prismatic structure parting to moderate medium subangular blocky; very firm; brittle; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; thin discontinuous very pale brown (10YR 7/3) silt coatings on vertical faces of peds and as fillings between prisms; few till pebbles; very strongly acid; gradual wavy boundary.

2Btx2—36 to 52 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct light brownish gray (10YR 6/2) and strong brown (7.5YR 5/6) mottles; moderate very coarse prismatic structure parting to moderate medium subangular blocky; very firm; brittle; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; thin patchy very pale brown (10YR 7/3) silt coatings on vertical faces of peds and as fillings between prisms; few till pebbles; very strongly acid; gradual wavy boundary.

3Bt1—52 to 62 inches; strong brown (7.5YR 5/6) silty clay loam; common medium distinct light brownish gray (10YR 6/2) mottles; moderate fine subangular blocky structure; firm; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; many medium black (N 2/0) iron and manganese oxide stains; few till pebbles; very strongly acid; gradual wavy boundary.

3Bt2—62 to 80 inches; strong brown (7.5YR 5/8) clay; common medium distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; firm; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; many medium black (N 2/0) iron and manganese oxide stains; few till pebbles; very strongly acid.

The thickness of the solum ranges from 80 to 100 inches. The depth to the fragipan ranges from 20 to 36 inches. The Ap horizon has chroma of 3 or 4. The Bx and 2Bx horizons are silty clay loam, silt loam, or loam.

Crosby Series

The Crosby series consists of deep, somewhat poorly drained, slowly permeable soils on till plains. These soils formed in a thin layer of loess and in the underlying glacial till. Slopes range from 1 to 5 percent.

The Crosby soils in this county have less clay than is definitive for the series. This difference, however, does not alter the usefulness or behavior of the soils.

Crosby soils are similar to Whitaker soils and are commonly adjacent to Miami soils. Whitaker soils formed in stratified outwash sediments. Miami soils do not have grayish mottles in the argillic horizon. They are in the more sloping, convex areas along the major drainageways.

A typical pedon of Crosby silt loam, 1 to 5 percent slopes, in an idle field; 275 feet west and 1,800 feet north of the southeast corner of sec. 1, T. 10 N., R. 4 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; many fine and medium roots; neutral; abrupt smooth boundary.

Bt1—8 to 13 inches; grayish brown (10YR 5/2) silt loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; friable; common fine roots; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; common medium black (N 2/0) accumulations of iron and manganese oxide;

about 1 percent gravel; slightly acid; clear smooth boundary.

2Bt2—13 to 20 inches; yellowish brown (10YR 5/6) silty clay loam; common medium distinct grayish brown (10YR 5/2) and dark yellowish brown (10YR 4/4) mottles; weak moderate prismatic structure parting to moderate medium subangular blocky; firm; common fine roots; thin continuous grayish brown (10YR 5/2) clay films on faces of peds; common medium black (N 2/0) accumulations of iron and manganese oxide; about 1 percent gravel; slightly acid; clear smooth boundary.

2Bt3—20 to 29 inches; dark yellowish brown (10YR 4/4) clay loam; common medium distinct grayish brown (10YR 5/2) mottles; moderate coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; many medium black (N 2/0) accumulations of iron and manganese oxide; about 2 percent gravel; neutral; gradual smooth boundary.

2Bt4—29 to 36 inches; yellowish brown (10YR 5/4) clay loam; common medium distinct grayish brown (10YR 5/2) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; thin continuous dark grayish brown (10YR 5/2) clay films on faces of peds; about 2 percent gravel; neutral; gradual smooth boundary.

2C—36 to 60 inches; yellowish brown (10YR 5/4) loam; many coarse distinct grayish brown (10YR 5/2) mottles; massive; friable; about 6 percent gravel; strong effervescence; moderately alkaline.

The solum is 30 to 40 inches thick. The loess is 6 to 18 inches thick. The Ap horizon is slightly acid or neutral. The 2Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 2 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 siltstone interbedded with sandstone and shale. Slopes range from 6 to 20 percent.

Gilpin soils are similar to Berks and Trevlac soils and are commonly adjacent to Stonehead, Tilsit, and Wellston soils. In the control section of Berks and Trevlac soils, the content of coarse fragments is more than 35 percent. Stonehead soils are more than 40 inches deep over bedrock and have more clay in the lower part of the subsoil than the Gilpin soils. They are on the slightly lower side slopes. Tilsit soils have a fragipan. They are on the less sloping parts of ridgetops. Wellston soils are more than 40 inches deep over bedrock. They are in the slightly higher areas.

A typical pedon of Gilpin silt loam, in a pastured area of Wellston-Gilpin silt loams, 6 to 20 percent slopes, eroded; 350 feet east and 1,025 feet south of the northwest corner of sec. 15, T. 10 N., R. 3 E.

Ap—0 to 6 inches; dark yellowish brown (10YR 4/4) silt loam, light yellowish brown (10YR 6/4) dry; pockets of yellowish brown (10YR 5/4) subsoil material; moderate medium granular structure; friable; many medium roots; medium acid; clear smooth boundary.

Bt1—6 to 14 inches; yellowish brown (10YR 5/6) channery silt loam; weak medium subangular blocky structure; friable; many medium roots; thin discontinuous brown (7.5YR 5/4) clay films on faces of peds; about 20 percent siltstone fragments; very strongly acid; clear wavy boundary.

Bt2—14 to 24 inches; strong brown (7.5YR 5/6) channery silty clay loam; moderate medium subangular blocky structure; friable; common fine and medium roots; thin continuous brown (7.5YR 5/4) clay films on faces of peds; about 25 percent siltstone fragments; very strongly acid; clear wavy boundary.

Bt3—24 to 31 inches; yellowish brown (10YR 5/6) channery silt loam; moderate medium subangular blocky structure; friable; common fine and medium roots; thin discontinuous brown (7.5YR 5/4) clay films on faces of peds; about 25 percent siltstone fragments as much as 3 inches long; very strongly acid; clear wavy boundary.

BC—31 to 36 inches; yellowish brown (10YR 5/4) very channery silt loam; moderate fine subangular blocky structure; friable; common fine and medium roots; thin discontinuous yellowish brown (10YR 5/4) clay films on faces of peds; about 45 percent siltstone fragments as much as 3 inches long; very strongly acid; clear wavy boundary.

Cr—36 inches; fractured siltstone interbedded with sandstone and shale.

The thickness of the solum ranges from 26 to 40 inches. It corresponds with the depth to bedrock.

The Ap horizon has chroma of 3 or 4. The Bt horizon has hue of 7.5YR or 10YR and chroma of 4 to 6. It is silt loam, silty clay loam, or the channery to extremely channery analogs of these textures.

Haymond Series

The Haymond series consists of deep, well drained, moderately permeable soils on flood plains. These soils formed in silty alluvial deposits. Slopes range from 0 to 2 percent.

Haymond soils are similar to Chagrin and Stonelick soils and are commonly adjacent to Beanblossom, Steff, and Stendal soils. Chagrin and Stonelick soils have more sand in the control section than the Haymond soils. In the control section of Beanblossom soils, the content of coarse fragments is more than 35 percent. These soils are at the upper end of drainageways. Steff soils have grayish mottles in the upper 20 inches. They are at the slightly lower elevations. Stendal soils are grayer below the surface soil than the Haymond soils. Also, they are at lower elevations, farther away from stream channels.

A typical pedon of Haymond silt loam, frequently flooded, in a cultivated field; 200 feet north and 50 feet west of the center of sec. 27, T. 9 N., R. 3 E.

Ap—0 to 8 inches; brown (10YR 5/3) silt loam, very pale brown (10YR 7/4) dry; moderate medium granular structure; friable; strongly acid; abrupt smooth boundary.

Bw1—8 to 12 inches; yellowish brown (10YR 5/4) silt loam; moderate fine subangular blocky structure; friable; thin discontinuous brown (10YR 5/3) organic coatings on faces of peds; medium acid; clear smooth boundary.

Bw2—12 to 30 inches; yellowish brown (10YR 5/4) silt loam; moderate medium subangular blocky structure; friable; strongly acid; clear wavy boundary.

BC—30 to 43 inches; yellowish brown (10YR 5/4) silt loam; few medium distinct pale brown (10YR 6/3) mottles; weak coarse subangular blocky structure; friable; strongly acid; clear wavy boundary.

C1—43 to 56 inches; yellowish brown (10YR 5/4) silt loam; few medium distinct pale brown (10YR 6/3) mottles; massive; friable; strongly acid; clear wavy boundary.

C2—56 to 60 inches; yellowish brown (10YR 5/4) loam; massive; friable; strongly acid.

The solum is 43 to 48 inches thick. Reaction is neutral to strongly acid throughout the profile.

The Ap horizon has value of 4 or 5 and chroma of 3 or 4. The Bw horizon has value of 4 to 6 and chroma of 3 or 4. The C horizon is fine sandy loam, loam, or silt loam.

Hickory Series

The Hickory series consists of deep, well drained, moderately permeable soils on uplands. These soils formed in a thin mantle of loess and in the underlying glacial till. Slopes range from 12 to 70 percent.

Hickory soils are similar to Bonnell and Chetwynd soils and are commonly adjacent to Cincinnati soils. Bonnell soils have more clay in the control section than the Hickory soils. Chetwynd soils formed in stratified outwash sediments. Cincinnati soils have a fragipan. They are on the upper parts of side slopes and on the wider ridgetops.

A typical pedon of Hickory silt loam, 20 to 70 percent slopes, in a wooded area; 950 feet south and 150 feet east of the center of sec. 6, T. 10 N., R. 2 E.

O—1 inch to 0; roots and partially decomposed leaves.

A—0 to 2 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; many fine and medium roots; very strongly acid; clear smooth boundary.

E—2 to 11 inches; yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure; friable; many medium and coarse roots; very strongly acid; clear wavy boundary.

Bt1—11 to 22 inches; strong brown (7.5YR 4/6) clay loam; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; common medium roots; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds; few till pebbles; very strongly acid; gradual wavy boundary.

Bt2—22 to 30 inches; strong brown (7.5YR 4/6) clay loam; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; common medium roots; thin continuous strong brown (7.5YR 4/6) clay films on faces of peds; about 7 percent gravel; very strongly acid; gradual wavy boundary.

Bt3—30 to 40 inches; strong brown (7.5YR 5/6) loam; weak medium prismatic structure parting to moderate medium subangular blocky; firm; common medium roots; thin continuous strong brown (7.5YR 4/6) clay films on faces of peds; about 7 percent gravel; very strongly acid; gradual wavy boundary.

Bt4—40 to 48 inches; strong brown (7.5YR 5/6) loam; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; thin continuous strong brown (7.5YR 4/6) clay films on faces of peds; common medium black (N 2/0) iron and manganese oxide stains; about 5 percent gravel; very strongly acid; gradual wavy boundary.

Bt5—48 to 58 inches; brown (7.5YR 5/4) loam; weak coarse subangular blocky structure; firm; few fine roots; thin discontinuous strong brown (7.5YR 4/6) clay films on faces of peds; many coarse dark brown (7.5YR 3/2) iron and manganese oxide stains; about 5 percent gravel; strongly acid; gradual wavy boundary.

C—58 to 70 inches; yellowish brown (10YR 5/4) loam; massive; firm; about 10 percent gravel; slight effervescence; moderately alkaline.

The solum ranges from 40 to 70 inches in thickness. The A horizon has value of 3 or 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. It is clay loam, loam, or silty clay loam.

Martinsville Series

The Martinsville series consists of deep, well drained, moderately permeable soils on terraces and outwash plains. These soils formed in loamy outwash sediments. Slopes range from 1 to 6 percent.

Martinsville soils are similar to Miami soils and are commonly adjacent to Rensselaer and Whitaker soils. Miami soils formed in glacial till. Rensselaer and Whitaker soils are in the lower areas and along drainageways. Rensselaer soils have a dark surface layer and a dominantly gray argillic horizon. Whitaker soils have grayish colors directly below the Ap horizon.

A typical pedon of Martinsville loam, 1 to 6 percent slopes, in an idle field; 250 feet north and 1,200 feet west of the southeast corner of sec. 6, T. 10 N., R. 5 E.

Ap1—0 to 2 inches; very dark grayish brown (10YR 3/2) loam, brown (10YR 5/3) dry; moderate medium granular structure; friable; many fine and medium roots; slightly acid; abrupt smooth boundary.

Ap2—2 to 7 inches; dark brown (10YR 4/3) loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; many fine and medium roots; slightly acid; abrupt smooth boundary.

Bt1—7 to 19 inches; yellowish brown (10YR 5/6) loam; moderate medium subangular blocky structure; friable; common fine roots; thin discontinuous dark brown (10YR 4/3) organic coatings on faces of peds; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; strongly acid; clear wavy boundary.

Bt2—19 to 26 inches; strong brown (7.5YR 5/6) clay loam; moderate medium subangular blocky structure; firm; few fine roots; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds; strongly acid; clear wavy boundary.

Bt3—26 to 36 inches; strong brown (7.5YR 5/6) sandy clay loam; moderate medium subangular blocky structure; firm; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds; strongly acid; clear wavy boundary.

Bt4—36 to 49 inches; yellowish brown (10YR 5/6) sandy loam; moderate medium subangular blocky structure; friable; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; strongly acid; clear wavy boundary.

BC—49 to 59 inches; yellowish brown (10YR 5/6) loamy sand; weak medium subangular blocky structure; friable; strongly acid; clear wavy boundary.

C—59 to 65 inches; yellowish brown (10YR 5/4) silt loam that has strata of loamy sand; common medium distinct grayish brown (10YR 5/2) mottles; massive; friable; common medium very dark gray (10YR 3/1) soft accumulations of iron and manganese oxide; slightly acid.

The Ap horizon has value of 3 to 5 and chroma of 2 or 3. It is silt loam or loam. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. The C horizon has value of 4 to 6 and chroma of 2 to 4.

Miami Series

The Miami series consists of deep, well drained soils on till plains. These soils formed in glacial till. Permeability is moderate in the solum and moderately slow in the substratum. Slopes range from 6 to 15 percent.

Miami soils are similar to Martinsville soils and are commonly adjacent to Crosby soils. Martinsville soils formed in stratified outwash sediments. Crosby soils have grayish colors directly below the Ap horizon. They are in the less sloping areas.

A typical pedon of Miami loam, 6 to 15 percent slopes, eroded, in an idle field; 2,200 feet south and 500 feet east of the northwest corner of sec. 2, T. 10 N., R. 4 E.

Ap—0 to 7 inches; dark brown (10YR 4/3) loam, pale brown (10YR 6/3) dry; pockets of yellowish brown (10YR 5/4) subsoil material; moderate medium granular structure; friable; many fine and medium roots; about 5 percent gravel; slightly acid; abrupt smooth boundary.

Bt1—7 to 12 inches; yellowish brown (10YR 5/4) loam; moderate medium subangular blocky structure; firm; common fine roots; thin continuous dark yellowish brown (10YR 4/4) clay films and thin discontinuous dark brown (10YR 4/3) organic coatings on faces of peds; about 2 percent gravel; neutral; clear wavy boundary.

Bt2—12 to 25 inches; yellowish brown (10YR 5/4) clay loam; weak medium prismatic structure parting to moderate medium subangular blocky; firm; common fine roots; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; about 2 percent gravel; neutral; gradual wavy boundary.

Bt3—25 to 37 inches; yellowish brown (10YR 5/6) clay loam; moderate medium subangular blocky structure; firm; few fine roots; thin discontinuous yellowish brown (10YR 5/4) clay films on faces of peds; about 5 percent gravel; neutral; gradual wavy boundary.

C—37 to 60 inches; light yellowish brown (10YR 6/4) loam; massive; firm; about 5 percent gravel; strong effervescence; moderately alkaline.

The solum is 26 to 38 inches thick. The Ap horizon has chroma of 3 or 4. It is medium acid or slightly acid. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is clay loam or loam. The content of coarse fragments in this horizon ranges from 1 to 10 percent. The C horizon has value of 5 or 6 and chroma of 3 or 4. The content of coarse fragments in this horizon is 1 to 5 percent.

Pekin Series

The Pekin series consists of deep, moderately well drained soils on stream terraces. These soils formed in silty and loamy alluvial deposits. They have a fragipan. Permeability is moderate above the fragipan and very slow in the fragipan. Slopes range from 2 to 12 percent.

Pekin soils are similar to Cincinnati, Rossmoyne, and Tilsit soils and are commonly adjacent to Bartle and Chetwynd soils. Cincinnati and Rossmoyne soils formed in loess and the underlying glacial drift. Tilsit soils formed in loess and the underlying siltstone, sandstone, and shale residuum. Bartle soils have grayish mottles directly below the Ap horizon. They are on the less sloping parts of the terraces. Chetwynd soils have no mottles. They are on the more sloping outwash terraces.

A typical pedon of Pekin silt loam, 2 to 6 percent slopes, in a cultivated field; 50 feet north and 1,200 feet west of the southeast corner of sec. 28, T. 10 N., R. 2 E.

Ap—0 to 9 inches; dark yellowish brown (10YR 4/4) silt loam, light yellowish brown (10YR 6/4) dry; moderate medium granular structure; friable; strongly acid; abrupt smooth boundary.

Bt1—9 to 15 inches; yellowish brown (10YR 5/4) silt loam; common fine faint light yellowish brown (10YR 6/4) mottles; moderate medium subangular blocky structure; friable; thin discontinuous yellowish brown (10YR 5/4) clay films on faces of peds; strongly acid; clear smooth boundary.

Bt2—15 to 22 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct light brownish gray (10YR 6/2) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; common very fine vesicular pores; thin continuous brown (10YR 5/3) clay films on faces of peds; thin discontinuous light gray (10YR 7/2) silt coatings on faces of peds; very strongly acid; clear wavy boundary.

Btx1—22 to 32 inches; yellowish brown (10YR 5/4) silt loam; many medium distinct light brownish gray (10YR 6/2) mottles; moderate very coarse prismatic structure parting to moderate very thick platy; very firm; brittle; common fine vesicular pores; thin discontinuous brown (7.5YR 5/4) and pale brown (10YR 6/3) clay films in pores and on faces of prisms; thin discontinuous light gray (10YR 7/2) silt coatings on vertical faces of peds and as fillings between prisms; few black (N 2/0) iron and manganese oxide stains; very strongly acid; clear wavy boundary.

Btx2—32 to 41 inches; light yellowish brown (10YR 6/4) silt loam; many coarse faint light brownish gray (10YR 6/2) and common medium prominent strong brown (7.5YR 5/6) mottles; strong very coarse prismatic structure parting to moderate very thick platy; very firm; brittle; common fine vesicular pores; thin discontinuous yellowish brown (10YR 5/4) and pale brown (10YR 6/3) clay films in pores and on faces of prisms; thin discontinuous light gray (10YR 7/2) silt coatings on vertical faces of peds and as fillings between prisms; few medium black (N 2/0) iron and manganese oxide stains; very strongly acid; clear wavy boundary.

B't—41 to 50 inches; light brownish gray (10YR 6/2) loam; common medium prominent strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; firm; common very fine vesicular pores; thin discontinuous light brownish gray (10YR 6/2) clay films on faces of peds; very strongly acid; clear wavy boundary.

C—50 to 60 inches; yellowish brown (10YR 5/6) sandy loam that has a 2-inch layer of gravelly sandy loam; few fine distinct pale brown (10YR 6/3) mottles; massive; friable; medium acid.

The solum is 48 to 60 inches thick. The depth to the fragipan is 20 to 30 inches.

The Ap horizon has value of 4 or 5 and chroma of 3 or 4. The Bt and Btx horizons have value of 5 or 6 and chroma of 4 to 6. The Btx horizon is silt loam or silty clay loam. The C horizon is dominantly sandy loam or silt loam.

Pekin silt loam, 6 to 12 percent slopes, eroded, has less clay in the control section than is definitive for the series. This difference, however, does not alter the usefulness or behavior of the soil.

Rensselaer Series

The Rensselaer series consists of deep, very poorly drained, moderately permeable soils on outwash terraces. These soils formed in stratified outwash sediments. Slopes range from 0 to 2 percent.

Rensselaer soils are commonly adjacent to Martinsville and Whitaker soils. Martinsville soils do not have a dark surface layer or grayish colors in the argillic horizon. They are in the more sloping areas on terraces and outwash plains. Whitaker soils do not have a dark surface layer or dominantly grayish colors in the upper part of the argillic horizon. They are in the slightly higher positions on the landscape.

A typical pedon of Rensselaer loam, in an idle area of the Rensselaer-Whitaker complex; 1,200 feet east and 100 feet south of the northwest corner of sec. 12, T. 10 N., R. 4 E.

Ap—0 to 8 inches; very dark gray (10YR 3/1) loam, dark grayish brown (10YR 4/2) dry; moderate medium and coarse granular structure; friable; many fine and medium roots; neutral; abrupt smooth boundary.

A—8 to 11 inches; very dark gray (10YR 3/1) clay loam, dark grayish brown (10YR 4/2) dry; moderate medium prismatic structure parting to moderate fine subangular blocky; firm; common fine roots; neutral; gradual smooth boundary.

Btg1—11 to 22 inches; dark gray (10YR 4/1) clay loam; few fine distinct yellowish brown (10YR 5/4) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; few fine and medium roots; thin continuous very dark gray (10YR 3/1) clay films on faces of peds; neutral; gradual wavy boundary.

Btg2—22 to 28 inches; gray (10YR 5/1) clay loam; many coarse distinct light olive brown (2.5Y 5/4) mottles; moderate medium subangular blocky structure; firm; few fine and medium roots; thin continuous gray (10YR 5/1) clay films on faces of peds; krotovinas, 2 to 3 inches in diameter, filled with dark gray (10YR 4/1) clay loam; neutral; gradual wavy boundary.

Btg3—28 to 42 inches; gray (10YR 5/1) clay loam; common medium distinct light olive brown (2.5Y 5/6) mottles; weak coarse subangular blocky structure; firm; thin discontinuous gray (10YR 5/1) clay films on faces of peds; krotovinas, 2 to 3 inches in diameter, filled with dark gray (10YR 4/1) clay loam; neutral; gradual wavy boundary.

Cg—42 to 60 inches; grayish brown (2.5Y 5/2) stratified loam, sandy loam, and loamy sand; common medium distinct yellowish brown (10YR 5/6) mottles; massive; about 5 percent gravel; friable; neutral.

The solum is 40 to 55 inches thick. The Ap horizon has chroma of 1 or 2. The Btg horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2. The C horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 or 2.

Rossmoyne Series

The Rossmoyne series consists of deep, moderately well drained soils on uplands. These soils formed in loess and the underlying silty drift. They have a fragipan. Permeability is moderate above the fragipan and slow in the fragipan. Slopes range from 2 to 6 percent.

Rossmoyne soils are similar to Cincinnati, Pekin, and Tilsit soils and are commonly adjacent to Avonburg soils. Cincinnati soils have a subsoil that is browner than that of the Rossmoyne soils. Pekin soils formed in silty and loamy alluvial material. Tilsit soils formed in loess and the underlying sandstone, siltstone, and shale residuum. Avonburg soils have a greater number of grayish mottles in the upper part of the subsoil than the Rossmoyne soils. They are on nearly level ridgetops.

A typical pedon of Rossmoyne silt loam, 2 to 6 percent slopes, eroded, in a cultivated field; 1,760 feet east and 1,080 feet south of the northwest corner of sec. 25, T. 10 N., R. 2 E.

Ap—0 to 9 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; pockets of yellowish brown (10YR 5/6) subsoil material; moderate medium granular structure; friable; neutral; abrupt smooth boundary.

Bt1—9 to 15 inches; yellowish brown (10YR 5/6) silt loam; moderate medium subangular blocky structure; friable; thin discontinuous yellowish brown (10YR 5/6) clay films on faces of peds; thin discontinuous pale brown (10YR 6/3) silt coatings on faces of peds; very strongly acid; clear smooth boundary.

Bt2—15 to 22 inches; yellowish brown (10YR 5/6) silt loam; few medium prominent light gray (10YR 7/2) mottles; moderate medium subangular blocky structure; friable; thin continuous yellowish brown (10YR 5/6) clay films on faces of peds; thin discontinuous pale brown (10YR 6/3) silt coatings on faces of peds; very strongly acid; clear wavy boundary.

Btx1—22 to 30 inches; yellowish brown (10YR 5/6) silt loam; common medium prominent light brownish gray (10YR 6/2) and faint yellowish brown (10YR 5/4) mottles; moderate very coarse prismatic structure parting to moderate very thick platy; very firm; brittle; thin continuous brown (10YR 5/3) clay films on faces of secondary peds; thin continuous very pale brown (10YR 7/3) silt coatings on vertical faces of peds and silty clay loam fillings between prisms; very strongly acid; clear wavy boundary.

2Btx2—30 to 56 inches; yellowish brown (10YR 5/4) silt loam; many coarse faint yellowish brown (10YR 5/6) and common medium distinct light brownish gray (10YR 6/2) mottles; moderate very coarse prismatic structure parting to moderate medium subangular blocky; very firm; brittle; thin continuous brown (10YR 5/3) clay films on faces of peds; thin continuous very pale brown (10YR 7/3) silt coatings on vertical faces of peds and silty clay loam fillings between prisms; few till pebbles; very strongly acid; gradual wavy boundary.

2Bt1—56 to 67 inches; yellowish brown (10YR 5/8) silt loam; many coarse prominent light brownish gray (10YR 6/2) and common medium prominent brown (10YR 5/3) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; thin continuous grayish brown (10YR 5/2) clay films on faces of peds; few till pebbles; strongly acid; gradual wavy boundary.

2Bt2—67 to 80 inches; brown (10YR 5/3) silt loam, many coarse faint light brownish gray (10YR 6/2) and common medium prominent yellowish brown (10YR 5/8) mottles; weak medium subangular blocky structure; friable; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds and as linings in channels; common medium black (N 2/0) accumulations of iron and manganese oxide; few till pebbles; strongly acid.

The solum is more than 80 inches thick. The depth to the fragipan is 20 to 30 inches.

The Ap horizon has value of 4 or 5. The Bt horizon is silt loam or silty clay loam. The 2Btx horizon has chroma of 4 to 6. It is silty clay loam, clay loam, or silt loam.

Steff Series

The Steff series consists of deep, moderately well drained, moderately permeable soils on flood plains. These soils formed in silty alluvial deposits. Slopes range from 0 to 2 percent.

Steff soils are similar to Wilbur soils and are commonly adjacent to Haymond and Stendal soils. Wilbur soils have less clay throughout than the Steff soils and are less acid. Haymond soils do not have grayish mottles in the upper part of the subsoil. They contain less clay and are less acid throughout than the Steff soils. Also, they are at slightly higher elevations or are adjacent to stream channels. Stendal soils are grayer directly below the surface soil than the Steff soils. Also, they are at slightly lower elevations, farther away from the stream channels.

A typical pedon of Steff silt loam, frequently flooded, in a cultivated field; 1,460 feet west and 25 feet north of the southeast corner of sec. 21, T. 8 N., R. 3 E.

Ap—0 to 10 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; neutral; abrupt smooth boundary.

Bw1—10 to 19 inches; yellowish brown (10YR 5/4) silt loam; few fine faint pale brown (10YR 6/3) mottles; weak medium subangular blocky structure; friable; thin discontinuous yellowish brown (10YR 5/4) silt coatings on faces of peds; slightly acid; clear smooth boundary.

Bw2—19 to 29 inches; pale brown (10YR 6/3) silt loam; common medium faint light brownish gray (10YR 6/2) and yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure; friable; thin patchy yellowish brown (10YR 5/4) silt coatings on faces of peds; strongly acid; clear smooth boundary.

C1—29 to 47 inches; light brownish gray (10YR 6/2) silt loam; many coarse distinct yellowish brown (10YR 5/6) mottles; massive; friable; strongly acid; gradual smooth boundary.

C2—47 to 60 inches; brown (10YR 5/3) silt loam; many coarse distinct light brownish gray (2.5Y 6/2) mottles; massive; friable; common medium dark brown (7.5YR 3/2) iron and manganese oxide stains and few fine strong brown (7.5YR 5/6) iron and manganese oxide accumulations; strongly acid.

The solum ranges from 24 to 50 inches in thickness. The Ap horizon has value of 4 to 6. The Bw horizon has value of 5 or 6 and chroma of 3 or 4. It is silt loam or silty clay loam. The C horizon has hue of 10YR or 2.5Y, value of 5 to 7, and chroma of 2 to 6.

Stendal Series

The Stendal series consists of deep, somewhat poorly drained, moderately permeable soils on flood plains. These soils formed in silty alluvial deposits. Slopes range from 0 to 2 percent.

Stendal soils are commonly adjacent to Beanblossom, Haymond, Steff, and Wilbur soils. Beanblossom soils do not have grayish mottles in the upper part of the underlying material. They have a higher content of coarse fragments than the Stendal soils. They are in the slightly higher positions on the landscape. Haymond soils do not have grayish mottles in the upper part of the subsoil and contain less clay throughout than the Stendal soils. They are on narrow bottom land adjacent to stream channels. Steff soils are browner directly below the surface soil than the Stendal soils. They are at the slightly higher elevations, generally adjacent to the stream channels. Wilbur soils are not so gray in the underlying material as the Stendal soils. They are in the slightly higher positions on the landscape.

A typical pedon of Stendal silt loam, frequently flooded, in a cultivated field; 2,150 feet west and 600 feet south of the center of sec. 14, T. 8 N., R. 3 E.

Ap—0 to 8 inches; brown (10YR 5/3) silt loam, very pale brown (10YR 7/3) dry; few fine faint light brownish gray (10YR 6/2) mottles; moderate medium granular structure; friable; slightly acid; abrupt smooth boundary.

A—8 to 13 inches; brown (10YR 5/3) silt loam, very pale brown (10YR 7/3) dry; common medium faint light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; friable; many fine pores; thin discontinuous pale brown (10YR 6/3) silt coatings on faces of pores; few medium strong brown (7.5YR 5/8) iron and manganese oxide stains; slightly acid; clear smooth boundary.

Cg1—13 to 40 inches; light gray (10YR 7/2) silt loam; many coarse prominent brown (7.5YR 5/4) mottles; weak coarse subangular blocky structure; friable; many fine pores; thin discontinuous pale brown (10YR 6/3) silt coatings on faces of pores; common medium strong brown (7.5YR 5/8) iron and manganese oxide stains; very strongly acid; gradual smooth boundary.

Cg2—40 to 60 inches; light gray (10YR 7/2) silt loam; many coarse distinct yellowish brown (10YR 5/6) mottles; massive; friable; many fine black (N 2/0) accumulations of iron and manganese oxide; strongly acid.

The control section generally is strongly acid or very strongly acid, but in places it is slightly acid in the upper part because of liming. The Ap horizon has value of 4 or 5 and chroma of 3 or 4.

Stonehead Series

The Stonehead series consists of deep, moderately well drained soils on uplands. These soils formed in loess and in the underlying material weathered from interbedded shale and siltstone. Permeability is moderate in the upper part of the solum and slow in the lower part. Slopes range from 6 to 20 percent.

Stonehead soils are similar to Wellston soils and are commonly adjacent to Gilpin, Tilsit, and Trevlac soils. Wellston soils have less clay in the lower part of the subsoil than the Stonehead soils. Gilpin soils have no mottles and are less than 40 inches deep over bedrock. They are on the slightly higher side slopes. Tilsit soils have a fragipan. They are on the less sloping ridgetops. In the control section of Trevlac soils, the content of coarse fragments is more than 35 percent. These soils are less than 40 inches deep over bedrock. They are on the lower parts of side slopes.

A typical pedon of Stonehead silt loam, 6 to 10 percent slopes, eroded, in a pasture; 75 feet west and 2,100 feet south of the northeast corner of sec. 31, T. 8 N., R. 4 E.

Ap—0 to 6 inches; dark yellowish brown (10YR 4/4) silt loam, light yellowish brown (10YR 6/4) dry; pockets of yellowish brown (10YR 5/6) subsoil material; moderate medium granular structure; friable; slightly acid; abrupt smooth boundary.

Bt1—6 to 14 inches; yellowish brown (10YR 5/6) silt loam; moderate fine subangular blocky structure; friable; thin discontinuous yellowish brown (10YR 5/4) clay films on faces of peds; very strongly acid; clear smooth boundary.

Bt2—14 to 26 inches; yellowish brown (10YR 5/6) silty clay loam; few fine faint pale brown (10YR 6/3) mottles; moderate medium subangular blocky structure; firm; thin discontinuous yellowish brown (10YR 5/4) clay films on faces of peds; very strongly acid; clear smooth boundary.

Bt3—26 to 35 inches; yellowish brown (10YR 5/6) silty clay loam; many medium distinct light brownish gray (10YR 6/2) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; thin continuous brown (7.5YR 5/4) clay films on faces of peds; very strongly acid; gradual smooth boundary.

2Bt4—35 to 44 inches; yellowish brown (10YR 5/6) silty clay; common medium distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; firm; thin discontinuous brown (7.5YR 5/4) clay films on faces of peds; about 5 percent siltstone fragments; very strongly acid; gradual smooth boundary.

2Bt5—44 to 54 inches; yellowish red (5YR 5/6) channery silty clay; common fine distinct light gray (2.5Y 7/2) mottles; moderate medium subangular blocky structure; very firm; thin discontinuous brown (7/5YR 5/4) clay films on faces of peds; about 15 percent shale and siltstone fragments; very strongly acid; clear smooth boundary.

2Bt6—54 to 63 inches; light olive brown (2.5Y 5/6) shaly silty clay loam; common fine faint light yellowish brown (2.5Y 6/4) and common fine distinct strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; very firm; thin patchy brown (7.5YR 5/4) clay films on faces of peds; about 20 percent siltstone and shale fragments; strongly acid; clear smooth boundary.

2BC—63 to 68 inches; yellowish brown (10YR 5/6) very shaly silt loam; common fine faint light yellowish brown (2.5Y 6/4) mottles; moderate fine subangular blocky structure; firm; about 50 percent siltstone and shale fragments; strongly acid; clear wavy boundary.

2Cr—68 inches; soft siltstone and shale bedrock.

The thickness of the solum ranges from 40 to 70 inches. It corresponds with the depth to bedrock.

The Ap horizon has value of 4 or 5 and chroma of 4 to 6. The Bt horizon also has chroma of 4 to 6. It is silty clay loam or silt loam. The 2Bt horizon has hue of 5YR, 7.5YR, 10YR, or 2.5Y, value of 5 or 6, and chroma of 4 to 6. It is silty clay loam, silty clay, or the channery, shaly, or very shaly analogs of these textures.

Stonelick Series

The Stonelick series consists of deep, well drained soils on flood plains. These soils formed in loamy alluvial deposits. Permeability is moderately rapid in the upper part of the profile and very rapid in the lower part of the substratum. Slopes range from 0 to 2 percent.

Stonelick soils are similar to Chagrin and Haymond soils. The similar soils are more acid than the Stonelick soils. Also, Chagrin soils have more clay in the control section, and Haymond soils have more silt in the control section.

A typical pedon of Stonelick loam, gravelly substratum, frequently flooded, in an idle field; 620 feet east and 2,300 feet south of the northwest corner of sec. 9, T. 10 N., R. 5 E.

Ap—0 to 7 inches; dark brown (10YR 3/3) loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; many fine and medium roots; neutral; abrupt smooth boundary.

C1—7 to 14 inches; dark brown (10YR 4/3) loam; weak fine subangular blocky structure; friable; common fine roots; thin continuous dark brown (10YR 3/3) organic coatings on faces of peds; slight effervescence; mildly alkaline; clear smooth boundary.

C2—14 to 46 inches; dark yellowish brown (10YR 4/4) loam that has thin strata of sandy loam; massive;

friable; few fine roots; strong effervescence; moderately alkaline; clear smooth boundary.
C3—46 to 60 inches; yellowish brown (10YR 5/4) very gravelly coarse sand; massive; loose; about 60 percent gravel; strong effervescence; moderately alkaline.

Free carbonates are within a depth of 10 inches. The depth to sand and gravel ranges from 40 to 60 inches.

The A horizon has value of 3 or 4 and chroma of 2 or 3. The C horizon has value of 4 or 5 and chroma of 3 or 4. It is loam or sandy loam in the upper part and the gravelly or very gravelly analogs of loamy sand or sand in the lower part.

Tilsit Series

The Tilsit series consists of deep, moderately well drained soils on the tops of ridges in the uplands. These soils formed in loess and in the underlying material weathered from interbedded siltstone, sandstone, and shale. They have a fragipan. Permeability is moderate above the fragipan and slow in the fragipan. Slopes range from 2 to 6 percent.

Tilsit soils are similar to Cincinnati, Pekin, and Rossmoyne soils and are commonly adjacent to Gilpin, Stonehead, Trevlac, and Wellston soils. Cincinnati and Rossmoyne soils formed in loess and the underlying glacial drift. Pekin soils formed in silty and loamy alluvial sediments. Gilpin, Stonehead, Trevlac, and Wellston soils do not have a fragipan. They are on side slopes.

A typical pedon of Tilsit silt loam, 2 to 6 percent slopes, in a wooded area; 2,800 feet north and 2,060 feet east of the southwest corner of sec. 5, T. 8 N., R. 3 E.

Oe—1 inch to 0; roots and partially decomposed leaves.
A—0 to 4 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; many fine and medium roots; medium acid; clear smooth boundary.
E—4 to 9 inches; brown (10YR 5/3) silt loam; weak fine subangular blocky structure; friable; common medium and coarse roots; very strongly acid; clear smooth boundary.
Bt1—9 to 20 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium subangular blocky structure; friable; common fine and medium roots; thin patchy dark brown (10YR 4/3) clay films on faces of peds; very strongly acid; clear smooth boundary.
Bt2—20 to 30 inches; yellowish brown (10YR 5/6) silty clay loam; common medium distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; firm; common medium roots; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; very strongly acid; gradual smooth boundary.
2Btx1—30 to 46 inches; yellowish brown (10YR 5/4) silt loam; common medium faint yellowish brown (10YR 5/6) and few fine distinct light brownish gray (10YR 6/2) mottles; weak very coarse prismatic structure parting to moderate thick platy; very firm; brittle; few fine roots; thin discontinuous pale brown (10YR 6/3) silt coatings on faces of peds; thin discontinuous brown (10YR 5/3) clay films on faces of peds; about 3 percent siltstone and shale fragments; very strongly acid; gradual smooth boundary.
2Btx2—46 to 52 inches; yellowish brown (10YR 5/4) silt loam; common medium faint pale brown (10YR 6/3) mottles; weak very coarse prismatic structure parting to moderate medium subangular blocky; very firm; thin discontinuous pale brown (10YR 6/3) silt coatings on faces of peds; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; about 5 percent shale and siltstone fragments; very strongly acid; gradual smooth boundary.
2Bt—52 to 64 inches; yellowish brown (10YR 5/6) channery silt loam; common medium distinct yellowish brown (10YR 5/4 and 5/8) mottles; moderate medium subangular blocky structure; firm; thin continuous dark brown (10YR 4/3) clay films on faces of peds; about 30 percent siltstone and shale fragments; very strongly acid; gradual smooth boundary.
2Cr—64 inches; interbedded siltstone and shale and thin layers of sandstone.

The solum ranges from 60 to 100 inches in thickness. The A horizon has value of 3 or 4 and chroma of 2 to 4. The Bt and 2Bx horizons are silt loam or silty clay loam. The Bt horizon has chroma of 4 to 6. The 2Bx horizon has hue of 7.5YR or 10YR and chroma of 2 to 8. The 2Bt horizon has hue of 7.5YR or 10YR and chroma of 4 to 6. It is silt loam, silty clay loam, or the channery analogs of these textures.

Trevlac Series

The Trevlac series consists of moderately deep, well drained, moderately permeable soils on uplands. These soils formed in material weathered from interbedded siltstone, sandstone, and shale. Slopes range from 6 to 70 percent.

Trevlac soils are similar to Berks and Gilpin soils and are commonly adjacent to Stonehead, Tilsit, and Wellston soils. Berks soils do not have an argillic horizon. In the control section of Gilpin, Stonehead, and Wellston soils, the content of coarse fragments is less than 35 percent. Stonehead and Wellston soils are more than 40 inches deep over bedrock. Stonehead soils have more clay in the lower part of the subsoil than the Trevlac soils. They are in the less sloping areas on ridgetops and the upper parts of side slopes. Wellston soils are in positions on the landscape similar to those of the Trevlac soils. Tilsit soils have a fragipan. They are on the less sloping parts of ridgetops.

A typical pedon of Trevlac silt loam, in a wooded area of Berks-Trevlac-Wellston complex, 20 to 70 percent slopes; 580 feet south and 75 feet east of the center of sec. 24, T. 8 N., R. 1 E.

Oe—1 inch to 0; roots and partially decomposed leaves.

A—0 to 2 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; many medium roots; neutral; clear smooth boundary.

E—2 to 6 inches; yellowish brown (10YR 5/4) silt loam; moderate medium granular structure; friable; many medium and coarse roots; strongly acid; clear wavy boundary.

BE—6 to 12 inches; yellowish brown (10YR 5/4) silt loam; weak fine subangular blocky structure; friable; many medium and coarse roots; very strongly acid; gradual wavy boundary.

Bt1—12 to 19 inches; yellowish brown (10YR 5/6) very channery silt loam; weak fine subangular blocky structure; friable; common medium roots; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds; about 40 percent siltstone fragments as much as 3 inches long; strongly acid; gradual wavy boundary.

Bt2—19 to 30 inches; yellowish brown (10YR 5/6) extremely channery silt loam; moderate fine subangular blocky structure; friable; common fine and medium roots; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds; about 65 percent siltstone fragments as much as 3 inches long; strongly acid; gradual wavy boundary.

Bt3—30 to 36 inches; yellowish brown (10YR 5/6) extremely channery silt loam; moderate fine subangular blocky structure; friable; common fine and medium roots; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds; about 70 percent siltstone fragments as much as 3 inches long; strongly acid; clear wavy boundary.

Cr—36 inches; fractured siltstone interbedded with sandstone and shale.

The thickness of the solum ranges from 20 to 40 inches. It corresponds with the depth to bedrock.

The A horizon has value of 3 or 4 and chroma of 2 or 3. The E horizon has value of 5 or 6 and chroma of 3 or 4. It is silt loam or channery silt loam. The BE and Bt horizons have chroma of 4 or 6. The Bt horizon is the very shaly, extremely shaly, very channery, or extremely channery analogs of silt loam or loam. Some pedons have a BC horizon. This horizon has hue of 2.5Y or 10YR, value of 5 or 6, and chroma of 4 to 6. It is very channery, extremely channery, or very flaggy silt loam.

Wellston Series

The Wellston series consists of deep, well drained, moderately permeable soils on uplands. These soils formed in loess and in the underlying material weathered from interbedded siltstone, sandstone, and shale. Slopes range from 6 to 70 percent.

Wellston soils are similar to Stonehead soils and are commonly adjacent to Berks, Gilpin, Tilsit, and Trevlac soils. Stonehead soils have more clay in the lower part of the subsoil than the Wellston soils. Berks and Trevlac soils are in positions on the landscape similar to those of the Wellston soils. Berks soils have less clay in the subsoil than the Wellston soils. The content of coarse fragments in their control section is more than 35 percent. Gilpin and Trevlac soils are less than 40 inches deep over bedrock. They are in the slightly lower areas. Tilsit soils have a fragipan and have grayish mottles in the upper part of the subsoil. They are on the less sloping ridgetops.

A typical pedon of Wellston silt loam, in a wooded area of Wellston-Berks-Trevlac complex, 6 to 20 percent slopes; 875 feet east and 75 feet north of the center of sec. 6, T. 8 N., R. 3 E.

Oe—1 inch to 0; roots and partially decomposed leaves.

A—0 to 3 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; many fine and medium roots; very strongly acid; clear smooth boundary.

E—3 to 7 inches; yellowish brown (10YR 5/4) silt loam; moderate medium granular structure; friable; many fine and medium roots; extremely acid; clear wavy boundary.

Bt1—7 to 19 inches; yellowish brown (10YR 5/6) silty clay loam; weak medium subangular blocky structure; firm; common fine and medium roots; thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; very strongly acid; clear smooth boundary.

Bt2—19 to 27 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium subangular blocky structure; firm; common fine and medium roots; thin continuous brown (7.5YR 4/4) clay films on faces of peds; very strongly acid; clear smooth boundary.

2Bt3—27 to 35 inches; yellowish brown (10YR 5/6) silty clay loam; moderate coarse prismatic structure parting to moderate medium angular blocky; firm; few fine roots; thin continuous brown (7.5YR 4/4) clay films on faces of peds; thin patchy pale brown (10YR 6/3) silt coatings on faces of peds; few small siltstone fragments; very strongly acid; gradual smooth boundary.

2Bt4—35 to 51 inches; yellowish brown (10YR 5/4) very channery silt loam; common medium prominent light brownish gray (2.5Y 6/2) mottles; moderate fine subangular blocky structure; friable; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; about 60 percent siltstone fragments as much as 3 inches long; very strongly acid; clear smooth boundary.

2Cr—51 inches; fractured siltstone interbedded with sandstone and shale.

The thickness of the solum ranges from 40 to 70 inches. It corresponds with the depth to bedrock.

The A horizon has value of 3 or 4 and chroma of 2 or 3. The E horizon has value of 5 or 6. Some pedons have a BE horizon. This horizon has hue of 10YR, value of 5, and chroma of 4 to 6. The Bt and 2Bt horizons have hue of 7.5YR or 10YR and chroma of 4 to 6. The Bt horizon is silty clay loam or silt loam. The 2Bt horizon is silt loam, silty clay loam, loam, or the channery, very channery, or extremely channery analogs of these textures.

Whitaker Series

The Whitaker series consists of deep, somewhat poorly drained, moderately permeable soils on outwash terraces. These soils formed in silty and loamy sediments. Slopes range from 0 to 2 percent.

Whitaker soils are similar to Crosby soils and are commonly adjacent to Martinsville and Rensselaer soils. Crosby soils formed in glacial till. Martinsville soils do not have grayish colors directly below the Ap horizon. They are in the more sloping areas on terraces and outwash plains. Rensselaer soils have a dark surface layer and have a dominantly gray argillic horizon. They are in the slightly lower areas.

A typical pedon of Whitaker silt loam, in an idle area of the Rensselaer-Whitaker complex; 240 feet west and 2,480 feet south of the northeast corner of sec. 3, T. 10 N., R. 4 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; many fine and medium roots; neutral; abrupt smooth boundary.

BE—8 to 12 inches; dark grayish brown (10YR 4/2) silt loam; common medium distinct brown (10YR 5/3) mottles; moderate medium subangular blocky structure; friable; many fine roots; slightly acid; clear smooth boundary.

2Bt1—12 to 18 inches; dark yellowish brown (10YR 4/4) clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; many fine roots; thin continuous dark brown (7.5YR 4/2) clay films on faces of peds; common medium black (N 2/0) iron and manganese oxide stains; about 2 percent gravel; slightly acid; clear smooth boundary.

2Bt2—18 to 28 inches; yellowish brown (10YR 5/6) silty clay loam; common medium distinct dark yellowish brown (10YR 4/4) mottles; moderate coarse prismatic structure parting to moderate medium angular blocky; firm; common fine roots; thin continuous dark brown (7.5YR 4/2) clay films on faces of peds; few medium black (N 2/0) iron and manganese oxide stains; about 2 percent gravel; neutral; clear smooth boundary.

2Bt3—28 to 41 inches; yellowish brown (10YR 5/6) clay loam; common medium distinct yellowish brown (10YR 5/4) mottles; weak coarse prismatic structure parting to moderate coarse subangular blocky; firm; few fine roots; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; about 5 percent gravel; neutral; gradual smooth boundary.

2C—41 to 60 inches; yellowish brown (10YR 5/4) stratified loam, sandy loam, and loamy sand; common medium distinct light brownish gray (10YR 6/2) mottles; massive; friable; about 2 percent gravel; slight effervescence; mildly alkaline.

The solum is 40 to 50 inches thick. The Ap horizon is silt loam or loam. It is slightly acid or neutral. The 2Bt horizon is clay loam, silty clay loam, or sandy clay loam. It ranges from medium acid in the upper part to neutral in the lower part.

Wilbur Series

The Wilbur series consists of deep, moderately well drained, moderately permeable soils on flood plains. These soils formed in silty alluvial deposits. Slopes range from 0 to 2 percent.

Wilbur soils are similar to Steff soils and are commonly adjacent to Stendal soils. Steff soils have more clay in the control section than the Wilbur soils and are more acid. Stendal soils are more acid than the Wilbur soils and have grayer underlying material. Also, they are at slightly lower elevations, farther away from stream channels.

A typical pedon of Wilbur silt loam, frequently flooded, in a cultivated field; 1,900 feet north and 150 feet east of the center of sec. 32, T. 10 N., R. 3 E.

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

C1—8 to 15 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium platy structure; friable; many fine roots; thin discontinuous dark brown (10YR 4/3) organic coatings on faces of peds; neutral; clear smooth boundary.

C2—15 to 34 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; friable; common fine roots; neutral; clear smooth boundary.

C3—34 to 43 inches; yellowish brown (10YR 5/4) silt loam; few medium distinct grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; friable; common fine roots; neutral; clear smooth boundary.

C4—43 to 60 inches; grayish brown (10YR 5/2) silt loam; few medium distinct yellowish brown (10YR 5/4) mottles; massive; friable; common medium dark brown (7.5YR 3/2) iron and manganese oxide stains; neutral.

The Ap horizon has value of 4 or 5 and chroma of 3 or 4. The C horizon has value of 4 to 6 and chroma of 2 to 6. It is dominantly silt loam, but in some pedons it has thin strata of loam or fine sandy loam.

Formation of the Soils

This section relates the major factors of soil formation to the soils in the survey area. It also describes the processes of soil formation.

Factors of Soil Formation

Soils form through the 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 accumulated and has 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 also 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 that has genetically related horizons. Some time is always required for the differentiation of 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. Many of the soils in the survey area formed in material weathered from sandstone, shale, and siltstone bedrock. This bedrock is Mississippian in age, or approximately 250 million years old. It is dominantly of the Borden Group.

Some soils in the survey area formed in Illinoian or Wisconsin glacial till, outwash, or alluvium. The parent materials that are of glacial origin were deposited by glaciers or by meltwater from the glaciers. Some of these materials were reworked and redeposited by the subsequent actions of water and wind. Glaciers covered part of the survey area about 20,000 to 45,000 years ago.

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. The small pebbles in glacial till have sharp corners, indicating that they have not been worn by water. The glacial till in the survey area is strongly acid to calcareous, friable or firm loam, clay loam, or gravelly sandy loam. Hickory soils are an example of soils that formed mainly in Illinoian glacial till. Crosby soils are an example of soils that formed mainly in Wisconsin glacial till. These soils typically are medium textured and have well developed structure.

Outwash was deposited by running water from melting glaciers. The size of the particles that make up outwash varies, depending on the velocity of the water that carried the material. When the water slowed down, the coarser particles were deposited. 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 similar-size particles, such as sandy loam, sand, gravel, and other coarse particles. Martinsville soils are an example of soils that formed in outwash.

Alluvial material was recently deposited by floodwater along present 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 Driftwood River, is coarser textured than that deposited along a slow, sluggish stream, such as Bean Blossom Creek. Stonelick and Haymond soils are examples of soils that formed in alluvium.

Plant and Animal Life

Plants are the principal organisms that have influenced the soils in the survey area. Bacteria, fungi, and earthworms, however, also have 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 kinds of native plants that grew on the soil. The remains of these plants accumulated on the surface, decayed, and eventually became humus. The roots of the plants provided channels for the downward movement of water through the soil and added organic matter as they decayed. Bacteria in the soil helped to break down the organic matter into plant nutrients.

The native vegetation in the survey area was mainly deciduous trees. Differences in natural soil drainage and minor variations in the kind of parent material affected the composition of the forest species. The well drained upland soils, such as Hickory, Trevlac, and Wellston soils, mainly supported sugar maple, beech, yellow-poplar, oak, and hickory. Berks soils supported chestnut oak. Pin oak, aspen, and sycamore grew mainly on wet soils. Soils that formed under forest vegetation generally have less organic matter than soils that formed under grasses.

Climate

Climate helps to determine the kind of plant and animal life on and in the soil and the amount of water available for the weathering of minerals and the translocation of soil material. Through its influence on soil temperature, climate determines the rate of chemical reactions that occur in the soil. These influences are important, but they affect large areas rather than a relatively small area, such as this survey area.

The climate in the survey area is cool and humid. It is presumably similar to the climate under which the soils formed. The soils in the survey area differ from those that formed under a dry, warm climate and from those that formed under a hot, moist climate. Although the climate is uniform throughout the survey area, its effect is modified locally by the cooling effect of hills and by runoff. 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 Survey Area."

Relief

Relief has markedly affected the soils in the survey area 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 ponded in the lower areas.

Natural soil drainage in the survey area ranges from well drained on narrow ridgetops to poorly drained in depressions. Through its effect on aeration of the soil, drainage determines the color of the soil. Water and air move freely through well drained soils but slowly through very poorly drained or poorly drained soils. In Berks and other well drained, well aerated soils, the iron compounds that give most soils their color are brightly colored and oxidized. The very poorly drained, poorly aerated Rensselaer soils are dull gray and mottled.

Time

Time, generally a long time, is required for the processes of soil formation to form distinct soil horizons. 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 survey area range from young to mature. The glacial deposits have been exposed to the soil-forming processes long enough for distinct horizons to form. Soils that formed in recent alluvium, however, have not been in place long enough for the development of distinct horizons. Haymond soils are an example.

Processes of Soil Formation

Several processes have been involved in the formation of the soils in the survey area. 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 survey area. The organic matter content of some soils is low, but that of others is high. Generally, the soils that have the most organic matter, such as Rensselaer soils, have a thick, dark surface soil.

Carbonates and bases have been leached from the upper horizons of nearly all the soils in the survey area. Leaching probably preceded the translocation of silicate clay minerals. Most of the carbonates and some of the bases have been leached from the A, E, 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 the water table is high and because water moves slowly through such soils.

Silicate clays accumulate in pores and on the faces of the structural units along which water moves. The leaching of bases and the translocation of silicate clays are among the most important processes of horizon differentiation. Tilsit soils are an example of soils in which translocated silicate clays 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 survey area. In these naturally wet soils, this process has significantly affected horizon differentiation. A gray color in the subsoil indicates the redistribution of iron oxide. The reduction is commonly accompanied by some transfer of the 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.

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Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation-exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

California bearing ratio (CBR). The load-supporting capacity of a soil as compared to that of a standard crushed limestone, expressed as a ratio. First standardized in California. A soil having a CBR of 16 supports 16 percent of the load that would be supported by standard crushed limestone, per unit area, with the same degree of distortion.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a channer.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Climax vegetation. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

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.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

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.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits (geology). Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

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.

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.

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.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent.* The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

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, glacial. Stratified sand and gravel produced by glaciers and carried, sorted, and deposited by glacial meltwater.

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.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains 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.

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

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.

Root zone. The part of the soil that can be penetrated by plant roots.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts 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.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the substratum. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

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.

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.

Stone line. A concentration of coarse fragments in a soil. Generally it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

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 soil blowing and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from about 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons. It includes all subdivisions of these horizons.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Till plain. An extensive flat to undulating area underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

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.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

(Recorded in the period 1951-74 at Columbus, 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	38.7	19.3	29.0	66	-7	12	3.08	1.63	4.34	5	3.7
February	42.9	23.0	33.0	69	-1	30	3.00	1.72	4.12	6	4.5
March	51.4	29.7	40.6	78	11	95	3.54	1.61	5.18	8	2.7
April	63.9	40.5	52.2	85	21	366	4.04	2.35	5.55	8	.0
May	73.8	49.7	61.8	92	31	676	4.96	2.67	6.97	9	.0
June	83.3	59.7	71.5	95	44	945	3.44	2.00	4.72	7	.0
July	86.4	63.4	74.9	96	50	1,082	4.93	2.05	7.36	7	.0
August	85.0	60.5	72.8	97	46	1,017	2.93	1.51	4.16	5	.0
September	79.8	52.9	66.3	97	36	789	2.62	.79	4.09	5	.0
October	70.2	42.0	56.2	90	25	502	1.68	.69	2.52	4	.0
November	53.8	31.9	42.8	80	10	131	2.98	1.51	4.26	6	1.6
December	41.7	23.5	32.6	69	-3	65	3.00	1.22	4.49	6	3.1
Yearly:											
Average	64.2	41.3	52.8	---	---	---	---	---	---	---	---
Extreme	---	---	---	99	-9	---	---	---	---	---	---
Total	---	---	---	---	---	5,710	40.20	35.13	44.25	76	15.6

* 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 (40 degrees F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

(Recorded in the period 1951-74 at Columbus, Indiana)

Probability	Temperature		
	24^{o} F or lower	28^{o} F or lower	32^{o} F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	Apr. 7	Apr. 17	May 4
2 years in 10 later than--	Apr. 3	Apr. 14	Apr. 29
5 years in 10 later than--	Mar. 26	Apr. 8	Apr. 19
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 26	Oct. 13	Oct. 5
2 years in 10 earlier than--	Oct. 30	Oct. 17	Oct. 10
5 years in 10 earlier than--	Nov. 7	Oct. 27	Oct. 19

TABLE 3.--GROWING SEASON

(Recorded in the period 1951-74 at Columbus, Indiana)

Probability	Daily minimum temperature during growing season		
	Higher than 24^{o} F	Higher than 28^{o} F	Higher than 32^{o} F
	Days	Days	Days
9 years in 10	209	186	163
8 years in 10	214	191	170
5 years in 10	225	201	182
2 years in 10	235	211	195
1 year in 10	241	216	201

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Brown County	Part of Bartholomew County	Total-- Area	Total-- Extent
		Acres	Acres	Acres	Pct
AvA	Avonburg silt loam, 0 to 2 percent slopes	175	50	225	0.1
Ba	Bartle silt loam, 0 to 3 percent slopes	640	1,150	1,790	0.8
Be	Beanblossom channery silt loam, occasionally flooded	12,800	550	13,350	5.8
BgF	Berks-Trevlac-Wellston complex, 20 to 70 percent slopes	96,000	3,800	99,800	43.8
BnD2	Bonnell loam, 12 to 20 percent slopes, eroded	1,000	1,750	2,750	1.2
BpD3	Bonnell clay loam, 12 to 20 percent slopes, gullied	50	250	300	0.1
Ca	Chagrin silt loam, occasionally flooded	0	1,150	1,150	0.5
CdD2	Chetwynd loam, 12 to 20 percent slopes, eroded	1,000	710	1,710	0.7
CdF	Chetwynd loam, 20 to 50 percent slopes	980	1,150	2,130	0.9
CnC2	Cincinnati silt loam, 6 to 12 percent slopes, eroded	5,900	1,350	7,250	3.2
CwB	Crosby silt loam, 1 to 5 percent slopes	0	1,750	1,750	0.8
Hc	Haymond silt loam, frequently flooded	4,800	0	4,800	2.1
HkD2	Hickory silt loam, 12 to 20 percent slopes, eroded	4,750	0	4,750	2.1
HkF	Hickory silt loam, 20 to 70 percent slopes	4,650	1,750	6,400	2.8
MaB	Martinsville loam, 1 to 6 percent slopes	0	475	475	0.2
MnC2	Miami loam, 6 to 15 percent slopes, eroded	30	880	910	0.4
PeB	Pekin silt loam, 2 to 6 percent slopes	1,500	710	2,210	1.0
PeC2	Pekin silt loam, 6 to 12 percent slopes, eroded	2,450	1,450	3,900	1.7
Re	Rensselaer-Whitaker complex	0	1,200	1,200	0.5
RoB2	Rossmoyne silt loam, 2 to 6 percent slopes, eroded	1,950	240	2,190	1.0
Sf	Steff silt loam, frequently flooded	2,300	1,100	3,400	1.5
St	Stendal silt loam, frequently flooded	2,700	970	3,670	1.6
Sv	Stendal silt loam, frequently flooded, very long duration	575	0	575	0.3
SwC2	Stonehead silt loam, 6 to 10 percent slopes, eroded	3,150	0	3,150	1.4
SwD3	Stonehead silt loam, 10 to 20 percent slopes, gullied	740	0	740	0.3
SxD2	Stonehead-Trevlac silt loams, 10 to 20 percent slopes, eroded	5,000	0	5,000	2.2
Sy	Stonelick loam, gravelly substratum, frequently flooded	0	1,100	1,100	0.5
TlB	Tilsit silt loam, 2 to 6 percent slopes	3,100	215	3,315	1.5
Ud	Udorthents, loamy	315	190	505	0.2
WaD	Wellston-Berks-Trevlac complex, 6 to 20 percent slopes	22,000	10	22,010	9.6
WeC2	Wellston-Gilpin silt loams, 6 to 20 percent slopes, eroded	19,000	1,600	20,600	9.0
Wt	Wilbur silt loam, frequently flooded	1,300	0	1,300	0.6
	Water areas more than 40 acres in size	3,072	0	3,072	1.3
	Water areas less than 40 acres in size	563	50	613	0.3
	Total	202,490	25,600	228,090	100.0

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
AvA	Avonburg silt loam, 0 to 2 percent slopes (where drained)
Ba	Bartle silt loam, 0 to 3 percent slopes (where drained)
Ca	Chagrin silt loam, occasionally flooded
CwB	Crosby silt loam, 1 to 5 percent slopes (where drained)
Hc	Haymond silt loam, frequently flooded (where protected from flooding or not frequently flooded during the growing season)
MaB	Martinsville loam, 1 to 6 percent slopes
PeB	Pekin silt loam, 2 to 6 percent slopes
Re	Rensselaer-Whitaker complex (where drained)
RoB2	Rossmoyne silt loam, 2 to 6 percent slopes, eroded
Sf	Steff silt loam, frequently flooded (where protected from flooding or not frequently flooded during the growing season)
St	Stendal silt loam, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
Sy	Stonelick loam, gravelly substratum, frequently flooded (where protected from flooding or not frequently flooded during the growing season)
TlB	Tilsit silt loam, 2 to 6 percent slopes
Wt	Wilbur silt loam, frequently flooded (where protected from flooding or not frequently flooded during the growing season)

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*
AvA------------------------ Avonburg	IIw	110	38	50	3.6	7.2
Ba------------------------- Bartle	IIw	110	38	50	3.6	7.2
Be------------------------- Beanblossom	IIIw	80	28	32	2.6	5.2
BgF------------------------ Berks-Trevlac-Wellston	VIIe	---	---	---	---	---
BnD2----------------------- Bonnell	IVe	80	---	28	2.7	5.4
BpD3----------------------- Bonnell	VIe	---	---	---	2.5	5.0
Ca------------------------- Chagrin	IIw	125	40	45	4.5	9.0
CdD2----------------------- Chetwynd	IVe	80	28	36	2.6	5.2
CdF------------------------ Chetwynd	VIIe	---	---	---	---	3.2
CnC2----------------------- Cincinnati	IIIe	100	30	40	3.3	6.6
CwB------------------------ Crosby	IIe	105	37	47	3.4	6.8
Hc------------------------- Haymond	IIw	110	39	42	3.7	8.0
HkD2----------------------- Hickory	IVe	67	---	---	2.5	5.0
HkF------------------------ Hickory	VIIe	---	---	---	---	---
MaB------------------------ Martinsville	IIe	120	42	48	4.0	8.0
MnC2----------------------- Miami	IIIe	95	33	43	3.1	6.2
PeB------------------------ Pekin	IIe	105	37	47	3.4	6.8
PeC2----------------------- Pekin	IIIe	85	30	38	2.8	5.6
Re------------------------- Rensselaer-Whitaker	IIw	144	51	58	4.8	9.6

See footnote 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*
RoB2---------------------- Rossmoyne	IIe	100	30	35	4.0	8.0
Sf------------------------ Steff	IIw	110	38	---	4.5	9.0
St------------------------ Stendal	IIw	110	38	---	3.7	7.4
Sv------------------------ Stendal	Vw	---	---	---	---	---
SwC2---------------------- Stonehead	IIIe	95	33	43	3.1	6.2
SwD3---------------------- Stonehead	VIe	---	---	---	2.4	4.8
SxD2---------------------- Stonehead-Trevlac	IVe	76	27	34	2.5	5.0
Sy------------------------ Stonelick	IIIw	80	28	---	2.6	5.2
TlB----------------------- Tilsit	IIe	105	35	40	3.4	6.8
Ud------------------------ Udorthents	VIIIs	---	---	---	---	---
WaD----------------------- Wellston-Berks-Trevlac	IVe	82	28	33	2.9	5.8
WeC2---------------------- Wellston-Gilpin	IVe	94	33	38	3.6	7.2
Wt------------------------ Wilbur	IIw	125	44	50	4.1	8.2

* 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.

TABLE 7.--CAPABILITY CLASSES AND SUBCLASSES

(Water areas are excluded. Dashes indicate no acreage)

Class	Total acreage	Major management concerns (Subclass)			
		Erosion (e)	Wetness (w)	Soil problem (s)	Climate (c)
		Acres	Acres	Acres	Acres
I:					
Brown County	---	---	---	---	---
Part of Bartholomew County	---	---	---	---	---
II:					
Brown County	18,465	6,550	11,915	---	---
Part of Bartholomew County	9,010	3,390	5,620	---	---
III:					
Brown County	24,330	11,530	12,800	---	---
Part of Bartholomew County	5,330	3,680	1,650	---	---
IV:					
Brown County	52,750	52,750	---	---	---
Part of Bartholomew County	4,070	4,070	---	---	---
V:					
Brown County	575	---	575	---	---
Part of Bartholomew County	---	---	---	---	---
VI:					
Brown County	790	790	---	---	---
Part of Bartholomew County	250	250	---	---	---
VII:					
Brown County	101,630	101,630	---	---	---
Part of Bartholomew County	6,700	6,700	---	---	---
VIII:					
Brown County	315	---	---	315	---
Part of Bartholomew County	190	---	---	190	---

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: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Volume*	Trees to plant
AvA------------- Avonburg	4D	Slight	Slight	Moderate	Moderate	White oak----------- Northern red oak---- Pin oak------------- Yellow-poplar------- Sweetgum------------	70 75 85 85 80	52 57 67 81 79	Eastern white pine, baldcypress, white ash, red maple, yellow-poplar, American sycamore.
Ba-------------- Bartle	4A	Slight	Slight	Slight	Slight	White oak----------- Pin oak------------- Yellow-poplar------- Sweetgum------------	75 85 85 80	57 67 81 79	Eastern white pine, baldcypress, white ash, red maple, yellow-poplar, American sycamore.
Be-------------- Beanblossom	7F	Slight	Moderate	Slight	Slight	Yellow-poplar------- American sycamore--- Northern red oak---- Black cherry--------	95 --- --- ---	98 --- --- ---	
BgF**:									
Berks-----------	4R	Moderate	Severe	Moderate	Slight	Northern red oak---- Black oak----------- Virginia pine-------	70 70 70	52 52 109	Virginia pine, eastern white pine, Japanese larch, red pine.
Trevlac---------	4R	Severe	Severe	Slight	Slight	Northern red oak---- Yellow-poplar------- Black oak-----------	70 --- ---	52 --- ---	Eastern white pine, yellow-poplar, Virginia pine, red pine.
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 --- --- --- --- ---	53 90 109 --- --- --- --- ---	Eastern white pine, black walnut, yellow-poplar, white ash, white oak, northern red oak, red pine, green ash.
BnD2------------ Bonnell	4R	Moderate	Severe	Slight	Slight	Northern red oak---- Yellow-poplar------- Shortleaf pine------ Virginia pine-------	76 90 80 80	58 90 130 122	Yellow-poplar, eastern white pine, shortleaf pine, Virginia pine, loblolly pine.

See footnotes 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	Volume*	
BpD3------------ Bonnell	3R	Moderate	Severe	Moderate	Slight	Northern red oak---- Shortleaf pine------ Virginia pine-------	66 70 70	48 110 109	Virginia pine, shortleaf pine, loblolly pine.
Ca-------------- Chagrin	5A	Slight	Slight	Slight	Slight	Northern red oak---- Yellow-poplar------- Sugar maple--------- White oak----------- Black cherry-------- White ash----------- Black walnut--------	86 96 86 --- --- --- ---	68 100 53 --- --- --- ---	Eastern white pine, black walnut, yellow-poplar, white ash, red pine, northern red oak, white oak.
CdD2------------ Chetwynd	7A	Slight	Slight	Slight	Slight	Yellow-poplar------- Northern red oak----	99 88	105 70	Eastern white pine, black walnut, yellow-poplar, red pine.
CdF------------- Chetwynd	7R	Severe	Severe	Slight	Slight	Yellow-poplar------- Northern red oak----	99 88	105 70	Eastern white pine, black walnut, yellow-poplar, red pine.
CnC2------------ Cincinnati	4A	Slight	Slight	Slight	Slight	Northern red oak---- White oak----------- Black walnut-------- Black cherry-------- Sugar maple--------- White ash----------- Yellow-poplar-------	80 --- --- --- --- --- ---	62 --- --- --- --- --- ---	Eastern white pine, black walnut, yellow-poplar, white ash, red pine, northern red oak, white oak.
CwB------------- Crosby	4A	Slight	Slight	Slight	Slight	White oak----------- Pin oak------------- Yellow-poplar------- Northern red oak----	75 85 85 75	57 67 81 57	Eastern white pine, northern red oak, white ash, red maple, yellow-poplar, American sycamore.
Hc-------------- Haymond	8A	Slight	Slight	Slight	Slight	Yellow-poplar------- White oak----------- Black walnut--------	100 90 70	107 72 ---	Eastern white pine, black walnut, yellow-poplar.
HkD2------------ Hickory	5R	Moderate	Moderate	Slight	Slight	White oak----------- Northern red oak---- Black oak----------- Green ash----------- Bitternut hickory--- Yellow-poplar-------	85 85 --- --- --- 95	67 67 --- --- --- 98	Eastern white pine, red pine, yellow-poplar, sugar maple, white oak, black walnut.

See footnotes 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	Volume*	Trees to plant
HkF------------- Hickory	5R	Severe	Severe	Slight	Slight	White oak-----------	85	67	Eastern white pine, red pine, yellow-poplar, sugar maple, white oak, black walnut.
						Northern red oak----	85	67	
						Black oak-----------	---	---	
						Green ash-----------	---	---	
						Bitternut hickory---	---	---	
						Yellow-poplar-------	95	98	
MaB------------- Martinsville	4A	Slight	Slight	Slight	Slight	White oak-----------	80	62	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
						Yellow-poplar-------	98	104	
						Sweetgum------------	76	70	
MnC2------------ Miami	5A	Slight	Slight	Slight	Slight	White oak-----------	90	72	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
						Yellow-poplar-------	98	104	
						Sweetgum------------	76	70	
PeB, PeC2------- Pekin	4A	Slight	Slight	Slight	Slight	White oak-----------	70	52	Eastern white pine, shortleaf pine, red pine, yellow-poplar, white ash.
						Yellow-poplar-------	85	81	
						Virginia pine-------	75	115	
						Sugar maple---------	75	47	
Re**:									
Rensselaer-----	5W	Slight	Severe	Severe	Severe	Pin oak-------------	86	68	Eastern white pine, baldcypress, sweetgum, red maple, white ash.
						White oak-----------	75	57	
						Sweetgum------------	90	106	
						Northern red oak----	76	58	
Whitaker-------	4A	Slight	Slight	Slight	Slight	White oak-----------	70	52	Eastern white pine, baldcypress, white ash, red maple, yellow-poplar, American sycamore.
						Pin oak-------------	85	67	
						Yellow-poplar-------	85	81	
						Sweetgum------------	80	79	
						Northern red oak----	75	57	
RoB2------------ Rossmoyne	3D	Slight	Slight	Moderate	Moderate	White oak-----------	61	44	White ash, Virginia pine, yellow-poplar, eastern white pine, black oak.
						White ash-----------	---	---	
						Northern red oak----	80	62	
						Sugar maple---------	---	---	
						Slippery elm--------	---	---	
						American beech------	---	---	
						American sycamore---	---	---	

See footnotes 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	Volume*	
Sf: Steff	8A	Slight	Slight	Slight	Slight	Yellow-poplar River birch Silver maple American sycamore Black oak White oak Sweetgum White ash Red maple Blackgum	107 --- --- --- 88 --- 100 --- --- ---	119 --- --- --- 70 --- 138 --- --- ---	Yellow-poplar, eastern white pine, sweetgum, black walnut, white oak, white ash, northern red oak, shortleaf pine.
St: Stendal	5W	Slight	Moderate	Slight	Slight	Pin oak Sweetgum Yellow-poplar Virginia pine	90 85 90 90	72 93 90 135	Eastern white pine, baldcypress, American sycamore, red maple, white ash.
Sv: Stendal	3W	Slight	Severe	Severe	Severe	River birch Willow Boxelder	60 --- ---	38 --- ---	
SwC2: Stonehead	5A	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar Black oak	90 --- ---	72 --- ---	Eastern white pine, yellow-poplar, black walnut, Virginia pine. red pine.
SwD3: Stonehead	5R	Moderate	Moderate	Slight	Slight	Northern red oak Yellow-poplar Black oak	90 --- ---	72 --- ---	Eastern white pine, yellow-poplar, black walnut, Virginia pine, red pine.
SxD2**:									
Stonehead	5R	Moderate	Moderate	Slight	Slight	Northern red oak Yellow-poplar Black oak	90 --- ---	72 --- ---	Eastern white pine, yellow-poplar, black walnut, Virginia pine, red pine.
Trevlac	4R	Moderate	Moderate	Slight	Slight	Northern red oak Yellow-poplar Black oak	70 --- ---	52 --- ---	Eastern white pine, yellow-poplar, Virginia pine, red pine.
Sy: Stonelick	7A	Slight	Slight	Slight	Slight	Yellow-poplar Eastern cottonwood American sycamore Sweetgum Green ash	95 --- --- --- ---	98 --- --- --- ---	Eastern cottonwood, yellow-poplar, American sycamore, green ash, black walnut, eastern white pine.

See footnotes 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	Volume*	Trees to plant
TlB------------- Tilsit	8A	Slight	Slight	Slight	Slight	Shortleaf pine------ White oak----------- Yellow-poplar------- Black oak----------- Virginia pine------- Scarlet oak--------- Hickory------------- Red maple----------- Pitch pine---------- Southern red oak----	72 68 90 74 73 74 --- --- 67 65	114 50 90 56 113 56 --- --- --- 48	Eastern white pine, shortleaf pine, white oak, yellow-poplar.
WaD**: 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 --- --- --- --- ---	53 90 109 --- --- --- --- ---	Eastern white pine, black walnut, yellow-poplar, white ash, white oak, northern red oak, red pine, green ash.
Berks-----------	4F	Slight	Slight	Moderate	Slight	Northern red oak---- Black oak----------- Virginia pine-------	70 70 70	52 52 109	Virginia pine, eastern white pine, Japanese larch, red pine.
Trevlac---------	4A	Slight	Slight	Slight	Slight	Northern red oak---- Yellow-poplar------- Black oak-----------	70 --- ---	52 --- ---	Eastern white pine, yellow-poplar, Virginia pine, red pine.
WeC2**: 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 --- --- --- --- ---	53 90 109 --- --- --- --- ---	Eastern white pine, black walnut, yellow-poplar, white ash, white oak, northern red oak, red pine, green ash.
Gilpin----------	4A	Slight	Slight	Slight	Slight	Northern red oak---- Yellow-poplar-------	80 95	62 98	Japanese larch, Virginia pine, eastern white pine, black cherry, yellow-poplar.
Wt-------------- Wilbur	8A	Slight	Slight	Slight	Slight	Yellow-poplar-------	100	107	Eastern white pine, black walnut, yellow-poplar.

* Volume is the yield in cubic feet per acre per year calculated at the age of culmination of mean annual increment for fully stocked natural stands.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--FORESTRY EQUIPMENT USE

(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	Limitations for-- Haul roads	Log landings	Skid trails and logging areas	Site preparation and planting
AvA: Avonburg	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
Ba: Bartle	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.
Be: Beanblossom	Moderate: flooding.	Moderate: flooding.	Slight	Slight.
BgF*:				
Berks	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Trevlac	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Wellston	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
BnD2: Bonnell	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
BpD3: Bonnell	Moderate: too clayey, slope.	Severe: too clayey, slope.	Slight	Moderate: slope.
Ca: Chagrin	Moderate: flooding.	Moderate: flooding.	Slight	Slight.
CdD2: Chetwynd	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.
CdF: Chetwynd	Severe: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.
CnC2: Cincinnati	Slight	Moderate: slope.	Slight	Slight.
CwB: Crosby	Moderate: wetness.	Moderate: wetness.	Moderate: wetness.	Severe: wetness.
Hc: Haymond	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Slight.
HkD2: Hickory	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.
HkF: Hickory	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
MaB: Martinsville	Slight	Slight	Slight	Slight.
MnC2: Miami	Slight	Moderate: slope.	Slight	Slight.

See footnote at end of table.

TABLE 9.--FORESTRY EQUIPMENT USE--Continued

Soil name and map symbol	Limitations for-- Haul roads	Log landings	Skid trails and logging areas	Site preparation and planting
PeB: Pekin	Slight	Slight	Slight	Slight.
PeC2: Pekin	Slight	Moderate: slope.	Slight	Slight.
Re*:				
Rensselaer	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Whitaker	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
RoB2: Rossmoyne	Slight	Slight	Slight	Slight.
Sf: Steff	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Moderate: flooding.
St: Stendal	Severe: flooding.	Severe: flooding.	Severe: wetness, flooding.	Severe: wetness, flooding.
Sv: Stendal	Severe: flooding.	Severe: flooding.	Severe: wetness.	Severe: wetness.
SwC2: Stonehead	Slight	Moderate: slope.	Slight	Slight.
SwD3: Stonehead	Moderate: slope.	Moderate: slope.	Slight	Moderate: slope.
SxD2*:				
Stonehead	Moderate: slope.	Moderate: slope.	Slight	Moderate: slope.
Trevlac	Moderate: slope.	Moderate: slope.	Slight	Moderate: slope.
Sy: Stonelick	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Moderate: flooding.
TlB: Tilsit	Slight	Slight	Slight	Slight.
WaD*:				
Wellston	Slight	Moderate: slope.	Slight	Slight.
Berks	Moderate: depth to rock.	Moderate: slope.	Slight	Slight.
Trevlac	Moderate: depth to rock.	Moderate: slope.	Slight	Slight.

See footnote at end of table.

TABLE 9.--FORESTRY EQUIPMENT USE--Continued

Soil name and map symbol	Limitations for-- Haul roads	Log landings	Skid trails and logging areas	Site preparation and planting
WeC2*:				
Wellston	Slight	Moderate: slope.	Slight	Slight.
Gilpin	Moderate: depth to rock.	Moderate: slope.	Slight	Slight.
Wt Wilbur	Severe: flooding.	Severe: flooding.	Slight	Slight.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--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
AvA: Avonburg	---	Arrowwood, eastern redcedar, Washington hawthorn, Amur honeysuckle, American cranberrybush, Amur privet, Tatarian honeysuckle.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
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.	---
Be: Beanblossom	---	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.
BgF*:					
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.	---	---
Trevlac	Siberian peashrub	Eastern redcedar, radiant crabapple, Washington hawthorn, autumn-olive, Amur honeysuckle, lilac, Tatarian honeysuckle.	Eastern white pine, Austrian pine, red pine, jack pine.	---	---
Wellston	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, northern white-cedar, blue spruce, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.

See footnote at end of table.

TABLE 10.--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
BnD2, BpD3: Bonnell	---	Eastern redcedar, Washington hawthorn, Amur honeysuckle, Amur privet, American cranberrybush, arrowwood, Tatarian honeysuckle.	Austrian pine, green ash, osageorange.	Pin oak, eastern white pine.	---
Ca: Chagrin	---	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.
CdD2, CdF: Chetwynd	---	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.
CnC2: Cincinnati	---	Eastern redcedar, Washington hawthorn, Tatarian honeysuckle, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Green ash, Austrian pine, osageorange.	Pin oak, eastern white pine.	---
CwB: Crosby	---	Arrowwood, eastern redcedar, Washington hawthorn, Amur honeysuckle, American cranberrybush, Amur privet, Tatarian honeysuckle.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
Hc: 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.
HkD2, HkF: Hickory	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	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 10.--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
MaB 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.
MnC2 Miami	---	Amur honeysuckle, Amur privet, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
PeB, PeC2 Pekin	---	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, Amur honeysuckle, Tatarian honeysuckle, American cranberrybush.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
Re*:					
Rensselaer	---	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.
Whitaker	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, Austrian pine, blue spruce, Washington hawthorn, northern white-cedar.	Norway spruce	Eastern white pine, pin oak.
RoB2 Rossmoyne	---	Washington hawthorn, Amur honeysuckle, Amur privet, Tatarian honeysuckle, eastern redcedar, arrowwood, American cranberrybush.	Austrian pine, osageorange, green ash.	Pin oak, eastern white pine.	---
Sf Steff	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, blue spruce, northern white-cedar, white fir, Austrian pine.	Norway spruce	Pin oak, eastern white pine.

See footnote at end of table.

TABLE 10.--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
St, Sv: Stendal	---	Amur honeysuckle, silky dogwood, Amur privet, American cranberrybush.	Northern white-cedar, Austrian pine, white fir, blue spruce, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
SwC2, SwD3: Stonehead	---	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.
SxD2*:					
Stonehead	---	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.
Trevlac	Siberian peashrub	Eastern redcedar, radiant crabapple, Washington hawthorn, autumn-olive, Amur honeysuckle, lilac, Tatarian honeysuckle.	Eastern white pine, Austrian pine, red pine, jack pine.	---	---
Sy: Stonelick	---	Tatarian honeysuckle, Siberian peashrub.	Green ash, eastern redcedar, osageorange, northern white-cedar, nannyberry viburnum, white spruce, Washington hawthorn.	Black willow	---
TlB: Tilsit	---	American cranberrybush, Amur honeysuckle, Tatarian honeysuckle, Amur privet, arrowwood, Washington hawthorn, eastern redcedar.	Hackberry, osageorange, Austrian pine.	Pin oak, eastern white pine.	---
Ud. Udorthents					
WaD*:					
Wellston	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, northern white-cedar, blue spruce, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.

See footnote at end of table.

TABLE 10.--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
WaD*:					
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.	---	---
Trevlac	Siberian peashrub	Eastern redcedar, radiant crabapple, Washington hawthorn, autumn-olive, Amur honeysuckle, lilac, Tatarian honeysuckle.	Eastern white pine, Austrian pine, red pine, jack pine.	---	---
WeC2*:					
Wellston	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, northern white-cedar, blue spruce, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
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.	---	---
Wt 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.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--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
AvA------------------- Avonburg	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
Ba-------------------- Bartle	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
Be-------------------- Beanblossom	Severe: flooding.	Moderate: small stones.	Severe: small stones.	Slight----------	Severe: droughty.
BgF*:					
Berks----------------	Severe: slope, small stones.	Severe: small stones, slope.	Severe: small stones, slope.	Severe: slope.	Severe: slope, small stones.
Trevlac--------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Wellston-------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
BnD2, BpD3------------ Bonnell	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Ca-------------------- Chagrin	Severe: flooding.	Slight----------	Moderate: flooding.	Slight----------	Moderate: flooding.
CdD2------------------ Chetwynd	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
CdF------------------- Chetwynd	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
CnC2------------------ Cincinnati	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
CwB------------------- Crosby	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Hc-------------------- Haymond	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
HkD2------------------ Hickory	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
HkF------------------- Hickory	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
MaB------------------- Martinsville	Slight----------	Slight----------	Moderate: slope, small stones.	Slight----------	Slight.

See footnote at end of table.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
MnC2: Miami	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
PeB: Pekin	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Slight	Slight.
PeC2: Pekin	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Moderate: slope.
Re*:					
Rensselaer	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Whitaker	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
RoB2: Rossmoyne	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
Sf: Steff	Severe: flooding.	Moderate: flooding, wetness.	Severe: flooding.	Severe: erodes easily.	Severe: flooding.
St, Sv: Stendal	Severe: flooding, wetness.	Moderate: flooding, wetness.	Severe: wetness, flooding.	Moderate: flooding, wetness.	Severe: flooding.
SwC2: Stonehead	Moderate: slope, wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
SwD3: Stonehead	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
SxD2*:					
Stonehead	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Trevlac	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Sy: Stonelick	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
TlB: Tilsit	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
Ud. Udorthents					
WaD*:					
Wellston	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.

See footnote at end of table.

TABLE 11.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
WaD*:					
Berks	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Slight	Severe: small stones.
Trevlac	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: droughty, slope, depth to rock.
WeC2*:					
Wellston	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Gilpin	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope, thin layer.
Wt Wilbur	Severe: flooding.	Moderate: flooding, wetness.	Severe: flooding.	Moderate: flooding, wetness.	Severe: flooding.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--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 herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
AvA-----------------Avonburg	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Ba-----------------Bartle	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Be-----------------Beanblossom	Fair	Fair	Good	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
BgF*:										
Berks-------------	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Trevlac-----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Fair	Fair	Very poor.
Wellston----------	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
BnD2, BpD3---------Bonnell	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Ca-----------------Chagrin	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
CdD2---------------Chetwynd	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
CdF----------------Chetwynd	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
CnC2---------------Cincinnati	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
CwB----------------Crosby	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Hc-----------------Haymond	Poor	Fair	Fair	Good	Good	Poor	Poor	Fair	Good	Poor.
HkD2---------------Hickory	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
HkF----------------Hickory	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
MaB----------------Martinsville	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
MnC2---------------Miami	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
PeB----------------Pekin	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 12.--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
PeC2---------------- Pekin	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Re*:										
Rensselaer----------	Fair	Poor	Poor	Fair	Fair	Good	Good	Fair	Fair	Good.
Whitaker------------	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
RoB2---------------- Rossmoyne	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Sf------------------ Steff	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
St------------------ Stendal	Fair	Fair	Fair	Good	Good	Good	Fair	Fair	Good	Fair.
Sv------------------ Stendal	Poor	Poor	Fair	Poor	Poor	Good	Fair	Poor	Poor	Good.
SwC2---------------- Stonehead	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
SwD3---------------- Stonehead	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
SxD2*:										
Stonehead-----------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Trevlac-------------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Sy------------------ Stonelick	Poor	Fair	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
TlB----------------- Tilsit	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Ud. Udorthents										
WaD*:										
Wellston------------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Berks---------------	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Fair	Poor	Very poor.
Trevlac-------------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
WeC2*:										
Wellston------------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Gilpin--------------	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
Wt------------------ Wilbur	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--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
AvA: Avonburg	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Ba: Bartle	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Be: Beanblossom	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: droughty.
BgF*:						
Berks	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, small stones.
Trevlac	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Wellston	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, frost action.	Severe: slope.
BnD2, BpD3: Bonnell	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
Ca: Chagrin	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
CdD2, CdF: Chetwynd	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
CnC2: Cincinnati	Moderate: dense layer, wetness, slope.	Moderate: slope.	Moderate: wetness, slope.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
CwB: Crosby	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Hc: Haymond	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding, frost action.	Severe: flooding.
HkD2, HkF: Hickory	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
MaB: Martinsville	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: frost action, shrink-swell.	Slight.

See footnote at end of table.

TABLE 13.--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
MnC2-------------- Miami	Moderate: slope, dense layer.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
PeB--------------- Pekin	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness, slope.	Severe: low strength, frost action.	Slight.
PeC2-------------- Pekin	Severe: wetness.	Moderate: wetness, slope.	Severe: wetness.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
Re*:						
Rensselaer-------	Severe: cutbanks cave, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Whitaker---------	Severe: cutbanks cave, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
RoB2-------------- Rossmoyne	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength, frost action.	Moderate: wetness.
Sf---------------- Steff	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding, frost action.	Severe: flooding.
St, Sv------------ Stendal	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Severe: flooding.
SwC2-------------- Stonehead	Severe: wetness.	Moderate: wetness, slope.	Severe: wetness.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
SwD3-------------- Stonehead	Severe: wetness, slope.	Severe: slope.	Severe: wetness, slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
SxD2*:						
Stonehead--------	Severe: wetness, slope.	Severe: slope.	Severe: wetness, slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
Trevlac----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Sy---------------- Stonelick	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
TlB--------------- Tilsit	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: slope, wetness.	Severe: low strength, frost action.	Moderate: wetness.

See footnote at end of table.

TABLE 13.--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
Ud. Udorthents						
WaD*:						
Wellston----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: frost action, slope.	Severe: slope.
Berks-------------	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
Trevlac-----------	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
WeC2*:						
Wellston----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: frost action, slope.	Severe: slope.
Gilpin------------	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.	Severe: slope.
Wt----------------- Wilbur	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding, frost action.	Severe: flooding.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--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
AvA: Avonburg	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Severe: wetness.	Poor: wetness.
Ba: Bartle	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Severe: wetness.	Poor: wetness.
Be: Beanblossom	Severe: flooding, wetness.	Severe: seepage, flooding, wetness.	Severe: flooding, depth to rock, seepage.	Severe: flooding, seepage, wetness.	Poor: small stones.
BgF*:					
Berks	Severe: depth to rock, slope.	Severe: slope, seepage, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: seepage, slope, depth to rock.	Poor: small stones, slope, area reclaim.
Trevlac	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, small stones, slope.
Wellston	Severe: slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.
BnD2, BpD3: Bonnell	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
Ca: Chagrin	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Good.
CdD2, CdF: Chetwynd	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: slope.
CnC2: Cincinnati	Severe: wetness, percs slowly.	Severe: slope.	Moderate: wetness, slope, too clayey.	Moderate: wetness, slope.	Fair: too clayey, slope, wetness.
CwB: Crosby	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Hc: Haymond	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Good.
HkD2, HkF: Hickory	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.

See footnote at end of table.

TABLE 14.--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
MaB: Martinsville	Slight	Severe: seepage.	Severe: seepage.	Slight	Fair: thin layer.
MnC2: Miami	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
PeB: Pekin	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
PeC2: Pekin	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, slope, wetness.
Re*:					
Rensselaer	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Whitaker	Severe: wetness.	Severe: seepage, wetness.	Severe: seepage, wetness.	Severe: wetness.	Poor: wetness.
RoB2: Rossmoyne	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Moderate: wetness.	Fair: too clayey, wetness.
Sf: Steff	Severe: flooding, wetness.	Severe: flooding, wetness, seepage.	Severe: flooding, wetness, seepage.	Severe: flooding, wetness, seepage.	Fair: too clayey, wetness.
St, Sv: Stendal	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
SwC2: Stonehead	Severe: wetness, percs slowly.	Severe: slope.	Severe: depth to rock.	Moderate: depth to rock, wetness, slope.	Poor: thin layer.
SwD3: Stonehead	Severe: wetness, percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope, thin layer.
SxD2*:					
Stonehead	Severe: wetness, percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope, thin layer.
Trevlac	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, small stones, slope.
Sy: Stonelick	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding, seepage.	Poor: seepage.

See footnote at end of table.

TABLE 14.--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
TlB----------------- Tilsit	Severe: percs slowly, wetness.	Severe: wetness.	Severe: depth to rock, wetness.	Moderate: wetness, depth to rock.	Fair: too clayey.
Ud. Udorthents					
WaD*:					
Wellston-----------	Severe: slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.
Berks--------------	Severe: depth to rock, slope.	Severe: slope, seepage, depth to rock.	Severe: depth to rock, seepage, slope.	Severe: seepage, depth to rock, slope.	Poor: small stones, slope.
Trevlac------------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, small stones, slope.
WeC2*:					
Wellston-----------	Severe: slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.
Gilpin-------------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, thin layer, slope.
Wt----------------- Wilbur	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--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
AvA: Avonburg	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim.
Ba: Bartle	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Be: Beanblossom	Fair: depth to rock, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
BgF*:				
Berks	Poor: slope, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Trevlac	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Wellston	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
BnD2, BpD3: Bonnell	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
Ca: Chagrin	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
CdD2: Chetwynd	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
CdF: Chetwynd	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
CnC2: Cincinnati	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones, slope.
CwB: Crosby	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
Hc: Haymond	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
HkD2: Hickory	Fair: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
HkF: Hickory	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.

See footnote at end of table.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
MaB: Martinsville	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
MnC2: Miami	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, slope, too clayey.
PeB: Pekin	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
PeC2: Pekin	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
Re*:				
Rensselaer	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Whitaker	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
RoB2: Rossmoyne	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim.
Sf: Steff	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
St, Sv: Stendal	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
SwC2: Stonehead	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
SwD3: Stonehead	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
SxD2*:				
Stonehead	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.
Trevlac	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Sy: Stonelick	Good	Probable	Probable	Poor: area reclaim.
TlB: Tilsit	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Ud. Udorthents				
WaD*:				
Wellston	Fair: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.

See footnote at end of table.

TABLE 15.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
WaD*:				
Berks	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Trevlac	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
WeC2*:				
Wellston	Fair: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Gilpin	Poor: depth to rock, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Wt Wilbur	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--WATER MANAGEMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "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
AvA----------------Avonburg	Moderate: seepage.	Moderate: piping, wetness.	Severe: no water.	Percs slowly, frost action.	Erodes easily, wetness, rooting depth.	Wetness, erodes easily, rooting depth.
Ba-----------------Bartle	Moderate: seepage.	Moderate: piping, wetness.	Severe: no water.	Percs slowly, frost action.	Erodes easily, wetness, rooting depth.	Wetness, erodes easily, rooting depth.
Be-----------------Beanblossom	Severe: seepage.	Severe: seepage.	Moderate: deep to water, depth to rock.	Deep to water	Favorable------	Droughty.
BgF*:						
Berks------------	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Depth to rock, slope, large stones.	Droughty, depth to rock, slope.
Trevlac----------	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, depth to rock, erodes easily.	Slope, erodes easily, droughty.
Wellston---------	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
BnD2, BpD3--------Bonnell	Severe: slope.	Moderate: hard to pack.	Severe: no water.	Deep to water	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
Ca-----------------Chagrin	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Favorable------	Favorable.
CdD2, CdF---------Chetwynd	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope----------	Slope.
CnC2--------------Cincinnati	Severe: slope.	Severe: thin layer.	Severe: no water.	Percs slowly, frost action, slope.	Slope, erodes easily, wetness.	Slope, erodes easily, rooting depth.
CwB---------------Crosby	Moderate: slope.	Severe: piping.	Severe: no water.	Percs slowly, frost action, slope.	Erodes easily, wetness.	Wetness, erodes easily, rooting depth.
Hc-----------------Haymond	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
HkD2, HkF---------Hickory	Severe: slope.	Moderate: thin layer.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
MaB---------------Martinsville	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.

See footnote at end of table.

TABLE 16.--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
MnC2: Miami	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily, rooting depth.
PeB: Pekin	Moderate: seepage, slope.	Severe: piping.	Severe: slow refill.	Percs slowly, frost action, slope.	Erodes easily, wetness.	Erodes easily, rooting depth.
PeC2: Pekin	Severe: slope.	Severe: piping.	Severe: slow refill.	Percs slowly, frost action, slope.	Slope, erodes easily, wetness.	Slope, erodes easily, rooting depth.
Re*:						
Rensselaer	Moderate: seepage.	Severe: thin layer, ponding.	Severe: cutbanks cave.	Ponding, frost action.	Ponding	Wetness.
Whitaker	Moderate: seepage.	Severe: wetness, piping.	Moderate: slow refill, cutbanks cave.	Frost action	Erodes easily, wetness.	Wetness, erodes easily.
RoB2: Rossmoyne	Moderate: seepage, slope.	Moderate: piping, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Erodes easily, wetness.	Erodes easily, rooting depth.
Sf: Steff	Severe: seepage.	Severe: piping, wetness.	Moderate: slow refill.	Flooding, frost action.	Erodes easily, wetness.	Erodes easily.
St, Sv: Stendal	Moderate: seepage.	Severe: piping, wetness.	Moderate: slow refill.	Flooding, frost action.	Erodes easily, wetness.	Wetness, erodes easily.
SwC2, SwD3: Stonehead	Severe: slope.	Moderate: piping, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, erodes easily, wetness.	Slope, erodes easily, percs slowly.
SxD2*:						
Stonehead	Severe: slope.	Moderate: piping, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Slope, erodes easily, wetness.	Slope, erodes easily, percs slowly.
Trevlac	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, depth to rock, erodes easily.	Slope, erodes easily, droughty.
Sy: Stonelick	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy	Favorable.
TlB: Tilsit	Moderate: depth to rock, seepage.	Severe: piping.	Severe: no water.	Percs slowly, slope.	Erodes easily, wetness.	Erodes easily, rooting depth.
Ud. Udorthents						
WaD*:						
Wellston	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.

See footnote at end of table.

TABLE 16.--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
WaD*:						
Berks	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Depth to rock, slope, large stones.	Droughty, depth to rock, slope.
Trevlac	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, depth to rock, erodes easily.	Slope, erodes easily, droughty.
WeC2*:						
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.
Wt Wilbur	Moderate: seepage.	Severe: piping, wetness.	Moderate: slow refill.	Flooding, frost action.	Erodes easily, wetness.	Erodes easily.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--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	
AvA------------- Avonburg	0-9	Silt loam--------	CL, ML, CL-ML	A-4	0	100	100	95-100	75-95	20-30	2-10
	9-23	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	75-95	30-45	10-20
	23-52	Silty clay loam, silt loam.	CL	A-6, A-7	0-3	95-100	95-100	90-100	70-95	30-45	10-20
	52-80	Clay loam, silt loam, silty clay loam.	CL	A-6, A-7	0-3	95-100	90-100	75-95	60-85	30-45	10-20
Ba--------------- Bartle	0-7	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	85-100	65-90	20-35	5-15
	7-24	Silt loam, silty clay loam.	CL, CL-ML, ML	A-4, A-6, A-7	0	100	100	90-100	70-90	25-45	5-15
	24-58	Silt loam, silty clay loam, loam.	CL	A-6, A-7	0	100	100	90-100	70-95	30-45	10-25
	58-80	Silty clay loam, silt loam, loam.	CL	A-6, A-7	0	100	100	90-100	70-95	30-45	10-25
Be--------------- Beanblossom	0-7	Channery silt loam.	CL-ML, CL, SM-SC, SC	A-4, A-2-4, A-1-b	0-5	50-100	50-80	35-80	20-70	18-30	4-10
	7-17	Very channery silt loam, very channery loam.	SM-SC, SC, GM-GC, GC	A-1, A-2-4, A-4	0-5	40-70	35-50	30-50	20-40	18-30	4-10
	17-54	Extremely channery loam, very channery loam.	GM-GC, GC, GW-GC, GM	A-1, A-2-4	0-5	20-50	10-30	10-30	5-25	15-30	NP-10
	54	Weathered bedrock	---	---	---	---	---	---	---	---	---
BgF*:											
Berks-----------	0-5	Very channery silt loam.	GM, GC, SM, SC	A-1, A-2, A-4	0-30	40-80	35-70	25-60	20-45	25-36	5-10
	5-10	Very channery silt loam, channery silt loam.	GM, GC, SM, SC	A-1, A-2, A-4	0-30	40-80	35-70	25-60	20-45	25-36	5-10
	10-27	Channery silt loam, very channery silt loam, extremely channery silt loam.	GM, SM, GP-GM, SP-SM	A-1, A-2	0-40	35-65	10-55	10-40	10-35	24-38	2-10
	27	Weathered bedrock	---	---	---	---	---	---	---	---	---
Trevlac---------	0-6	Silt loam--------	CL-ML, ML	A-4	0-3	90-100	85-100	70-100	55-95	<25	NP-6
	6-12	Silt loam, channery silt loam.	CL, CL-ML, SC, SM-SC	A-4, A-6	0-15	60-100	55-100	45-85	35-75	15-30	3-11
	12-36	Very channery silt loam, extremely channery silt loam.	CL, CL-ML, SC, SM-SC	A-4, A-6, A-1, A-2	0-15	20-75	15-70	15-65	10-65	15-30	3-11
	36	Weathered bedrock	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 17.--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	
BgF*:											
Wellston	0-10	Silt loam	ML	A-4	0	95-100	90-100	85-100	70-95	25-35	3-10
	10-33	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
	33-40	Silt loam, loam, gravelly 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
	40-48	Channery silt loam, gravelly sandy loam, channery clay loam.	SM-SC, SC, GM-GC, CL	A-1-b, A-2, A-4, A-6	0-15	60-80	45-75	30-70	15-55	20-35	5-15
	48	Weathered bedrock	---	---	---	---	---	---	---	---	---
BnD2 Bonnell	0-5	Loam	ML, CL-ML, CL	A-4, A-6	0	95-100	95-100	85-100	65-90	25-35	4-12
	5-38	Silty clay, clay, clay loam.	CH	A-7	0	95-100	95-100	90-100	75-95	50-65	30-40
	38-43	Clay loam, silty clay loam.	CL	A-6, A-7	0-5	95-100	90-100	85-95	60-80	30-50	15-30
	43-60	Clay loam, loam	CL	A-6, A-7	0-10	95-100	90-100	85-95	60-80	30-50	15-30
BpD3 Bonnell	0-4	Clay loam	CL	A-6	0	95-100	95-100	85-100	65-90	30-40	11-16
	4-15	Silty clay, clay, clay loam.	CH	A-7	0	95-100	95-100	90-100	75-95	50-65	30-40
	15-52	Clay loam, silty clay loam.	CL	A-6, A-7	0-5	95-100	90-100	85-95	60-80	30-50	15-30
	52-60	Clay loam, loam	CL	A-6, A-7	0-10	95-100	90-100	85-95	60-80	30-50	15-30
Ca Chagrin	0-4	Silt loam	ML, CL, CL-ML	A-4	0	95-100	85-100	80-100	70-90	20-35	2-10
	4-60	Silt loam, loam, sandy loam.	ML, SM	A-4, A-2, A-6	0	90-100	75-100	55-90	30-80	20-40	NP-14
CdD2, CdF Chetwynd	0-7	Loam	CL-ML, CL	A-4	0	95-100	85-100	70-100	50-90	18-30	4-10
	7-40	Loam, clay loam	CL-ML, CL	A-4, A-6	0	85-100	75-100	70-100	50-75	20-35	5-15
	40-56	Gravelly loam	CL-ML, CL, SM-SC, SC	A-4	0	70-80	60-75	55-70	40-60	20-30	5-10
	56-80	Stratified gravelly sandy loam to loamy sand.	SM, SM-SC	A-2-4, A-1-b	0	70-80	60-75	40-45	15-30	<20	NP-5
CnC2 Cincinnati	0-7	Silt loam	ML, CL	A-4, A-6	0	100	100	90-100	80-100	25-40	3-16
	7-26	Silty clay loam, loam, silt loam.	CL	A-6, A-4	0	95-100	90-100	90-100	70-100	25-40	8-15
	26-52	Clay loam, silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0	95-100	85-100	75-90	65-80	25-40	6-20
	52-80	Clay loam, silty clay loam, clay.	CL, ML, CL-ML	A-6, A-4	0	95-100	85-95	75-90	65-80	25-40	5-20
CwB Crosby	0-13	Silt loam	CL, CL-ML, ML	A-4, A-6	0	100	95-100	80-100	50-90	15-30	4-15
	13-36	Clay loam, silty clay loam, clay.	CL	A-6, A-7	0-3	90-100	85-100	75-95	65-95	35-50	15-25
	36-60	Loam	CL, ML, CL-ML	A-4, A-6	0-3	85-100	80-95	75-90	50-65	15-30	4-15
Hc Haymond	0-8	Silt loam	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
	8-56	Silt loam	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
	56-60	Fine sandy loam, silt loam, loam.	ML, SM	A-4	0	95-100	90-100	80-100	35-90	27-36	4-10

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
HkD2------------- Hickory	0-6	Silt loam--------	CL	A-6, A-4	0-5	95-100	90-100	90-100	75-95	20-35	8-15
	6-66	Clay loam, silty clay loam, loam.	CL	A-6, A-7	0-5	95-100	75-100	70-95	65-80	30-50	15-30
	66-70	Sandy loam, loam, gravelly clay loam.	CL-ML, CL	A-4, A-6	0-5	85-100	75-95	70-95	60-80	20-40	5-20
HkF-------------- Hickory	0-11	Silt loam--------	CL	A-6, A-4	0-5	95-100	90-100	90-100	75-95	20-35	8-15
	11-58	Clay loam, silty clay loam, loam.	CL	A-6, A-7	0-5	95-100	75-100	70-95	65-80	30-50	15-30
	58-70	Sandy loam, loam, gravelly clay loam.	CL-ML, CL	A-4, A-6	0-5	85-100	75-95	70-95	60-80	20-40	5-20
MaB-------------- Martinsville	0-7	Loam-------------	CL, CL-ML, ML	A-4	0	100	85-100	75-100	65-90	<25	3-8
	7-36	Clay loam, loam, sandy clay loam.	CL, SC	A-4, A-6, A-2	0	95-100	85-100	70-100	30-95	25-40	7-15
	36-49	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
	49-65	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
MnC2------------- Miami	0-12	Loam-------------	CL, CL-ML, ML	A-4	0	100	90-100	80-100	50-90	15-30	3-10
	12-37	Clay loam, silty clay loam.	CL, SC	A-6	0	90-100	85-100	70-95	40-95	30-40	15-25
	37-60	Loam-------------	CL, CL-ML, SC, SM-SC	A-4, A-6	0-3	85-100	85-100	70-90	45-70	20-40	5-20
PeB, PeC2-------- Pekin	0-9	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	85-100	65-100	20-30	5-15
	9-22	Silt loam, silty clay loam.	CL	A-6	0	100	100	90-100	70-100	25-40	10-20
	22-41	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	88-98	65-90	25-35	5-15
	41-60	Stratified sandy loam to silt loam.	CL, CL-ML	A-4, A-6	0	95-100	85-100	80-95	50-85	20-40	5-15
Re*:											
Rensselaer------	0-8	Loam-------------	CL, ML, CL-ML	A-4, A-6	0	95-100	90-100	80-100	55-90	15-35	4-15
	8-42	Clay loam, silty clay loam, loam.	CL	A-6, A-4	0	95-100	90-100	80-100	50-95	25-40	8-20
	42-60	Stratified fine sand to silt loam.	CL, SC, ML, SM	A-4, A-2	0	95-100	90-100	45-95	25-85	<25	2-10
Whitaker--------	0-12	Silt loam--------	CL, CL-ML, ML	A-4, A-6	0	100	95-100	80-100	60-90	15-35	2-15
	12-41	Clay loam, silty clay loam, sandy clay loam.	CL, CL-ML	A-6, A-4	0	95-100	90-100	90-100	70-80	20-35	5-15
	41-60	Stratified coarse sand to silt loam.	ML, SM, CL-ML, SM-SC	A-4	0	95-100	95-100	60-85	40-60	<25	NP-7

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
RoB2------------- Rossmoyne	0-9	Silt loam--------	ML	A-4	0	90-100	90-100	90-100	85-100	30-40	4-10
	9-22	Silty clay loam, silt loam.	CL, ML	A-6, A-7, A-4	0	90-100	90-100	85-100	75-95	30-48	8-20
	22-56	Clay loam, silt loam, silty clay loam.	CL	A-6, A-4	0	90-100	85-95	80-90	70-85	25-40	9-19
	56-80	Clay loam, loam, silt loam.	CL	A-6, A-7, A-4	0	80-95	70-95	65-85	60-80	25-42	8-20
Sf--------------- Steff	0-10	Silt loam--------	ML	A-4	0	95-100	90-100	80-100	55-95	<35	NP-10
	10-29	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	0	95-100	90-100	85-100	70-95	20-40	3-20
	29-60	Silt loam, gravelly loam, very fine sandy loam.	ML, CL-ML, SM, GM	A-4, A-2, A-1	0-10	50-100	40-100	35-95	20-90	<35	NP-10
St, Sv----------- Stendal	0-13	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	75-90	25-40	5-15
	13-60	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	75-90	25-40	5-15
SwC2------------- Stonehead	0-6	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	95-100	80-100	65-80	20-30	4-12
	6-35	Silt loam, silty clay loam.	CL	A-4, A-6	0	100	95-100	80-100	65-95	25-40	7-16
	35-63	Silty clay, channery silty clay, shaly silty clay loam.	CL, CH	A-7	0-5	70-100	65-100	60-100	50-95	40-60	15-30
	63-68	Extremely shaly silty clay loam, very shaly silty clay loam, very shaly silt loam.	GC, SC	A-6, A-7, A-2-6, A-2-7	5-50	25-80	20-80	20-70	15-50	30-45	10-20
	68	Weathered bedrock	---	---	---	---	---	---	---	---	---
SwD3------------- Stonehead	0-3	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	95-100	80-100	65-80	20-30	4-12
	3-13	Silt loam, silty clay loam.	CL	A-4, A-6	0	100	95-100	80-100	65-95	25-40	7-16
	13-44	Silty clay, clay, channery silty clay.	CL, CH	A-7	0-5	70-100	65-100	60-100	50-95	40-60	15-30
	44	Weathered bedrock	---	---	---	---	---	---	---	---	---
SxD2*:											
Stonehead-------	0-6	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	95-100	80-100	65-80	20-30	4-12
	6-24	Silt loam, silty clay loam.	CL	A-4, A-6	0	100	95-100	80-100	65-95	25-40	7-16
	24-51	Silty clay, channery silty clay, shaly silty clay loam.	CL, CH	A-7	0-5	70-100	65-100	60-100	50-95	40-60	15-30
	51-54	Extremely shaly silty clay loam, very shaly silty clay loam, very shaly silt loam.	GC, SC	A-6, A-7, A-2-6, A-2-7	5-50	25-80	20-80	20-70	15-50	30-45	10-20
	54	Weathered bedrock	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 17.--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	
SxD2*:											
Trevlac	0-5	Silt loam	CL-ML, ML	A-4	0-3	90-100	85-100	70-100	55-95	<25	NP-6
	5-12	Silt loam, channery silt loam.	CL, CL-ML, SC, SM-SC	A-4, A-6	0-15	60-90	55-85	45-85	35-75	15-30	3-11
	12-29	Very channery silt loam, extremely channery silt loam.	CL, CL-ML, SC, SM-SC	A-4, A-6, A-1, A-2	0-15	20-75	15-70	15-65	10-65	15-30	3-11
	29	Weathered bedrock	---	---	---	---	---	---	---	---	---
Sy Stonelick	0-7	Loam	ML, CL-ML, CL	A-4	0	90-100	80-100	65-95	50-75	15-30	2-10
	7-46	Stratified loamy sand to loam.	SM, SM-SC, SP-SM	A-4, A-2-4	0	90-100	80-100	50-80	10-50	<23	NP-7
	46-60	Very gravelly coarse sand.	GP, SP, GP-GM, SP-SM	A-1	0-5	35-55	25-45	10-25	2-10	---	NP
TlB Tilsit	0-9	Silt loam	CL, CL-ML	A-4, A-6	0	90-100	85-100	75-100	60-100	20-35	4-15
	9-30	Silt loam, silty clay loam, loam.	CL, CL-ML	A-4, A-6	0	90-100	85-100	75-100	65-100	25-40	5-20
	30-52	Silt loam, silty clay loam, loam.	CL, CL-ML	A-4, A-6, A-7	0	90-100	85-100	75-100	65-100	25-45	5-25
	52-64	Channery silt loam, silty clay loam, silty clay.	CL, CH, CL-ML	A-4, A-6, A-7	0-30	70-100	65-85	60-85	55-80	25-60	5-35
	64	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Ud. Udorthents											
WaD*:											
Wellston	0-7	Silt loam	ML	A-4	0	95-100	90-100	85-100	70-95	25-35	3-10
	7-35	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
	35-51	Very channery silt loam, loam.	GM-GC, CL, SC, SM-SC	A-4, A-6, A-1, A-2	0-10	35-90	25-90	20-90	20-65	20-35	5-15
	51	Weathered bedrock	---	---	---	---	---	---	---	---	---
Berks	0-3	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
	3-8	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
	8-27	Channery loam, very channery loam, channery silt loam.	GM, SM	A-1, A-2	0-40	35-65	25-55	20-40	15-35	24-38	2-10
	27	Weathered bedrock	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 17.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
WaD*:											
Trevlac	0-10	Silt loam	CL-ML, ML	A-4	0-3	90-100	85-100	70-100	55-95	<25	NP-6
	10-37	Very channery silt loam, extremely channery silt loam.	CL, CL-ML, SC, SM-SC	A-4, A-6, A-1, A-2	0-15	20-75	15-70	15-65	10-65	15-30	3-11
	37	Weathered bedrock	---	---	---	---	---	---	---	---	---
WeC2*:											
Wellston	0-5	Silt loam	ML	A-4	0	95-100	90-100	85-100	70-95	25-35	3-10
	5-35	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
	35-52	Silt loam, loam, gravelly 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
	52	Weathered bedrock	---	---	---	---	---	---	---	---	---
Gilpin	0-6	Silt loam	CL, CL-ML	A-4, A-6	0-5	100	100	70-100	65-80	20-40	4-15
	6-24	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
	24-36	Channery silt loam, very channery silt loam, very shaly silty clay loam.	GC, GM-GC	A-1, A-2, A-4, A-6	0-35	25-60	20-50	15-45	15-40	20-40	4-15
	36	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Wt Wilbur	0-8	Silt loam	ML, CL-ML	A-4	0	100	100	90-100	70-90	<25	3-7
	8-60	Silt loam	ML, CL-ML	A-4	0	100	100	90-100	70-90	<25	3-7

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--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 erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
AvA	0-9	10-18	1.30-1.45	0.6-2.0	0.20-0.24	4.5-7.3	Low	0.43	4	5	.5-2
Avonburg	9-23	22-30	1.35-1.50	0.6-2.0	0.18-0.20	4.5-5.5	Moderate	0.43			
	23-52	22-30	1.60-1.85	<0.06	0.06-0.08	4.5-5.5	Moderate	0.43			
	52-80	14-30	1.50-1.70	<0.06	0.06-0.10	4.5-8.4	Moderate	0.43			
Ba	0-7	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
Bartle	7-24	22-35	1.40-1.60	0.6-2.0	0.20-0.22	3.6-7.3	Low	0.43			
	24-58	22-35	1.60-1.80	<0.06	0.06-0.08	4.5-6.0	Low	0.43			
	58-80	22-35	1.40-1.60	0.2-0.6	0.15-0.18	4.5-7.3	Low	0.43			
Be	0-7	12-27	1.40-1.50	2.0-6.0	0.10-0.17	5.1-7.3	Low	0.28	3	5	1-2
Beanblossom	7-17	12-27	1.40-1.50	2.0-6.0	0.07-0.12	5.1-6.0	Low	0.28			
	17-54	7-27	1.40-1.50	2.0-6.0	0.02-0.07	5.6-6.5	Low	0.28			
	54	---	---	---	---	---	------------	----			
BgF*:											
Berks	0-5	5-23	1.20-1.50	2.0-6.0	0.04-0.10	3.6-6.5	Low	0.17	3	5	.5-3
	5-10	5-27	1.20-1.60	2.0-6.0	0.04-0.10	3.6-6.5	Low	0.17			
	10-27	5-20	1.20-1.60	2.0-6.0	0.04-0.10	3.6-6.5	Low	0.17			
	27	---	---	---	---	---	------------	----			
Trevlac	0-6	5-15	1.25-1.45	0.6-2.0	0.20-0.24	4.5-7.3	Low	0.37	4	5	1-3
	6-12	10-25	1.25-1.50	0.6-2.0	0.13-0.20	3.6-5.5	Low	0.28			
	12-36	10-25	1.25-1.50	0.6-2.0	0.03-0.14	3.6-5.5	Low	0.28			
	36	---	---	---	---	---	------------	----			
Wellston	0-10	13-27	1.30-1.50	0.6-2.0	0.18-0.22	3.6-6.5	Low	0.37	4	6	1-3
	10-33	18-35	1.30-1.65	0.6-2.0	0.17-0.21	4.5-6.0	Low	0.37			
	33-40	15-27	1.30-1.60	0.6-2.0	0.12-0.17	4.5-6.0	Low	0.37			
	40-48	15-30	1.30-1.60	0.6-2.0	0.06-0.16	4.5-6.0	Low	0.20			
	48	---	---	---	---	---	------------	----			
BnD2	0-5	15-25	1.30-1.45	0.6-2.0	0.22-0.24	4.5-7.3	Low	0.43	3	5	1-3
Bonnell	5-38	35-60	1.50-1.70	0.06-0.2	0.09-0.13	4.5-6.0	High	0.32			
	38-43	27-40	1.45-1.60	0.2-0.6	0.14-0.19	5.6-8.4	Moderate	0.32			
	43-60	25-40	1.45-1.60	0.2-0.6	0.08-0.15	6.1-8.4	Moderate	0.32			
BpD3	0-4	27-32	1.30-1.50	0.2-0.6	0.17-0.23	4.5-7.3	Moderate	0.43	3	5	<3
Bonnell	4-15	35-60	1.50-1.70	0.06-0.2	0.09-0.13	4.5-6.0	High	0.32			
	15-52	27-40	1.45-1.60	0.2-0.6	0.14-0.19	5.6-8.4	Moderate	0.32			
	52-60	25-40	1.45-1.60	0.2-0.6	0.08-0.15	6.1-8.4	Moderate	0.32			
Ca	0-4	10-27	1.20-1.40	0.6-2.0	0.20-0.24	5.6-7.3	Low	0.32	5	5	2-4
Chagrin	4-60	18-27	1.20-1.50	0.6-2.0	0.14-0.20	5.6-7.3	Low	0.32			
CdD2, CdF	0-7	12-24	1.35-1.45	0.6-2.0	0.20-0.22	4.5-7.3	Low	0.32	5	5	1-3
Chetwynd	7-40	18-30	1.40-1.60	0.6-2.0	0.15-0.19	4.5-6.0	Moderate	0.32			
	40-56	18-25	1.40-1.70	0.6-2.0	0.15-0.17	4.5-6.0	Low	0.24			
	56-80	8-15	1.50-1.70	2.0-6.0	0.08-0.10	5.1-6.0	Low	0.17			
CnC2	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
Cincinnati	7-26	22-35	1.45-1.65	0.6-2.0	0.15-0.19	4.5-5.5	Low	0.37			
	26-52	24-35	1.60-1.85	0.06-0.2	0.08-0.12	4.5-6.5	Moderate	0.37			
	52-80	24-45	1.55-1.75	0.06-0.6	0.08-0.12	4.5-6.5	Moderate	0.37			

See footnote at end of table.

TABLE 18.--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
CwB--------------	0-3	11-24	1.35-1.45	0.6-2.0	0.20-0.24	5.1-7.3	Low-----------	0.43	3	5	1-3
Crosby	13-36	35-45	1.50-1.70	0.06-0.2	0.15-0.20	5.1-7.3	Moderate-----	0.43			
	36-60	15-27	1.70-2.00	0.06-0.6	0.05-0.17	7.4-8.4	Low-----------	0.43			
Hc---------------	0-8	10-18	1.30-1.45	0.6-2.0	0.22-0.24	5.1-7.3	Low-----------	0.37	5	5	1-3
Haymond	8-56	10-18	1.30-1.45	0.6-2.0	0.20-0.22	5.1-7.3	Low-----------	0.37			
	56-60	10-18	1.30-1.45	0.6-2.0	0.20-0.22	5.1-7.3	Low-----------	0.37			
HkD2-------------	0-6	19-25	1.30-1.50	0.6-2.0	0.20-0.22	4.5-7.3	Low-----------	0.37	5	6	1-2
Hickory	6-66	25-35	1.45-1.65	0.6-2.0	0.15-0.19	4.5-6.0	Moderate-----	0.37			
	66-70	15-32	1.50-1.70	0.6-2.0	0.11-0.19	5.1-8.4	Low-----------	0.37			
HkF--------------	0-11	19-25	1.30-1.50	0.6-2.0	0.20-0.22	4.5-7.3	Low-----------	0.37	5	6	1-2
Hickory	11-58	25-35	1.45-1.65	0.6-2.0	0.15-0.19	4.5-6.0	Moderate-----	0.37			
	58-70	15-32	1.50-1.70	0.6-2.0	0.11-0.19	5.1-8.4	Low-----------	0.37			
MaB--------------	0-7	8-20	1.30-1.45	0.6-2.0	0.20-0.24	6.1-7.3	Low-----------	0.37	5	5	1-2
Martinsville	7-36	20-33	1.40-1.60	0.6-2.0	0.16-0.20	5.1-6.5	Moderate-----	0.37			
	36-49	15-25	1.40-1.60	0.6-2.0	0.12-0.17	5.1-6.5	Low-----------	0.24			
	49-65	2-20	1.50-1.70	0.6-6.0	0.08-0.17	5.1-8.4	Low-----------	0.24			
MnC2-------------	0-12	11-22	1.30-1.45	0.6-2.0	0.20-0.24	5.6-7.3	Low-----------	0.37	5	5	.5-3
Miami	12-37	27-35	1.45-1.65	0.6-2.0	0.15-0.20	5.1-7.3	Moderate-----	0.37			
	37-60	15-25	1.55-1.90	0.2-0.6	0.05-0.19	7.4-8.4	Moderate-----	0.37			
PeB, PeC2--------	0-9	15-26	1.30-1.45	0.6-2.0	0.22-0.24	5.1-7.3	Low-----------	0.43	3	5	1-3
Pekin	9-22	25-35	1.40-1.60	0.6-2.0	0.20-0.22	4.5-6.5	Low-----------	0.43			
	22-41	22-30	1.60-1.80	<0.06	0.06-0.08	4.5-6.5	Low-----------	0.43			
	41-60	20-27	1.40-1.60	0.6-2.0	0.06-0.08	4.5-7.3	Low-----------	0.43			
Re*:											
Rensselaer-------	0-8	11-27	1.30-1.45	0.6-2.0	0.20-0.24	6.1-7.3	Low-----------	0.32	5	5	2-8
	8-42	20-35	1.40-1.60	0.6-2.0	0.15-0.20	6.1-7.3	Moderate-----	0.32			
	42-60	8-20	1.50-1.70	0.6-2.0	0.10-0.18	6.6-8.4	Low-----------	0.43			
Whitaker---------	0-12	8-19	1.30-1.45	0.6-2.0	0.20-0.24	6.1-7.3	Low-----------	0.37	5	5	1-3
	12-41	20-33	1.40-1.60	0.6-2.0	0.15-0.19	5.6-7.3	Moderate-----	0.37			
	41-60	3-18	1.50-1.70	0.6-6.0	0.19-0.21	6.1-8.4	Low-----------	0.37			
RoB2-------------	0-9	13-27	1.35-1.50	0.6-2.0	0.20-0.24	4.5-7.3	Low-----------	0.37	4	6	1-3
Rossmoyne	9-22	22-35	1.40-1.60	0.6-2.0	0.14-0.19	4.5-5.5	Moderate-----	0.37			
	22-56	24-35	1.70-1.90	0.06-0.2	0.06-0.10	4.5-5.5	Moderate-----	0.37			
	56-80	18-40	1.60-1.75	0.06-0.6	0.06-0.10	5.1-8.4	Moderate-----	0.37			
Sf---------------	0-10	12-25	1.30-1.50	0.6-2.0	0.15-0.23	4.5-7.3	Low-----------	0.43	5	5	1-3
Steff	10-29	12-34	1.30-1.55	0.6-2.0	0.18-0.23	4.5-6.5	Low-----------	0.43			
	29-60	10-25	1.40-1.65	0.6-2.0	0.19-0.21	4.5-5.5	Low-----------	0.43			
St, Sv-----------	0-13	18-27	1.30-1.45	0.6-2.0	0.22-0.24	4.5-6.5	Low-----------	0.37	5	5	1-3
Stendal	13-60	18-35	1.45-1.65	0.6-2.0	0.20-0.22	4.5-5.5	Low-----------	0.37			
SwC2-------------	0-6	12-27	1.30-1.50	0.6-2.0	0.22-0.24	4.5-6.5	Low-----------	0.37	4	6	1-3
Stonehead	6-35	18-35	1.35-1.65	0.6-2.0	0.18-0.22	4.5-5.5	Low-----------	0.37			
	35-63	35-60	1.40-1.70	0.06-0.2	0.09-0.15	4.5-6.0	Moderate-----	0.37			
	63-68	25-40	1.50-2.00	0.06-0.2	0.03-0.14	4.5-6.5	Moderate-----	0.37			
	68	---	---	---	---	---	-------------	----			

See footnote at end of table.

TABLE 18.--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
SwD3----------- Stonehead	0-3	12-27	1.30-1.50	0.6-2.0	0.22-0.24	4.5-6.5	Low----------	0.37	4	6	.5-3
	3-13	18-35	1.35-1.65	0.6-2.0	0.18-0.22	4.5-5.5	Low----------	0.37			
	13-44	40-60	1.40-1.70	0.06-0.2	0.09-0.15	4.5-6.0	Moderate-----	0.37			
	44	---	---	---	---	---	-------------	----			
SxD2*:											
Stonehead-------	0-6	12-27	1.30-1.50	0.6-2.0	0.22-0.24	4.5-6.5	Low----------	0.37	4	6	1-3
	6-24	18-35	1.35-1.65	0.6-2.0	0.18-0.22	4.5-5.5	Low----------	0.37			
	24-51	35-60	1.40-1.70	0.06-0.2	0.09-0.15	4.5-6.0	Moderate-----	0.37			
	51-54	25-40	1.50-2.00	0.06-0.2	0.03-0.14	4.5-6.5	Moderate-----	0.37			
	54	---	---	---	---	---	-------------	----			
Trevlac---------	0-5	5-15	1.25-1.45	0.6-2.0	0.20-0.24	4.5-7.3	Low----------	0.37	4	5	1-3
	5-12	10-25	1.25-1.50	0.6-2.0	0.13-0.20	3.6-5.5	Low----------	0.28			
	12-29	10-25	1.25-1.50	0.6-2.0	0.03-0.14	3.6-5.5	Low----------	0.28			
	29	---	---	---	---	---	-------------	----			
Sy--------------- Stonelick	0-7	10-22	1.35-1.45	2.0-6.0	0.20-0.22	6.6-8.4	Low----------	0.32	5	5	.5-2
	7-46	5-18	1.35-1.70	2.0-6.0	0.17-0.19	7.4-8.4	Low----------	0.24			
	46-60	2-5	1.70-1.80	>20	0.02-0.04	7.4-8.4	Low----------	0.10			
TlB-------------- Tilsit	0-9	10-25	1.20-1.55	0.6-2.0	0.16-0.22	3.6-6.0	Low----------	0.43	3	5	1-3
	9-30	18-35	1.30-1.55	0.6-2.0	0.16-0.22	3.6-5.5	Low----------	0.43			
	30-52	18-35	1.40-1.65	0.06-0.2	0.08-0.12	3.6-5.5	Low----------	0.43			
	52-64	10-50	1.40-1.60	0.06-0.6	0.08-0.12	3.6-5.5	Low----------	0.43			
	64	---	---	---	---	---	-------------	----			
Ud. Udorthents											
WaD*:											
Wellston--------	0-7	13-27	1.30-1.50	0.6-2.0	0.18-0.22	3.6-6.5	Low----------	0.37	4	6	1-3
	7-35	18-35	1.30-1.65	0.6-2.0	0.17-0.21	4.5-6.0	Low----------	0.37			
	35-51	15-27	1.30-1.60	0.6-2.0	0.12-0.17	4.5-6.0	Low----------	0.37			
	51	---	---	---	---	---	-------------	----			
Berks-----------	0-3	5-23	1.20-1.50	2.0-6.0	0.08-0.12	3.6-6.5	Low----------	0.17	3	5	.5-3
	3-8	5-27	1.20-1.60	2.0-6.0	0.04-0.10	3.6-6.5	Low----------	0.17			
	8-27	5-20	1.20-1.60	2.0-6.0	0.04-0.10	3.6-6.5	Low----------	0.17			
	27	---	---	---	---	---	-------------	----			
Trevlac---------	0-10	5-15	1.25-1.45	0.6-2.0	0.20-0.24	4.5-7.3	Low----------	0.37	4	5	1-3
	10-37	10-25	1.25-1.50	0.6-2.0	0.03-0.14	3.6-5.5	Low----------	0.28			
	37	---	---	---	---	---	-------------	----			
WeC2*:											
Wellston--------	0-5	13-27	1.30-1.50	0.6-2.0	0.18-0.22	3.6-6.5	Low----------	0.37	4	6	1-3
	5-35	18-35	1.30-1.65	0.6-2.0	0.17-0.21	4.5-6.0	Low----------	0.37			
	35-52	15-27	1.30-1.60	0.6-2.0	0.12-0.17	4.5-6.0	Low----------	0.37			
	52	---	---	---	---	---	-------------	----			
Gilpin----------	0-6	15-27	1.20-1.40	0.6-2.0	0.12-0.18	3.6-6.0	Low----------	0.32	3	5	.5-4
	6-24	18-35	1.20-1.50	0.6-2.0	0.12-0.16	3.6-5.5	Low----------	0.24			
	24-36	15-35	1.20-1.50	0.6-2.0	0.08-0.12	3.6-5.5	Low----------	0.24			
	36	---	---	---	---	---	-------------	----			
Wt--------------- Wilbur	0-8	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
	8-60	10-17	1.30-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low----------	0.37			

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 19.--SOIL AND WATER FEATURES

("Flooding" and "water table" and terms such as "frequent," "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				
AvA: Avonburg	D	None	---	---	1.0-3.0	Perched	Jan-Apr	>60	---	High	High	High.
Ba: Bartle	D	None	---	---	1.0-2.0	Perched	Jan-Apr	>60	---	High	High	High.
Be: Beanblossom	B	Occasional	Very brief	Jan-Jun	3.0-5.0	Apparent	Feb-Jun	40-60	Soft	Moderate	Moderate	Moderate.
BgF*:												
Berks	C	None	---	---	>6.0	---	---	20-40	Soft	Low	Low	High.
Trevlac	B	None	---	---	>6.0	---	---	20-40	Soft	Moderate	Low	High.
Wellston	B	None	---	---	>6.0	---	---	>40	Soft	High	Moderate	High.
BnD2, BpD3: Bonnell	C	None	---	---	>6.0	---	---	>60	---	Moderate	High	Moderate.
Ca: Chagrin	B	Occasional	Brief	Nov-May	>6.0	---	---	>60	---	Moderate	Low	Moderate.
CdD2, CdF: Chetwynd	B	None	---	---	>6.0	---	---	>60	---	Moderate	Low	High.
CnC2: Cincinnati	C	None	---	---	2.5-3.0	Perched	Jan-Apr	>60	---	High	Moderate	High.
CwB: Crosby	C	None	---	---	1.0-3.0	Perched	Jan-Apr	>60	---	High	High	Moderate.
Hc: Haymond	B	Frequent	Brief	Jan-May	>6.0	---	---	>60	---	High	Low	Low.

See footnote at end of table.

TABLE 19.--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				
HkD2, HkF--------- Hickory	C	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
MaB--------------- Martinsville	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
MnC2-------------- Miami	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
PeB, PeC2--------- Pekin	C	None---------	---	---	2.0-6.0	Apparent	Mar-Apr	>60	---	High-----	Moderate	High.
Re*:												
Rensselaer--------	B/D	None---------	---	---	+.5-1.0	Apparent	Dec-May	>60	---	High-----	Moderate	Low.
Whitaker----------	C	None---------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Moderate.
RoB2-------------- Rossmoyne	C	None---------	---	---	1.5-3.0	Perched	Jan-Apr	>60	---	High-----	High-----	High.
Sf---------------- Steff	C	Frequent----	Brief-----	Dec-Apr	1.5-3.0	Apparent	Dec-Apr	>60	---	High-----	Moderate	High.
St, Sv------------ Stendal	C	Frequent----	Brief to very long.	Jan-May	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	High.
SwC2, SwD3-------- Stonehead	C	None---------	---	---	2.0-3.5	Perched	Jan-Apr	>40	Soft	High-----	Moderate	High.
SxD2*:												
Stonehead---------	C	None---------	---	---	2.0-3.5	Perched	Jan-Apr	>40	Soft	High-----	Moderate	High.
Trevlac-----------	B	None---------	---	---	>6.0	---	---	20-40	Soft	Moderate	Low------	High.
Sy---------------- Stonelick	B	Frequent----	Very brief to brief.	Nov-Jun	>6.0	---	---	>60	---	Moderate	Low------	Low.

See footnote at end of table.

TABLE 19.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic 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				
TlB: Tilsit	C	None	---	---	1.5-2.5	Perched	Jan-Apr	>40	Hard	High	High	High.
Ud. Udorthents												
WaD*:												
Wellston	B	None	---	---	>6.0	---	---	>40	Soft	High	Moderate	High.
Berks	C	None	---	---	>6.0	---	---	20-40	Soft	Low	Low	High.
Trevlac	B	None	---	---	>6.0	---	---	20-40	Soft	Moderate	Low	High.
WeC2*:												
Wellston	B	None	---	---	>6.0	---	---	>40	Soft	High	Moderate	High.
Gilpin	C	None	---	---	>6.0	---	---	20-40	Soft	Moderate	Low	High.
Wt: Wilbur	B	Frequent	Brief	Oct-Jun	1.5-3.0	Apparent	Mar-Apr	>60	---	High	Moderate	Moderate.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 20.--CLASSIFICATION OF THE SOILS

(An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series)

Soil name	Family or higher taxonomic class
Avonburg	Fine-silty, mixed, mesic Aeric Fragiaqualfs
Bartle	Fine-silty, mixed, mesic Aeric Fragiaqualfs
Beanblossom	Loamy-skeletal, mixed, nonacid, mesic Typic Udifluvents
Berks	Loamy-skeletal, mixed, mesic Typic Dystrochrepts
Bonnell	Fine, mixed, mesic Typic Hapludalfs
Chagrin	Fine-loamy, mixed, mesic Dystric Fluventic Eutrochrepts
Chetwynd	Fine-loamy, mixed, mesic Typic Hapludults
Cincinnati	Fine-silty, mixed, mesic Typic Fragiudalfs
*Crosby	Fine, mixed, mesic Aeric Ochraqualfs
Gilpin	Fine-loamy, mixed, mesic Typic Hapludults
Haymond	Coarse-silty, mixed, nonacid, mesic Typic Udifluvents
Hickory	Fine-loamy, mixed, mesic Typic Hapludalfs
Martinsville	Fine-loamy, mixed, mesic Typic Hapludalfs
Miami	Fine-loamy, mixed, mesic Typic Hapludalfs
Pekin	Fine-silty, mixed, mesic Aquic Fragiudalfs
Rensselaer	Fine-loamy, mixed, mesic Typic Argiaquolls
Rossmoyne	Fine-silty, mixed, mesic Aquic Fragiudalfs
Steff	Fine-silty, mixed, mesic Fluvaquentic Dystrochrepts
Stendal	Fine-silty, mixed, acid, mesic Aeric Fluvaquents
Stonehead	Fine-silty, mixed, mesic Ultic Hapludalfs
Stonelick	Coarse-loamy, mixed (calcareous), mesic Typic Udifluvents
Tilsit	Fine-silty, mixed, mesic Typic Fragiudults
Trevlac	Loamy-skeletal, mixed, mesic Typic Hapludults
Udorthents	Loamy, mixed, mesic Udorthents
Wellston	Fine-silty, mixed, mesic Ultic Hapludalfs
Whitaker	Fine-loamy, mixed, mesic Aeric Ochraqualfs
Wilbur	Coarse-silty, mixed, nonacid, mesic Aquic Udifluvents

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