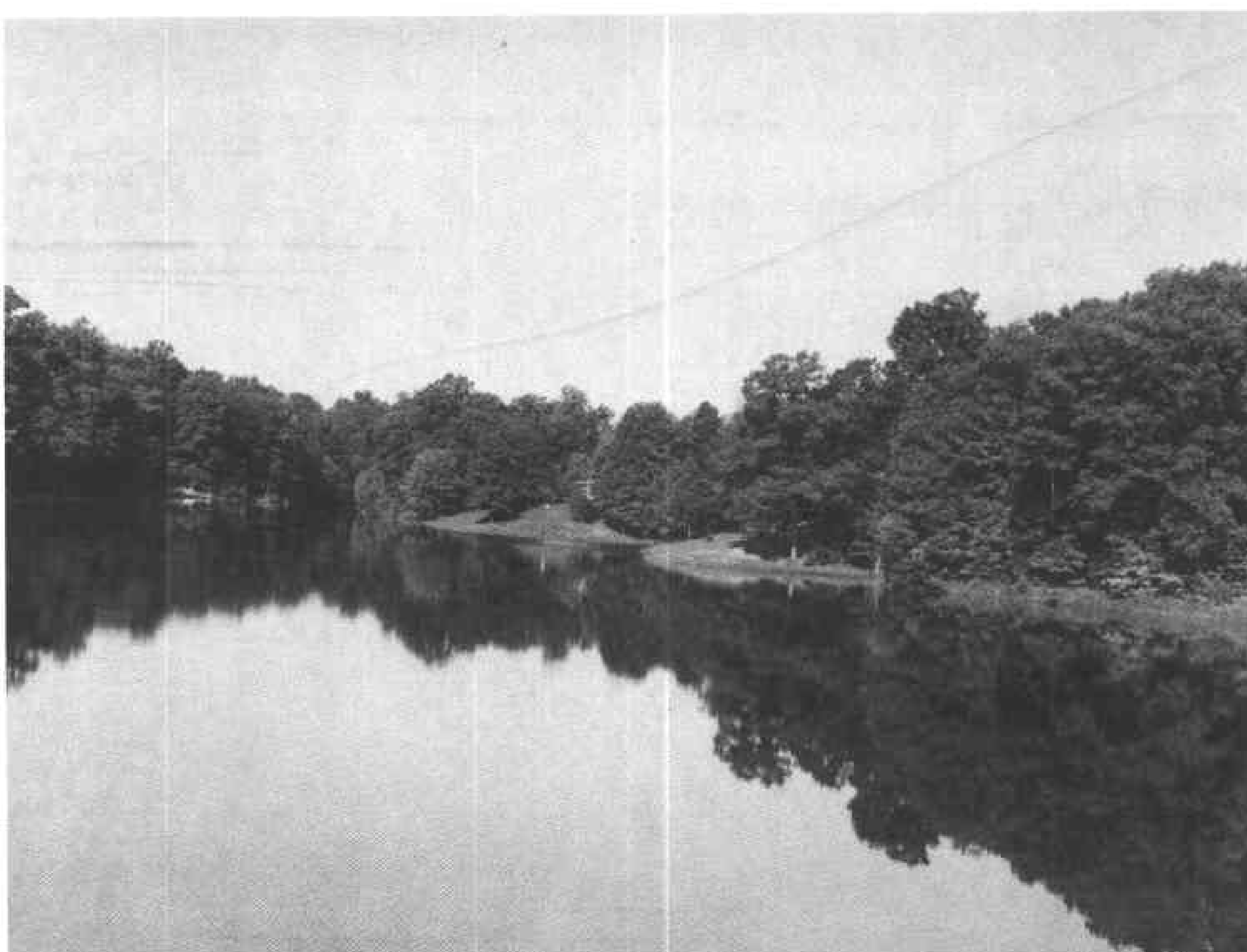
United States
Department of
Agriculture

Soil
Conservation
Service

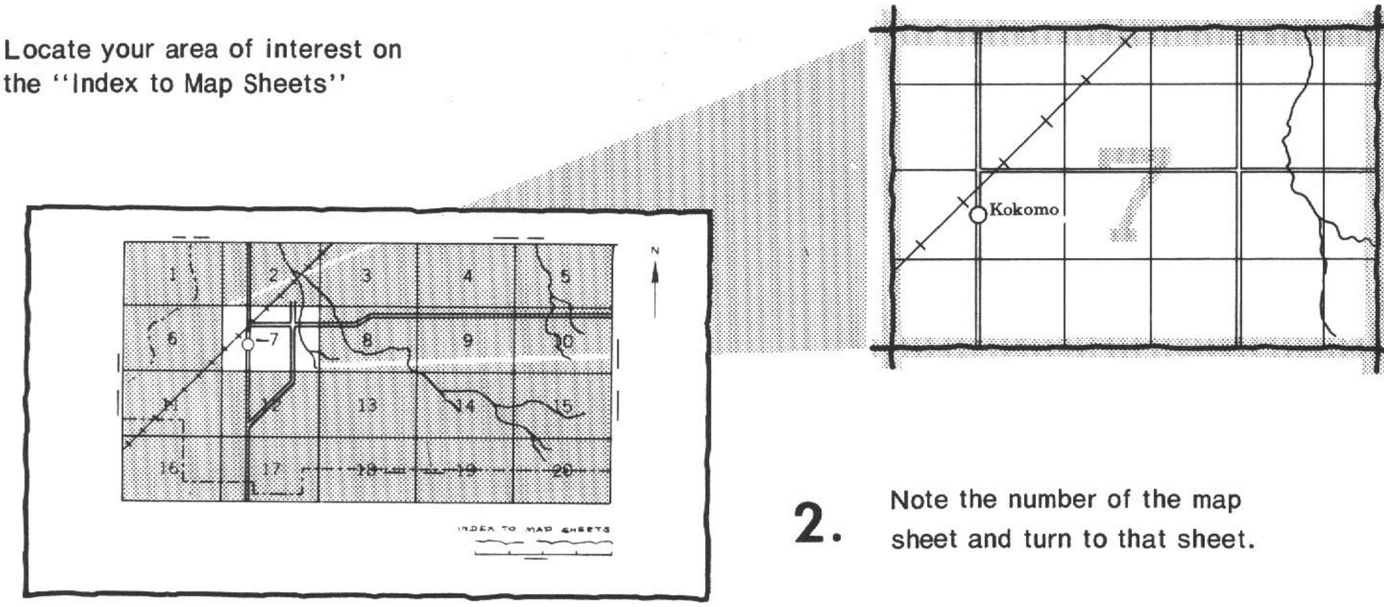
In cooperation with
the Purdue University
Agricultural Experiment
Station and the Indiana
Department of Natural
Resources, Soil and Water
Conservation Committee

Soil Survey of Pike County, Indiana



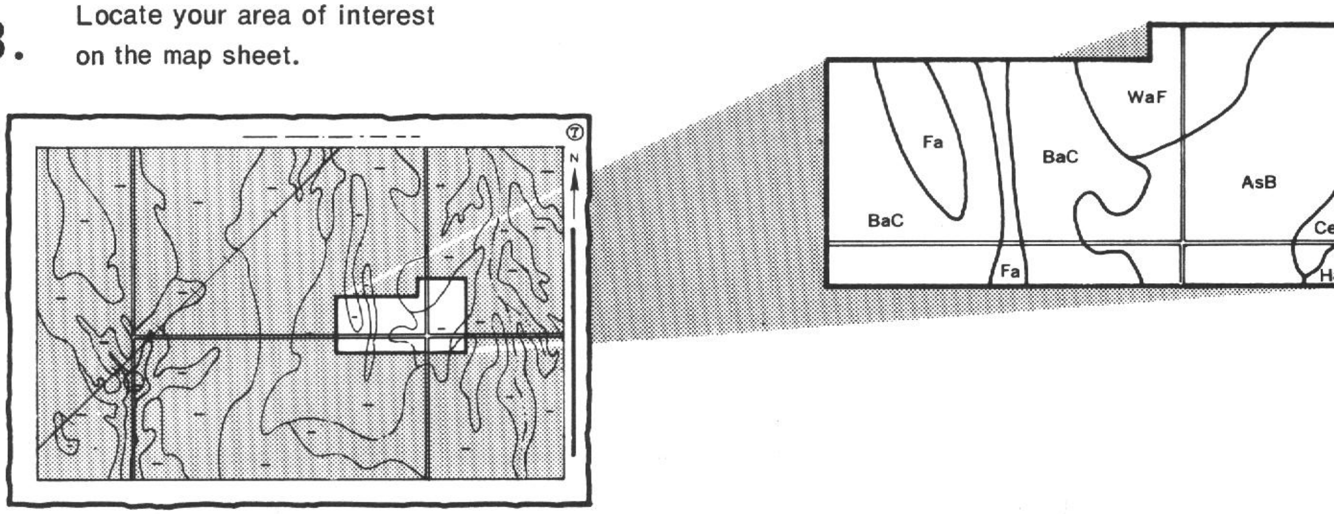
HOW TO USE

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

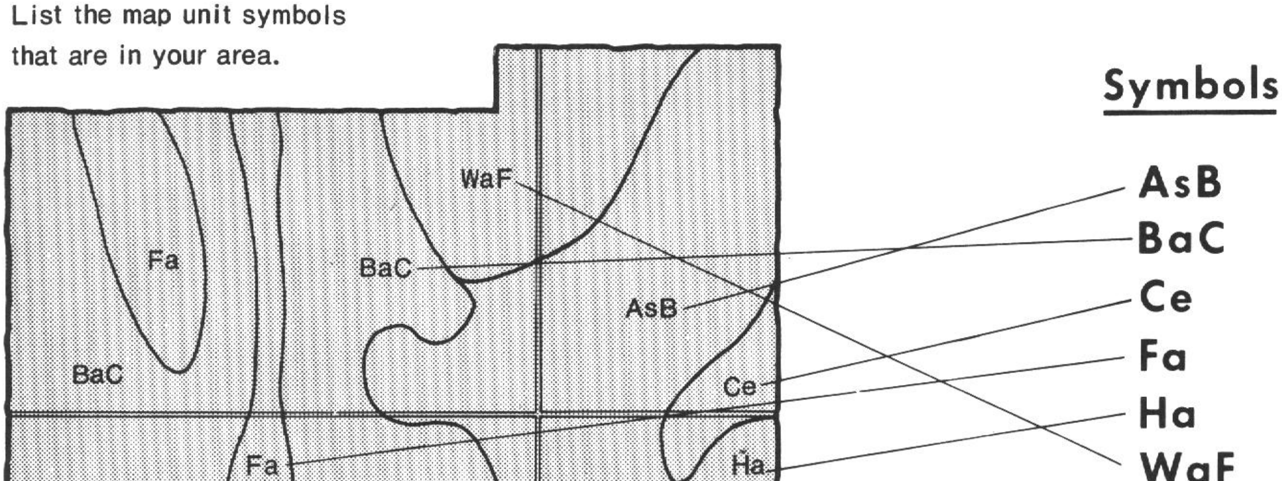


2. Note the number of the map sheet and turn to that sheet.

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

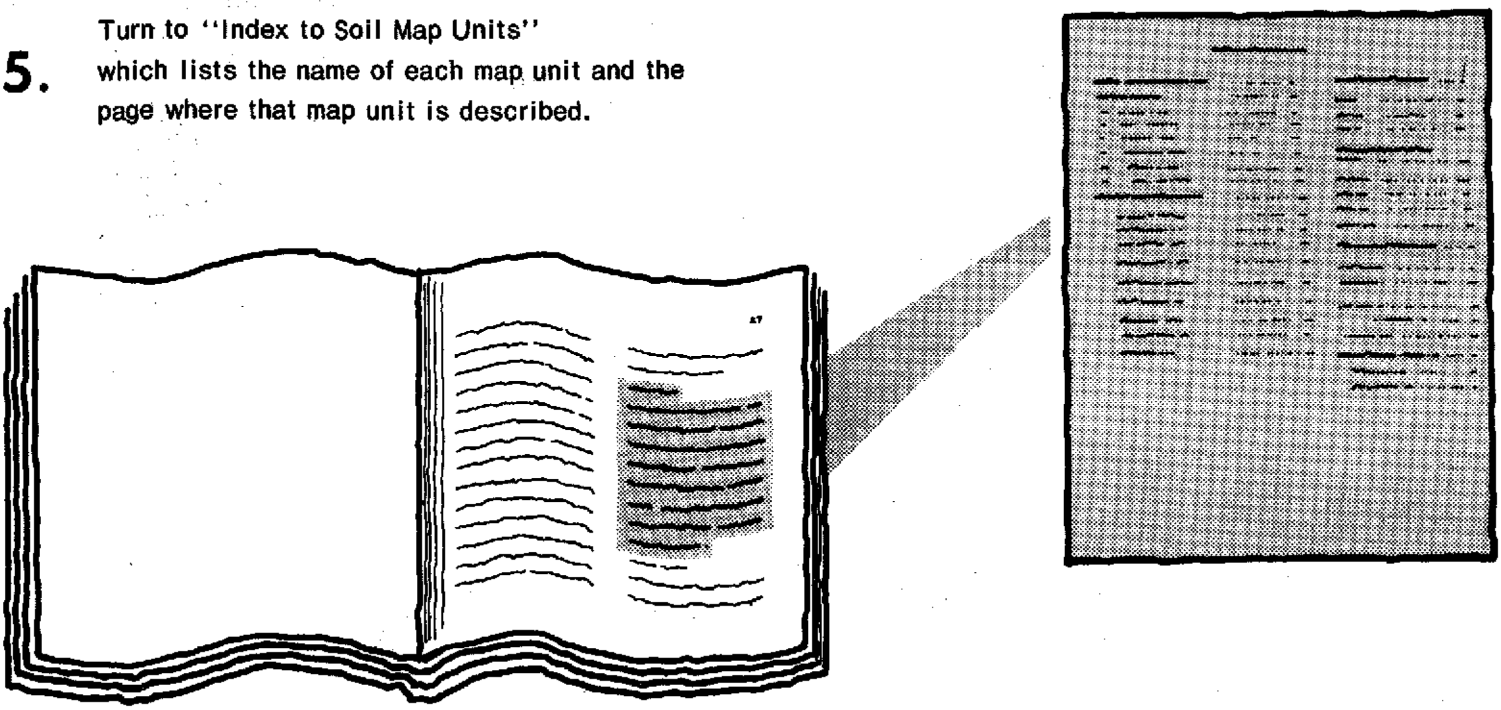


4. List the map unit symbols that are in your area.

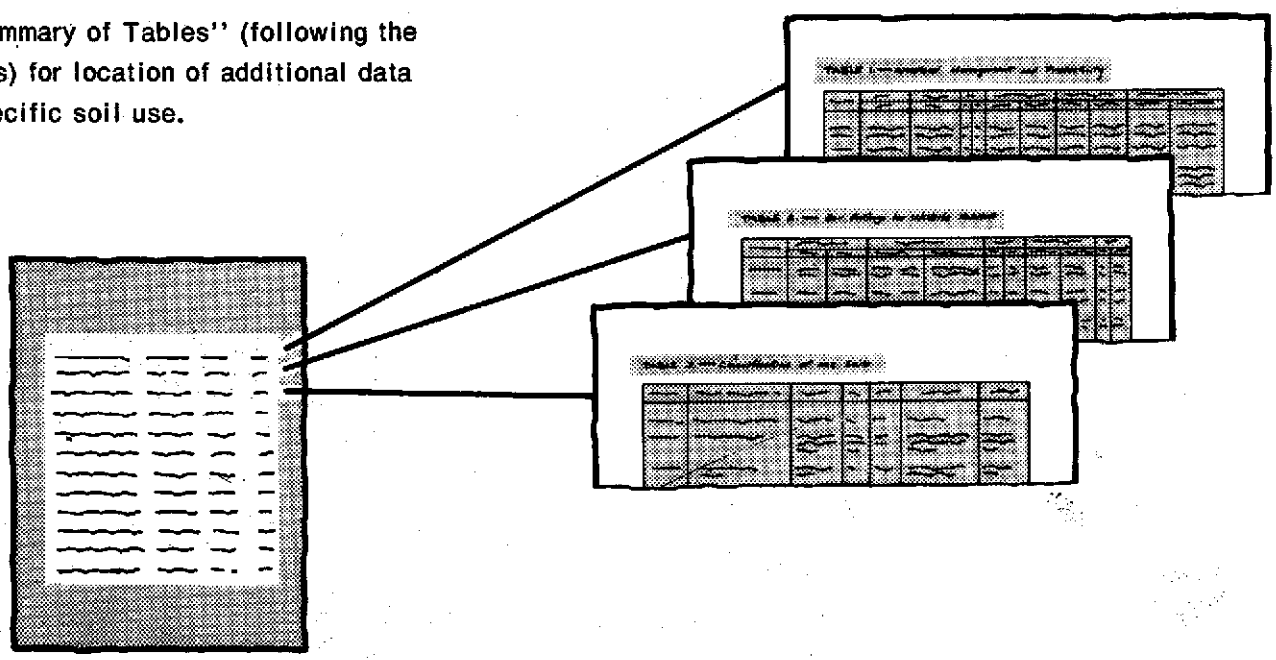


THIS SOIL SURVEY

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



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



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

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

Major fieldwork for this soil survey was completed in 1982. Soil names and descriptions were approved in 1983. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1982. This survey was made cooperatively by the Soil Conservation Service, the 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 Pike County Soil and Water Conservation District. Financial assistance was provided by the Pike County Board of 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 farm pond in an area of Zanesville and Wellston soils.

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Soil Series

Issued August 1987

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Summary of Tables

Foreword

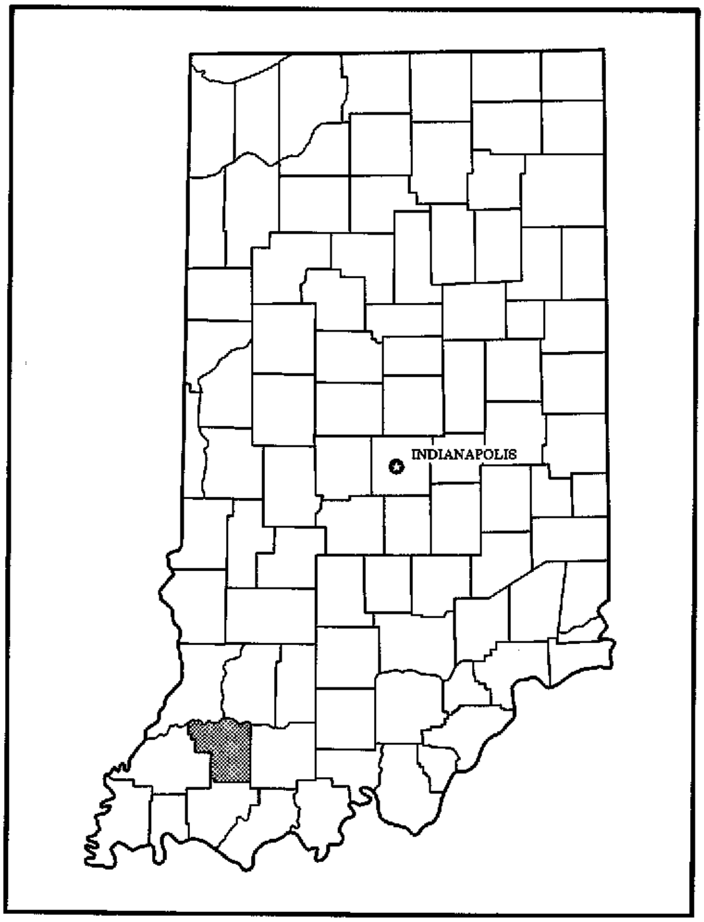
This soil survey contains information that can be used in land-planning programs in Pike County, Indiana. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the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

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

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

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

Robert L. Eddleman
State Conservationist
Soil Conservation Service



Location of Pike County in Indiana.

Soil Survey of
Pike County, Indiana

By Gary R. Struben, Soil Conservation Service

Fieldwork by Gary R. Struben, Kendall M. McWilliams, and Leo A. Kelly, Soil Conservation Service, and Curtis R. Crafton and Steven W. Neyhouse, Indiana Department of Natural Resources, Soil and Water Conservation Committee

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

PIKE COUNTY is in the southwestern part of Indiana. It is bordered on the north by the White River and the East Fork of the White River. It has an area of 218,407 acres, or 341 square miles. Petersburg, the county seat, is in the north-central part of the county, along the White River.

Farming is the main land use in the county. Slightly more than half of the county is farmland. Corn, soybeans, and wheat are the major crops. About one-third of the county is woodland. The main enterprises other than farming are the mining of bituminous coal and the production of oil and gas. Strip mining takes several hundred acres per year out of farm production. Most urban development in the county is centered around Petersburg. The acreage developed for urban uses is only slightly increasing.

This survey updates the soil survey of Pike County published in 1938 (*8*). It provides additional information and larger maps, which show the soils in greater detail.

General Nature of the County

This section gives general information about Pike County. It describes relief and drainage; water supply; climate; settlement; farming; and industries, transportation facilities, and markets.

Relief and Drainage

The highest point in Pike County is about 2.5 miles southeast of Stendal, in an area where a series of hills rises to a height of 660 feet above sea level. The lowest elevation is about 408 feet, at the point where the White River leaves the county. The average elevation is about 525 feet above sea level. The county is on the Wabash Lowland, which is characterized by filled-in valleys. The extensive stream bottoms in these valleys are out of proportion to the size of the streams. The elevation on this lowland gradually decreases from east to west.

The southeastern part of the county is rough, highly dissected land where the soils formed in a thin layer of loess and in material weathered from sandstone, siltstone, and shale. This area has long, narrow ridges and steep hillsides sloping sharply into narrow, V-shaped valleys.

The southwestern part of the county is characterized by long, smooth, rounded hills. The valleys are broader and more U-shaped than those in the southeastern part of the county. Throughout this area, some residual hills rise 20 to 40 feet above the surrounding land. These hills are remnants of the former landscape.

Because of the action of the Illinoian glacier, the northern part of the county is characterized by smooth relief. It is on nearly level, stream-dissected lake plains and on more thoroughly dissected, rolling till plains (*8*).

The Ohio River eventually receives all of the surface water in the county. The water in the extreme southeastern and southwestern parts drains directly into the Ohio. The water in the rest of the county reaches the Ohio indirectly through the Patoka, White, and Wabash Rivers. The Patoka River drains about two-thirds of the county, and the White River drains nearly all the rest (*8*).

Water Supply

Ground water is the main water source in Pike County. Petersburg and some of the surrounding communities obtain their water from wells on the plains along the White River. While the quantity of water obtained from these wells is abundant, more than 1,000 gallons per minute, there are some problems with quality, mainly a high content of iron and manganese. Some elements are removed by special treatment. Two communities, Winslow and Stendal, use surface water. Winslow draws water from the Patoka River, and Stendal draws water from a reservoir in Holland, in Dubois County (*7*).

A few areas in the uplands where lacustrine material is deposited may have moderate amounts of available ground water, as much as 200 gallons per minute. Examples are Otwell and the surrounding area. The rest of the upland areas have low amounts of available ground water, 10 gallons per minute or less. The supply is limited because of the restricted permeability of the underlying Pennsylvania sandstone, shale, and coal bedrock (*7*).

Climate

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

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

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

In winter the average temperature is 34 degrees F, and the average daily minimum temperature is 25 degrees. The lowest temperature on record, which occurred at Princeton on January 17, 1977, is -18 degrees. In summer the average temperature is 76 degrees, and the average daily maximum temperature is 87 degrees. The highest recorded temperature, which occurred on September 2, 1953, 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 43.62 inches. Of this, about 24 inches, or nearly 55 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 20 inches. The heaviest 1-day rainfall during the period of record was 4.89 inches at Princeton on March 9, 1964. Thunderstorms occur on about 45 days each year. Tornadoes and severe thunderstorms occur occasionally. These storms are usually local in extent and of short duration. They cause damage in a variable pattern.

The average seasonal snowfall is about 9 inches. The greatest snow depth at any one time during the period of record was 10 inches. On the average, 3 days of the year have at least 1 inch of snow on the ground.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 85 percent. The sun shines 75 percent of the time possible in summer and 45 percent in winter. The prevailing wind is from the southwest. Average windspeed is highest, 11 miles per hour, in spring.

Settlement

The first permanent settler in the survey area was Woolsey Pride, who settled in the White Oak Springs area about 1800. By 1811, a sufficient number of settlers had arrived to build a stockade at the present site of Petersburg. In 1817, the county was organized and named in honor of General Z.M. Pike. The earliest settlers were from the South and East (*5*).

Petersburg was established at a site that was a natural ford of the White River in pioneer days. Buffalo crossed the river at this site. Abraham Lincoln and his family forded the river at this spot.

The population of the county reached its peak in 1900, when it was 20,846. It was 12,281 in 1970 (*5*) and 13,465 in 1980 (*12*).

Farming

About 118,000 acres in Pike County, or 54 percent of the total acreage, is used as cropland, hayland, or pasture. About 57,000 acres is used for corn and soybeans, 26,000 acres for permanent hay and pasture, 17,000 acres for wheat and other small grain, and 5,000 acres for rotation hay and pasture. The rest of the farmland is used for conservation purposes, farmsteads, or feedlots or is left idle (*4*).

During the period 1969 to 1974, the number of farms in the county decreased from 669 to 526. The average size of the farms increased from 171 to 190 acres. The total acreage of farmland decreased (*11*). In many areas this decrease resulted from an increase in the acreage mined for coal. This trend is expected to continue in the future.

Industries, Transportation Facilities, and Markets

Coal mining is a major industry in the county. There are several mining companies located in the county. Petersburg and Winslow are coal-mining towns. The coal mining was originally shaft mining, which employed large numbers of people, but in recent years strip mining has largely replaced shaft mining. The switch to strip mining resulted in a decrease in the population of the county. About 4,800 acres was strip mined by 1936 (*5*).

Oil and gas are produced mainly in the western and southwestern parts of the county. Electrical power is generated by two plants located on the White River. The power plants provide many new jobs and a good outlet for the coal mined in the county.

The transportation facilities in Pike County include three railroads and eight state highways. The major north-south routes are Indiana Highways 57, 257, and 61. The major east-west routes are Indiana Highways 56, 64, and 356. Indiana Highways 364 and 65 also serve the county. Hard-surface or black-topped roads extend to most of the smaller towns. The rest of the roads either are surfaced with crushed limestone or are earthen roads.

Pike County is within the major livestock market areas of Evansville and Indianapolis, Indiana; Louisville, Kentucky; and St. Louis, Missouri. Grain-marketing elevators are located at Petersburg, Winslow, and Otwell. Some of the grain is consumed locally by livestock and stored in farmer-owned facilities. Trucks and railroads ship the grain at harvest time.

How This Survey Was Made

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

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

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

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

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

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

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

Map Unit Composition

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

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

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

General Soil Map Units

The general soil map at the back of this publication shows 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 map units.

Soil Descriptions

Areas Dominated by Deep, Nearly Level, Well Drained, Somewhat Poorly Drained, Poorly Drained, and Very Poorly Drained Soils on Flood Plains and Slack Water Terraces

These soils make up about 20 percent of the county. Most areas have been cleared and drained and are used for cultivated crops. Flooding and wetness are the main management concerns. Some areas are used as woodland or pasture. The soils are generally unsuitable for urban uses because of flooding and wetness.

1. Nolin-Haymond-Petrolia Association

Nearly level, well drained and poorly drained soils formed in alluvium; on flood plains

This association consists of soils on broad flood plains characterized by a swell and swale topography. It makes up about 4 percent of the county. It is about 31 percent Nolin soils, 24 percent Haymond soils, 10 percent Petrolia soils, and 35 percent soils of minor extent.

The well drained Nolin soils are on swells. Typically, they have a surface layer of dark brown silty clay loam and a subsoil of dark yellowish brown and yellowish brown silt loam. These soils are frequently flooded for brief or long periods and have a seasonal high water table at a depth of 3 to 6 feet during winter and early spring.

The well drained Haymond soils are on swells. Typically, they have a surface layer of dark yellowish brown silt loam and a subsoil of yellowish brown silt loam. These soils are frequently flooded for brief periods during winter and spring.

The poorly drained Petrolia soils are in narrow swales. Typically, they have a surface layer of dark grayish brown silty clay loam and a subsoil of gray, mottled silty clay loam. These soils are frequently flooded for long or very long periods and have a seasonal high water table above or near the surface from late winter to early summer.

Minor in this association are Stonelick, Stendal, Lindside, Armiesburg, and Wakeland soils. The well drained Stonelick soils are more sandy than the major soils. They are on small rises on the flood plains and in the lower positions next to stream channels. The somewhat poorly drained Stendal soils are on broad flood plains. The moderately well drained Lindside soils formed in alluvial deposits in sloughs. The well drained Armiesburg soils have a dark surface layer. They are in the slightly higher positions on the flood plains. The somewhat poorly drained Wakeland soils are along the smaller streams.

This association is used mainly for cultivated crops. A few areas are used for hay and pasture or are wooded. The association is well suited to cultivated crops and woodland. It is poorly suited to specialty crops, urban uses, and intensive recreation uses. It is fairly well suited to extensive recreation uses. The flooding is a severe hazard, and the wetness is a problem in some areas.

2. Armiesburg-Vincennes Variant-Wilhite Association

Nearly level, well drained, poorly drained, and very poorly drained soils formed in alluvium; on flood plains and slack water terraces

This association consists of soils on broad flood plains and slack water terraces characterized by a swell and swale topography. It makes up about 3 percent of the county. It is about 29 percent Armiesburg soils, 23 percent Vincennes Variant soils, 18 percent Wilhite soils, and 30 percent soils of minor extent.

The well drained Armiesburg soils are on swells on flood plains. Typically, they have a surface layer of very dark grayish brown silty clay loam and a subsoil of dark brown and dark yellowish brown silty clay loam. These soils are occasionally flooded for brief periods during winter and spring.

The poorly drained Vincennes Variant soils are in swales on slack water terraces and flood plains. Typically, they have a surface layer of dark grayish brown clay loam and a subsoil of dark gray and gray, mottled clay loam. These soils have a seasonal high water table at or slightly below the surface and are occasionally flooded for brief periods during winter and spring.

The very poorly drained Wilhite soils are in swales on slack water terraces and flood plains. Typically, they have a surface layer of dark gray silty clay loam and a subsoil of dark gray and gray, mottled silty clay loam and silty clay. These soils have a seasonal high water table near or slightly above the surface and are frequently flooded for brief or long periods during winter and spring.

Minor in this association are Huntsville, Petrolia, Nolin, Lindside, and Stendal soils. The well drained Huntsville soils have a surface layer that is thicker than that of the major soils. They are on the higher lying swells adjacent to the White River. The poorly drained Petrolia soils are in swales on flood plains. They are more silty than the major soils. The well drained Nolin soils are on swells on flood plains. They have a surface layer that is browner than that of the major soils. The moderately well drained Lindside soils formed in alluvial deposits in sloughs. The somewhat poorly drained Stendal soils are on broad flats on flood plains.

This association is used mainly for cultivated crops. Some areas are used for hay and pasture. A few are wooded. The association is well suited to cultivated crops. It is fairly well suited to woodland and extensive recreation uses. It is poorly suited to specialty crops, urban uses, and intensive recreation uses. The flooding is a severe hazard, and the wetness is a severe limitation.

3. Belknap-Bonnie-Wakeland Association

Nearly level, somewhat poorly drained and poorly drained soils formed in alluvium; on flood plains

This association consists of soils on broad to narrow flood plains characterized by a swell and swale topography. It makes up about 13 percent of the county. It is about 40 percent Belknap soils, 23 percent Bonnie soils, 9 percent Wakeland soils, and 28 percent soils of minor extent.

The somewhat poorly drained Belknap soils are on the narrow flood plains and on gradual swells on the broader flood plains. They are near stream channels. Typically, they have a surface layer of brown silt loam and a substratum of grayish brown and light brownish gray, mottled silt loam. These soils have a seasonal high water table at a depth of 1 to 3 feet. They are rarely or frequently flooded for brief or long periods during winter and spring.

The poorly drained Bonnie soils are mainly in slightly concave swales on the broader flood plains. They are farther away from stream channels than the Belknap soils. Typically, they have a surface layer of grayish brown silt loam and a substratum of gray, mottled silt loam. These soils have a seasonal high water table above or near the surface. They are frequently flooded or ponded for brief or long periods in the spring.

The somewhat poorly drained Wakeland soils are in areas of local alluvial deposits, mainly on narrow flood plains. Typically, they have a surface layer of brown silt loam and a substratum of brown and grayish brown, mottled silt loam. These soils have a seasonal high water table at a depth of 1 to 3 feet. They are frequently flooded for brief or long periods during winter and spring.

Minor in this association are Steff, Birds, Bartle, Pekin, Beaucoup, Fairpoint, and Bethesda soils. The moderately well drained Steff soils are on swells along stream channels. The poorly drained Birds soils are in slightly concave areas on broad flood plains. They are less acid than the major soils. The somewhat poorly drained Bartle and moderately well drained Pekin soils are on the slightly higher stream terraces. Bartle soils are more clayey than the major soils. The poorly drained Beaucoup soils have a dark surface layer and are in depressions on broad flood plains. The well drained, gently sloping to very steep Fairpoint and Bethesda soils are on uplands.

This association is used mainly for cultivated crops. Some areas are used for hay and pasture. Some are wooded. The association is well suited to cultivated crops and woodland. It is fairly well suited to extensive recreation uses. It is poorly suited to specialty crops, urban uses, and intensive recreation uses. The flooding is a severe hazard, and the wetness is a severe limitation.

Areas Dominated by Deep, Nearly Level to Very Steep, Well Drained and Somewhat Excessively Drained Soils on Uplands and Terraces

These soils make up about 12 percent of the county. They are used mainly for cultivated crops, hay, and pasture. Erosion, droughtiness, and slope are the main management concerns. Some areas are used as woodland and a few as urban land. The less sloping areas are suitable for urban uses.

4. Alvin-Bloomfield Association

Gently sloping to very steep, well drained and somewhat excessively drained soils formed in windblown sand and silt; on uplands and terraces

This association consists of soils on ridgetops and side slopes and in dunelike areas on uplands and terraces. It makes up about 3 percent of the county. It is about 41 percent Alvin soils, 16 percent Bloomfield soils, and 43 percent soils of minor extent (fig. 1).

The well drained Alvin soils are gently sloping on ridgetops and moderately sloping in dunelike areas. Typically, they have a surface layer of dark brown fine sandy loam and a subsoil of yellowish brown and brown fine sandy loam and loamy fine sand.

The somewhat excessively drained Bloomfield soils are moderately sloping and strongly sloping in dunelike areas and steep and very steep on side slopes. Typically, they have a surface layer of dark brown sand and a subsurface layer of yellowish brown sand. The

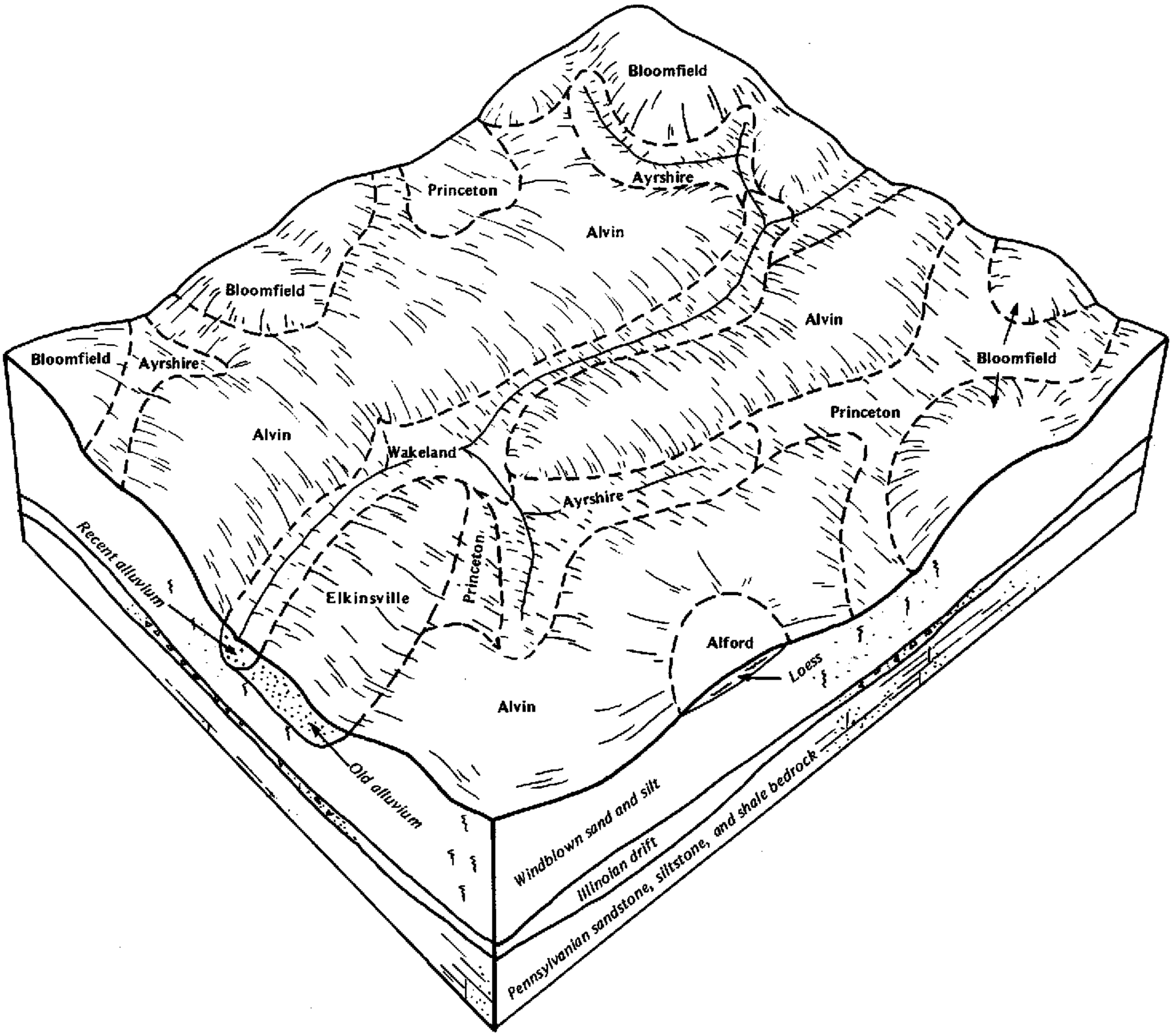


Figure 1.—Typical pattern of soils and parent material in the Alvin-Bloomfield association.

subsoil is yellowish brown sand and dark brown loamy sand or fine sand and has bands of dark brown fine sandy loam and yellowish brown fine sand and sand.

Minor in this association are Princeton, Ayrshire, Elkinsville, Alford, Sylvan, and Wakeland soils. The well drained, nearly level Princeton soils have more clay in the subsoil than the major soils. They are on ridgetops and terraces. The somewhat poorly drained Ayrshire soils are in slightly concave and nearly level areas on the lower lying uplands. The well drained, silty, nearly level Elkinsville soils are on terraces. The well drained, silty Alford and Sylvan soils are gently sloping on ridgetops and moderately sloping on side slopes. The somewhat poorly drained, nearly level Wakeland soils are on narrow flood plains.

This association is used mainly for cultivated crops, hay, and pasture. Some areas are wooded. A few are used as urban land. The association is well suited to specialty crops, particularly in the less sloping areas. It is fairly well suited to cultivated crops, woodland, urban uses, and intensive and extensive recreation uses. Droughtiness, slope, and sandiness are limitations, and erosion is a hazard. Some areas are too steep for these uses.

5. Alford-Sylvan Association

Nearly level to very steep, well drained soils formed in loess; on uplands and terraces

This association consists of soils that are nearly level and gently sloping on ridges and moderately sloping to very steep on side slopes. It makes up about 9 percent of the county. It is about 49 percent Alford soils, 10 percent Sylvan soils, and 41 percent soils of minor extent (fig. 2).

Alford soils are nearly level and gently sloping on ridges and moderately sloping on side slopes. Typically, they have a surface layer of dark brown silt loam and a subsoil of brown and strong brown silty clay loam and silt loam.

The gently sloping to very steep Sylvan soils are on ridges and side slopes. Typically, they have a surface layer of dark brown silt loam and a subsoil of dark yellowish brown and yellowish brown silty clay loam and silt loam.

Minor in the association are Hosmer, Muren, Iona, Iva, Reesville, Pike, Hickory, Chetwynd, Wellston, Wakeland, Birds, Alvin, Fairpoint, and Bethesda soils. The well drained Hosmer soils are nearly level and gently sloping on ridges and gently sloping to strongly sloping on side slopes. They have a fragipan. The moderately well drained, nearly level Muren and Iona soils are on ridges. The somewhat poorly drained Iva and Reesville soils are on flats and at the head of drainageways. The well drained, strongly sloping to very steep Pike, Hickory, Chetwynd, and Wellston soils are on side slopes. They are more sandy than the major soils. The somewhat poorly drained Wakeland and poorly drained Birds soils are at the base of side slopes along drainageways. The well drained, sandy, gently sloping and moderately sloping Alvin soils are in dunelike areas. The well drained, gently sloping to very steep Fairpoint and Bethesda soils are in surface-mined areas. They are less silty than the major soils.

This association is used mainly for cultivated crops, hay, and pasture. Some areas are wooded. A few are used as urban land. The association is well suited to cultivated crops, specialty crops, woodland, urban uses, and intensive and extensive recreation uses. The erosion hazard and the slope are the major management concerns.

Areas Dominated by Deep, Nearly Level to Strongly Sloping, Well Drained to Somewhat Poorly Drained Soils on Glacial Lake Plains

These soils make up about 9 percent of the county. They are used mainly for cultivated crops. The erosion hazard and wetness are the main management concerns. Some areas are used for hay or pasture or for woodland. A few are used as urban land. The soils are poorly suited to urban uses because of the wetness and very slow or slow permeability.

6. Otwell-Haubstadt-Dubois Association

Nearly level to strongly sloping, well drained to somewhat poorly drained soils formed in loess and in stratified glacial outwash and lacustrine deposits; on glacial lake plains

This association consists of soils on broad flats, ridges, and side slopes on glacial lake plains. It makes up about 9 percent of the county. It is about 33 percent Otwell soils, 28 percent Haubstadt soils, 14 percent Dubois soils, and 25 percent soils of minor extent (fig. 3).

The well drained Otwell soils are gently sloping on narrow ridges and moderately sloping or strongly sloping on side slopes. Typically, they have a surface layer of yellowish brown silt loam. The subsoil is dark yellowish brown silty clay loam in the upper part; a fragipan of dark yellowish brown and dark brown, mottled silt loam in the next part; and yellowish brown, mottled silt loam in the lower part. These soils have a perched seasonal high water table at a depth of 3.5 to 6.0 feet.

The moderately well drained, nearly level and gently sloping Haubstadt soils are on ridges. Typically, they have a surface layer of dark brown silt loam. The upper part of the subsoil is yellowish brown, mottled silt loam. The next part is a fragipan of yellowish brown, mottled silty clay loam. The lower part is dark yellowish brown and brownish yellow, mottled silt loam that has strata of silty clay loam. These soils have a perched seasonal high water table at a depth of 1.5 to 3.0 feet.

The somewhat poorly drained, nearly level Dubois soils are on broad flats. Typically, they have a surface layer of brown silt loam and a subsurface layer of light

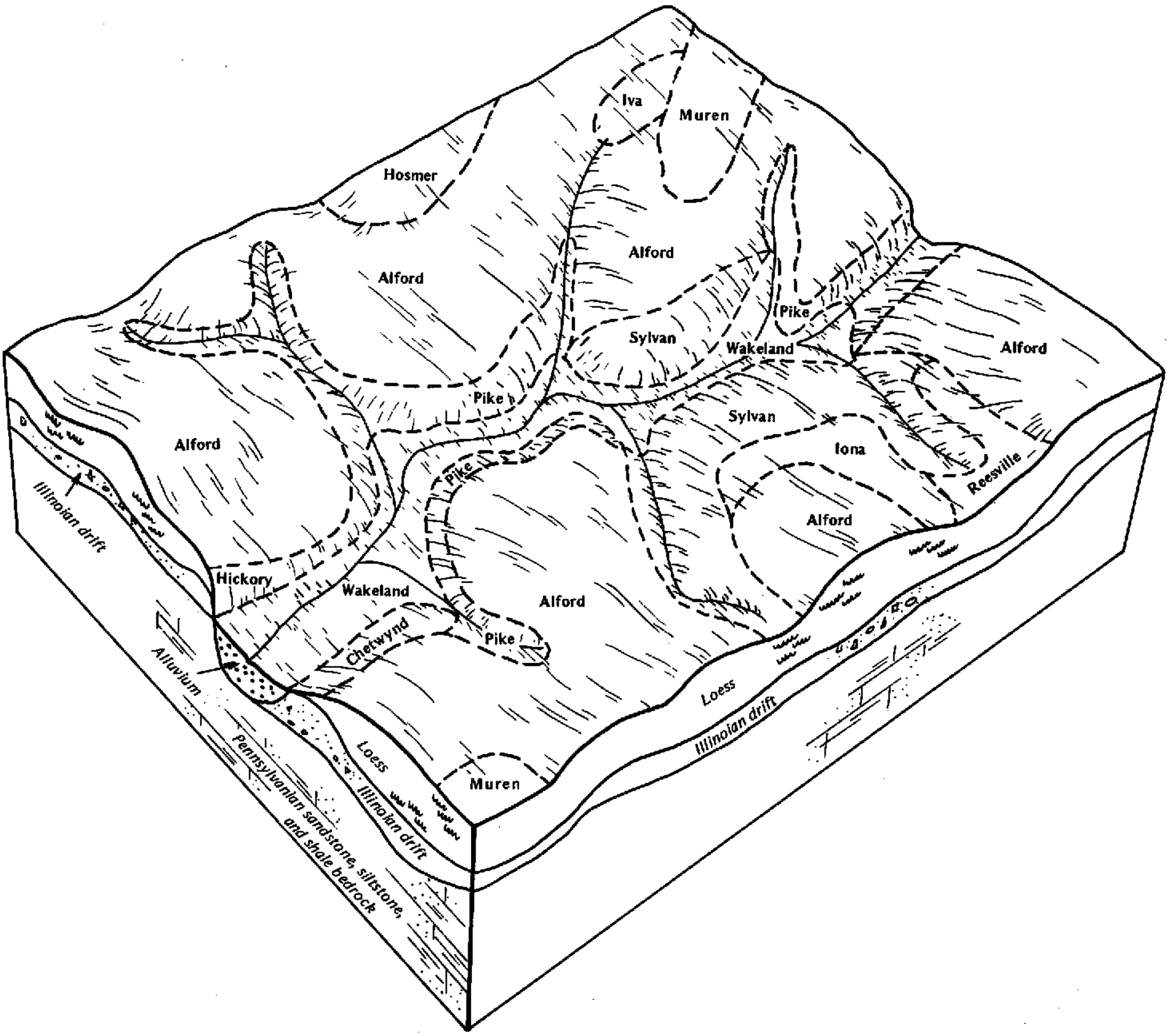


Figure 2.—Typical pattern of soils and parent material in the Alford-Sylvan association.

yellowish brown, mottled silt loam. The upper part of the subsoil is light brownish gray, mottled silty clay loam. The lower part is a fragipan of light brownish gray and yellowish brown, mottled silty clay loam and silt loam. These soils have a seasonal high water table at a depth of 1 to 3 feet.

Minor in this association are Pike, Hickory, Hosmer, Peoga, Bonnie, Wakeland, Belknap, and Steff soils. The well drained, sandy, strongly sloping to very steep Pike and Hickory soils are on side slopes. The well drained Hosmer soils are in the higher landscape positions. The poorly drained Peoga soils are near the center of the broad flats. The poorly drained Bonnie, somewhat poorly drained Wakeland and Belknap, and moderately well drained Steff soils are along small streams and in depressions.

This association is used mainly for cultivated crops. Some areas are used for hay and pasture. Some are wooded. A few are used as urban land. The association is fairly well suited to cultivated crops, woodland, and

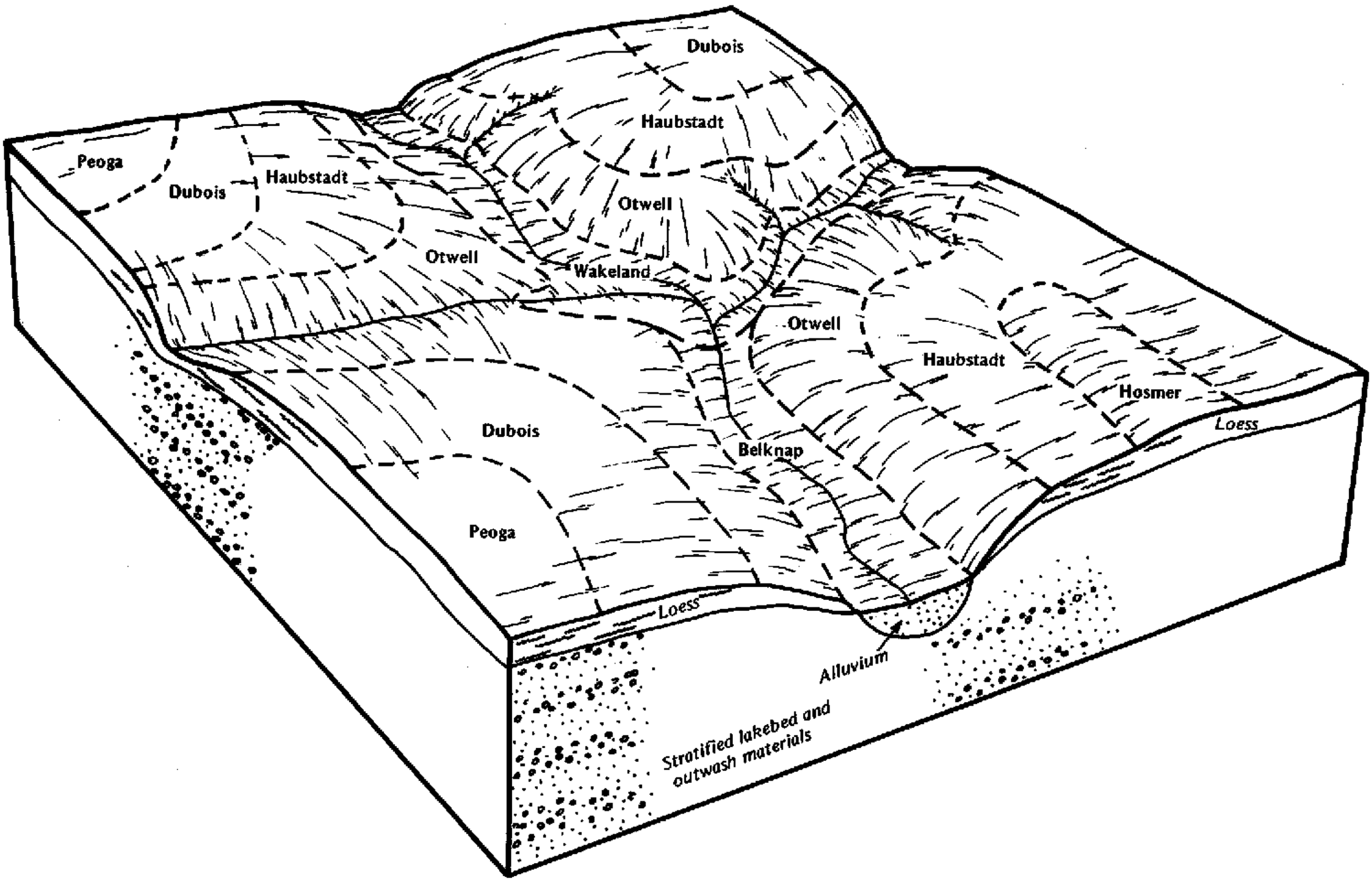


Figure 3.—Typical pattern of soils and parent material in the Otwell-Haubstadt-Dubois association.

intensive and extensive recreation uses. It is poorly suited to specialty crops and urban uses. Erosion is a hazard. The fragipan in the major soils restricts permeability and rooting depth. Wetness is a problem when the water table is perched on the fragipan.

Areas Dominated by Deep, Nearly Level to Strongly Sloping, Well Drained and Moderately Well Drained Soils on Uplands

These soils make up about 28 percent of the county. They are used mainly for cultivated crops, hay, and pasture. The erosion hazard is the main management concern. Some areas are wooded, and a few are used as urban land. The soils are poorly suited to urban uses because of wetness, very slow permeability, and slope.

7. Hosmer Association

Nearly level to strongly sloping, well drained soils formed in loess; on uplands

This association consists of soils on ridges and side slopes in the uplands. It makes up about 11 percent of the county. It is about 60 percent Hosmer soils and 40 percent soils of minor extent.

Hosmer soils are nearly level and gently sloping on broad ridges and gently sloping to strongly sloping on side slopes. Typically, they have a surface layer of brown silt loam. The subsoil is yellowish brown silty clay loam and silt loam in the upper part; a fragipan of strong brown and yellowish brown silt loam in the next part; and yellowish brown silt loam in the lower part. These soils have a perched seasonal high water table at a depth of 2.5 to 3.0 feet.

Minor in this association are Iva, Belknap, Wakeland, Fairpoint, Bethesda, Hickory, Wellston, Gilpin, Alford, and Pekin soils. The somewhat poorly drained Iva soils are on flats and in slightly concave areas at the head of drainageways. The somewhat poorly drained Belknap and Wakeland soils are at the base of side slopes along drainageways. The well drained, gently sloping to very steep Fairpoint and Bethesda soils are in surface-mined areas. They are sandier than the Hosmer soils. The well drained, steep and very steep Hickory, Wellston, and Gilpin soils are on side slopes. They are less silty than the Hosmer soils. The well drained Alford soils are gently sloping on ridges and moderately sloping on side slopes. They do not have a fragipan. The moderately well drained Pekin soils are on the lower lying terraces.

This association is used mainly for cultivated crops, hay, and pasture. Some areas are wooded. A few are used as urban land. The association is fairly well suited to cultivated crops, woodland, and extensive recreation uses. It is poorly suited to specialty crops, urban uses, and intensive recreation uses. Erosion is a hazard. The fragipan in the Hosmer soils restricts rooting depth and permeability. Wetness is a problem when the water table is perched on the fragipan.

8. Zanesville-Hosmer Association

Gently sloping to strongly sloping, moderately well drained and well drained soils formed in loess or in loess and material weathered from sandstone, siltstone, and shale; on uplands

This association consists of soils on ridges and side slopes in the uplands. It makes up about 17 percent of the county. It is about 33 percent Zanesville soils, 30 percent Hosmer soils, and 37 percent soils of minor extent.

The moderately well drained, moderately sloping and strongly sloping Zanesville soils are on side slopes. Typically, they have a surface layer of yellowish brown silt loam. The subsoil is strong brown silt loam in the upper part; yellowish brown silty clay loam in the next part; and a fragipan of yellowish brown and dark brown silt loam in the lower part. These soils have a perched seasonal high water table at a depth of 2 to 3 feet.

The well drained Hosmer soils are gently sloping on broad ridges and gently sloping and moderately sloping on side slopes. Typically, they have a surface layer of brown silt loam. The subsoil is yellowish brown silty clay loam and silt loam in the upper part; a fragipan of strong brown and yellowish brown silt loam in the next part; and yellowish brown silt loam in the lower part. These soils have a perched seasonal high water table at a depth of 2.5 to 3.0 feet.

Minor in this association are Wellston, Gilpin, Fairpoint, Bethesda, Belknap, Wakeland, Bonnie, Steff, and Pekin soils. The well drained, strongly sloping to steep Wellston and Gilpin soils, which do not have a fragipan, are on side slopes. The well drained, nearly level to very steep Fairpoint and Bethesda soils are in surface-mined areas. The somewhat poorly drained Belknap and Wakeland, poorly drained Bonnie, and moderately well drained Steff soils are at the base of side slopes along drainageways. The moderately well drained Pekin soils are on the lower lying stream terraces.

This association is used mainly for cultivated crops, hay, and pasture. Some areas are wooded. A few are used as urban land. The association is fairly well suited to cultivated crops, woodland, and extensive recreation uses. It is poorly suited to specialty crops, urban uses, and intensive recreation uses. Erosion is a hazard. The fragipan in the major soils restricts permeability and rooting depth. Wetness is a problem when the water table is perched on the fragipan.

Areas Dominated by Deep, Nearly Level to Very Steep, Well Drained Soils on Surface-Mined Uplands

These soils make up about 16 percent of the county. They are used mainly for pasture or hay or for woodland. Some areas are used for cultivated crops. Slope, the erosion hazard, and droughtiness are the main management concerns. The soils are poorly suited or unsuited to urban uses because of shrinking and swelling, large stones, moderately slow permeability, slope, and soil slippage.

9. Fairpoint-Bethesda Association

Nearly level to very steep, well drained soils formed in regolith in surface-mined areas; on uplands

This association is in steep and very steep areas where overburden was cast aside during mining and in nearly level to strongly sloping areas where the overburden was smoothed and shaped. The association makes up about 16 percent of the county. It is about 50 percent Fairpoint soils, 30 percent Bethesda soils, and 20 percent soils of minor extent.

Fairpoint soils are in nearly level to very steep areas. Typically, they have a thin surface layer of very dark grayish brown very shaly silt loam. The substratum is mottled dark grayish brown, yellowish brown, and dark yellowish brown very shaly silty clay loam and very shaly silt loam.

Bethesda soils are in moderately sloping to very steep areas. Typically, they have a thin surface layer of dark grayish brown shaly silt loam. The substratum is yellowish brown, mottled shaly and very shaly silty clay loam.

Minor in this association are Hosmer, Gilpin, Alford, Zanesville, Bonnie, Wakeland, Belknap, and Steff soils and mine dumps. The well drained, silty Hosmer, Gilpin, and Alford and moderately well drained, silty Zanesville soils are nearly level and gently sloping on ridges and moderately sloping to very steep on side slopes in the uplands. The poorly drained Bonnie, somewhat poorly drained Wakeland and Belknap, and moderately well drained Steff soils are on the lower lying flood plains.

This association is used mainly for pasture, hay, and woodland. Some areas are used for cultivated crops. The association is generally unsuited to cultivated crops and specialty crops because of the slope. It is poorly suited to woodland, urban uses, and intensive and extensive recreation uses. The hazard of erosion, a low available water capacity, and the slope are the major management concerns. The use of tillage and harvesting equipment is limited in some areas because of rock fragments on the surface. Restricted permeability is a limitation in septic tank absorption fields.

Areas Dominated by Deep and Moderately Deep, Gently Sloping to Very Steep, Moderately Well Drained and Well Drained Soils on Uplands

These soils make up about 14 percent of the county. They are used mainly for hay, pasture, and woodland. Some areas are used for cultivated crops. The erosion hazard and the slope are the main management concerns. The soils are poorly suited or unsuited to urban uses because of very slow permeability, wetness, slope, and the depth to bedrock.

10. Zanesville-Gilpin Association

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

This association consists of soils on ridges and side slopes in the uplands. It makes up about 14 percent of the county. It is about 46 percent Zanesville soils, 32 percent Gilpin soils, and 22 percent soils of minor extent.

The deep, moderately well drained Zanesville soils are gently sloping on narrow ridges and moderately sloping and strongly sloping on side slopes. Typically, they have a surface layer of yellowish brown silt loam. The subsoil is strong brown silt loam in the upper part; yellowish brown silty clay loam in the next part; and a fragipan of yellowish brown and dark brown silt loam in the lower part. These soils have a perched seasonal high water table at a depth of 2 to 3 feet.

The moderately deep, well drained, strongly sloping to very steep Gilpin soils are on side slopes. Typically, they have a surface layer of very dark grayish brown silt loam, a subsurface layer of dark brown silt loam, and a subsoil of yellowish brown loam, channery clay loam, and very channery loam. Sandstone bedrock is at a depth of about 35 inches.

Minor in this association are Berks, Fairpoint, Bethesda, Wellston, Bonnie, Belknap, Steff, Pekin, and Hosmer soils. The well drained, steep and very steep Berks soils are on side slopes. They are more sandy than the major soils. The well drained, gently sloping to very steep Fairpoint and Bethesda soils are in surface-mined areas. The well drained, strongly sloping to steep Wellston soils are on side slopes. They do not have a fragipan. The poorly drained Bonnie, somewhat poorly drained Belknap, and moderately well drained Steff soils are at the base of side slopes along drainageways. The moderately well drained Pekin soils are on low stream terraces. The well drained Hosmer soils are on the higher lying ridges. They have a fragipan.

This association is used mainly for hay, pasture, and woodland. Some areas are used for cultivated crops. The association is fairly well suited to woodland and extensive recreation uses and poorly suited to cultivated crops, specialty crops, urban uses, and intensive recreation uses. The hazard of erosion and the slope are the major management concerns. The fragipan in the Zanesville soils and the moderate depth to bedrock in the Gilpin soils are additional concerns.

Areas Dominated by Deep, Nearly Level to Strongly Sloping, Somewhat Poorly Drained and Well Drained Soils on Lake Plains and Terraces

These soils make up about 1 percent of the county. They are used mainly for cultivated crops. Wetness and the erosion hazard are the main management concerns. A few areas are used for hay or pasture or for woodland. These soils are poorly suited to urban uses because of wetness, slow permeability, and shrinking and swelling.

11. McGary-Henshaw-Markland Association

Nearly level to strongly sloping, somewhat poorly drained and well drained soils formed in lacustrine sediments; on lake plains and terraces

This association consists of soils on flats and side slopes on lake plains and terraces (fig. 4). It makes up about 1 percent of the county. It is about 34 percent McGary soils, 16 percent Henshaw soils, 15 percent Markland soils, and 35 percent soils of minor extent (fig. 5).

The somewhat poorly drained, nearly level McGary soils are on broad flats. Typically, they have a surface layer of dark grayish brown silty clay loam and a subsoil of olive brown and grayish brown, mottled silty clay and silty clay loam. These soils have a seasonal high water table at a depth of 1 to 3 feet.

The somewhat poorly drained, nearly level Henshaw soils are on broad flats. Typically, they have a surface layer of dark brown silt loam and a subsoil of yellowish brown, mottled silt loam and silty clay loam. These soils have a seasonal high water table at a depth of 1 to 2 feet.

The well drained, moderately sloping and strongly sloping Markland soils are on narrow side slopes. Typically, they have a surface layer of yellowish brown silty clay loam and a subsoil of yellowish brown silty clay. These soils have a perched seasonal high water table at a depth of 3 to 6 feet.

Minor in this association are Montgomery, Birds, Beaucoup, Wakeland, Princeton, Elkinsville, and Reesville soils. The very poorly drained Montgomery soils are in depressions. The somewhat poorly drained Birds and Beaucoup and somewhat poorly drained Wakeland soils are on the lower lying flood plains. The well drained Princeton and Elkinsville and somewhat poorly drained Reesville soils are in the slightly higher

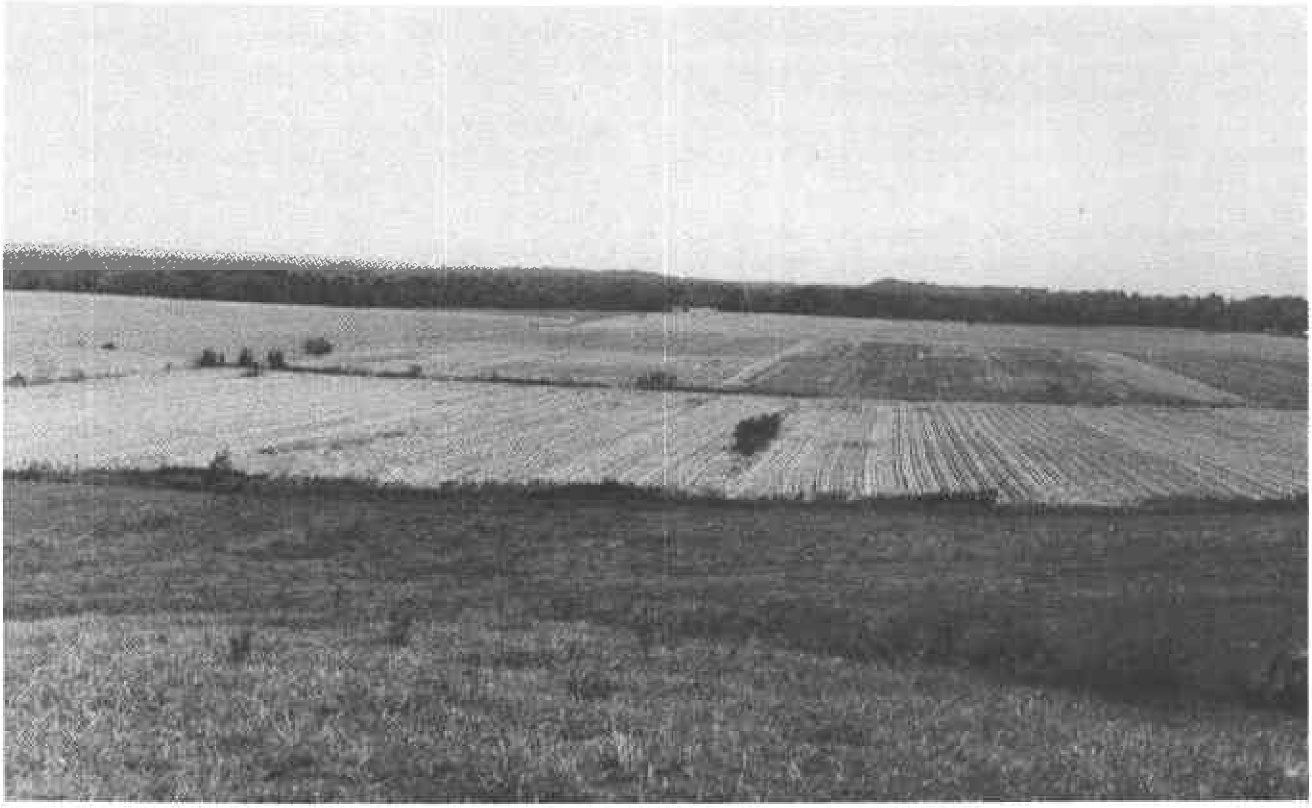


Figure 4.—An area of the McGary-Henshaw-Markland association on a lacustrine terrace in the background.

landscape positions. Reesville soils are less clayey than the major soils.

This association is used mainly for cultivated crops. A few areas are used for hay or pasture or for woodland. The association is fairly well suited to cultivated crops, woodland, and extensive recreation uses and poorly suited to specialty crops, urban uses, and intensive recreation uses. The wetness and the hazard of erosion are the main management concerns.

Broad Land Use Considerations

The general soil map can be used to identify broad areas of soils that are suited to specific uses. It cannot be used, however, for the selection of specific sites for these uses.

Of all the soils in the county, those that are best suited to cultivated crops are in the Nolin-Haymond-Petrolia, Armiesburg-Vincennes Variant-Wilhite, and Belknap-Bonnie-Wakeland associations. Flooding is the chief hazard on these soils. The Alvin-Bloomfield, Otwell-Haubstadt-Dubois, Hosmer, Zanesville-Hosmer, and McGary-Henshaw-Markland associations are fairly well suited to cultivated crops. In most areas of these associations, the slope is more than 6 percent. A drainage system is needed in some areas.

The Alford-Sylvan and Alvin-Bloomfield associations are better suited to specialty crops than the other associations. The dominant soils are deep and well drained and are well suited to fruit and vegetable crops. The slope of the Bloomfield soils in the Alvin-Bloomfield association is a limitation.

Most of the associations are suitable for pasture and hay, except for the steep and very steep soils in the Fairpoint-Bethesda and Zanesville-Gilpin associations. Flooding and wetness are problems on the Nolin-Haymond-Petrolia, Armiesburg-Vincennes Variant-Wilhite, and Belknap-Bonnie-Wakeland associations. Water-tolerant grasses and legumes should be selected for planting in areas where wetness is a problem. The Alford-Sylvan, Hosmer, Zanesville-Hosmer, and McGary-Henshaw-Markland associations are well suited to pasture and hay.

Nearly all of the soils in the county are suitable as woodland. The suitability for woodland production is good. Management of stands could be greatly improved. The management concerns and growth rates vary widely on the different associations. Commercially valuable

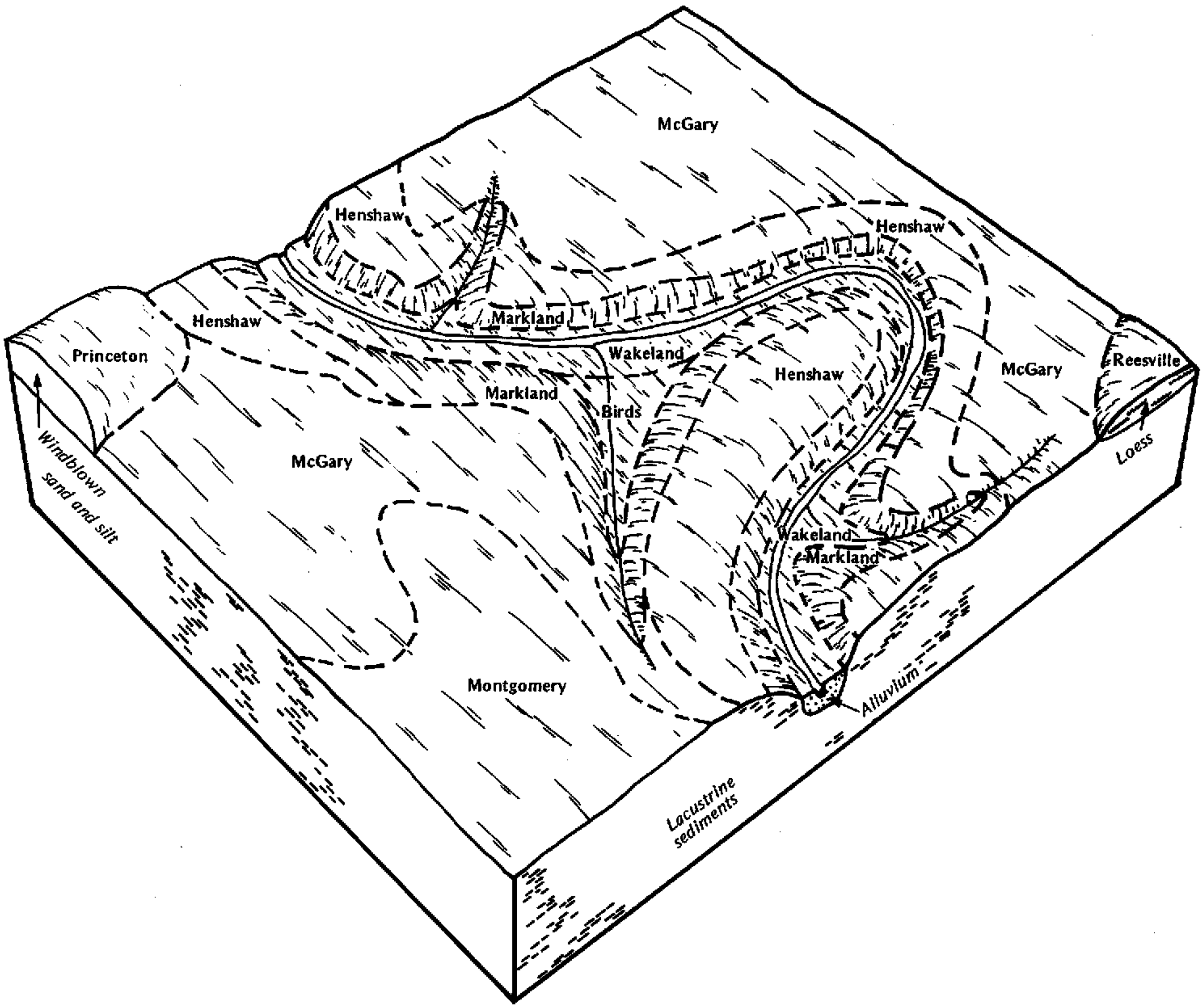


Figure 5.—Typical pattern of soils and parent material in the McGary-Henshaw-Markland association.

trees are most common in areas of the Zanesville-Gilpin, Alford-Sylvan, and Belknap-Bonnie-Wakeland associations.

The Alford-Sylvan association is better suited to trees than the other associations in the county, but most areas have been cleared and are used for crops or pasture. The Nolin-Haymond-Petrolia and Armiesburg-Vincennes Variant-Wilhite associations are used for woodland only in isolated areas along the White River. Most of the surface-mined areas in the Fairpoint-Bethesda association are wooded. The quality of the trees varies greatly because the high content of rock fragments can result in droughty conditions. The steep and very steep Bloomfield soils in the Alvin-Bloomfield association are used for woodland. Because these soils are droughty, productivity is low. On the steeper soils in the Alvin-Bloomfield, Fairpoint-Bethesda, and Zanesville-Gilpin associations, special harvesting methods are needed to minimize the use of rubber-tired and crawler tractors and to control erosion.

Only a small part of the county is suitable for urban uses. The Alford-Sylvan association and the gently sloping to strongly sloping soils in the Alvin-Bloomfield association generally are well suited to these uses. The Bloomfield soils in the Alvin-Bloomfield association, however, are poorly suited to septic tank absorption fields because of a poor filtering capacity.

The Nolin-Haymond-Petrolia, Armiesburg-Vincennes Variant-Wilhite, and Belknap-Bonnie-Wakeland associations are unsuitable for urban uses because of flooding or wetness. The Otwell-Haubstadt-Dubois, Hosmer, Zanesville-Hosmer, and Zanesville-Gilpin associations are unsuitable for most urban uses because of wetness and a slowly permeable or very slowly permeable fragipan. Dwellings and small commercial buildings can be constructed in the less sloping areas of the well drained soils in these associations if sanitary facilities are connected to commercial sewers and treatment facilities or if septic tank absorption fields are specially designed, so that the limitations are overcome.

The Fairpoint-Bethesda association is unsuitable for most urban uses because of the slope, the shrink-swell potential, large stones, and moderately slow permeability. Dwellings and small commercial buildings can be constructed in the less sloping areas of these soils if the large stones are buried, if the soil material is well compacted and allowed time to settle, and if sanitary facilities are connected to commercial sewers or treatment facilities. The McGary-Henshaw-Markland association generally is unsuitable for urban uses because of wetness, slow permeability, and shrinking and swelling.

Surface mining of coal is a major commercial pursuit in the county. About 40,000 acres has been mined. The Fairpoint-Bethesda association has been modified by mining activities. A considerable amount of surface mining has occurred in the Hosmer, Zanesville-Hosmer, and Zanesville-Gilpin associations. Some areas of the Belknap-Bonnie-Wakeland, Alford-Sylvan, Otwell-Haubstadt-Dubois, and Alvin-Bloomfield associations have been mined.

Because of wetness or slope, many of the soils in the county are poorly suited to intensively used recreational areas, such as camp areas and picnic areas. The best suited soils are the gently sloping to strongly sloping ones in the Alvin-Bloomfield and Alford-Sylvan associations.

Many of the soils in the county are suitable for extensive recreational areas, such as primitive camping areas, hiking trails, and nature-study areas. The best suited soils are in the Alford-Sylvan association. The other associations are fairly well suited. Undrained marshes and swamps in the Nolin-Haymond-Petrolia, Armiesburg-Vincennes Variant-Wilhite, and Belknap-Bonnie- Wakeland associations are suitable areas for nature study. Forests enhance the beauty of many areas in the county, particularly in the Zanesville-Hosmer, Zanesville-Gilpin, and Fairpoint-Bethesda associations. Ponds and lakes throughout the county and strip pits in the Fairpoint-Bethesda association enhance the opportunities for recreation. All of the associations provide habitat for many important wildlife species.

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, Hosmer silt loam, 2 to 6 percent slopes, eroded, is a phase in the Hosmer 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. Gilpin-Berks loams, 25 to 50 percent slopes, is an example.

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

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

The names, descriptions, and delineations of the soils identified on the detailed soil maps of this county do not always agree or 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

AdA—Alford silt loam, 0 to 2 percent slopes. This nearly level, deep, well drained soil is on broad flats on terraces and uplands. Individual areas are broad and irregularly shaped and are 5 to 80 acres in size.

In a typical profile, the surface layer is dark yellowish brown silt loam about 8 inches thick. The subsoil is about 67 inches thick. It is yellowish brown, friable silt loam in the upper part; strong brown and yellowish brown, firm silty clay loam in the next part; and strong brown and yellowish brown, friable silt loam in the lower part. The substratum to a depth of 80 inches is yellowish brown silt loam. In places gray mottles are below a depth of 24 inches. In a few areas the slope is more than 2 percent.

Included with this soil in mapping are small areas of the somewhat poorly drained Iva soils at the head of drainageways. Also included are small areas of the moderately well drained Muren and well drained Hosmer soils on the broader, flatter ridges. Hosmer soils have a fragipan. Included soils make up 10 to 12 percent of the unit.

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

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

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

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

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

Because of shrinking and swelling, this soil is moderately limited as a site for dwellings. It is suitable as a site for septic tank absorption fields. Strengthening foundations, footings, and basement walls, backfilling with coarser textured material, and installing foundation drain tile help to prevent the structural damage caused by shrinking and swelling. 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 material improves the ability of the roads and streets to support vehicular traffic and helps to prevent frost damage.

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

AdB2—Alford silt loam, 2 to 6 percent slopes, eroded. This gently sloping, deep, well drained soil is on broad, convex ridgetops and long side slopes in the uplands. Individual areas are broad and irregularly shaped and are 2 to 110 acres in size.

In a typical profile, the surface layer is dark brown silt loam about 7 inches thick. The subsoil is about 66 inches thick. It is brown, firm silty clay loam in the upper part; strong brown, firm silt loam in the next part; and brown, friable silt loam in the lower part. The substratum to a depth of 80 inches is dark yellowish brown silt loam. In places the subsoil is mottled below a depth of 30 inches. In a few areas the lower part of the subsoil and the substratum have a higher content of sand. In some areas, the depth to the substratum is less than 60 inches and the soil is less acid. In other areas the slope is more than 6 or less than 2 percent. In a few of the more sloping areas, the soil is severely eroded.

Included with this soil in mapping are small areas of the nearly level, moderately well drained Muren soils, the well drained Hosmer soils, and the somewhat poorly drained Iva soils. Hosmer soils have a fragipan. Included soils make up 6 to 12 percent of the unit.

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

Most areas of this soil are used for cultivated crops. Some are used for hay and pasture, and a few are used for orchards or woodland. A few are used as urban land.

This soil is well suited to corn, soybeans, and small grain. Measures that help to control erosion are needed if cultivated crops are grown. Examples are a crop rotation that includes grasses and legumes, a system of conservation tillage that leaves protective amounts of crop residue on the surface, diversions, grassed waterways, and grade stabilization structures. Slopes that are long and uniform can be terraced and farmed on the contour. Terraces and contour farming help to slow runoff and prevent excessive soil loss. Cover crops help to control erosion and maintain tilth and the organic matter content.

This soil is well suited to grasses, such as orchardgrass, and legumes, such as red clover, for hay or pasture. Overgrazing causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates and pasture rotation help to keep the pasture in good condition.

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

Because of shrinking and swelling, this soil is moderately limited as a site for dwellings. It is suitable as a site for septic tank absorption fields. Strengthening foundations, footings, and basement walls, backfilling with coarser textured material, and installing foundation drain tile help to prevent the structural damage caused by shrinking and swelling. 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 material improves the ability of the roads and streets to support vehicular traffic and helps to prevent frost damage.

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

AdC2—Alford silt loam, 6 to 12 percent slopes, eroded. This moderately sloping, deep, well drained soil is on side slopes in the uplands. Individual areas are narrow and irregularly shaped and are 10 to 60 acres in size.

In a typical profile, the surface layer is dark brown silt loam about 6 inches thick. The subsoil is about 59 inches thick. The upper part is strong brown, firm silty clay loam, and the lower part is strong brown and brown, friable silt loam. The substratum to a depth of 70 inches is dark yellowish brown silt loam. In a few areas the soil has less than 60 inches of loess and has a higher content of sand in the lower part of the subsoil and in the substratum. In some areas, the depth to the substratum is less than 60 inches and the soil is less acid. In other areas the slope is more than 12 or less than 6 percent.

Included with this soil in mapping are small areas of the nearly level, somewhat poorly drained Iva and moderately well drained Muren soils at the head of drainageways; a few areas of the well drained Hosmer soils on the higher lying, broader ridgetops and on the lower part of side slopes; and a few areas of the somewhat poorly drained Wakeland soils at the base of side slopes. Hosmer soils have a fragipan. Also included are small areas of the well drained Pike soils on the steeper side slopes. Included soils make up 8 to 12 percent of the unit.

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

Most areas of this soil are used for cultivated crops. Some are used for hay and pasture, and a few are wooded. A few are used as urban land.

This soil is fairly well suited to corn, soybeans, and small grain. Measures that help to control erosion are needed if cultivated crops are grown. Examples are a crop rotation that includes grasses and legumes and a system of conservation tillage that leaves protective amounts of crop residue on the surface. Diversions, grassed waterways, and grade stabilization structures help to prevent gullying. Slopes that are long and uniform can be terraced and farmed on the contour. Terraces and contour farming help to slow runoff and prevent excessive soil loss. Cover crops help to control erosion, maintain tilth, and increase the organic matter content.

This soil is well suited to grasses, such as orchardgrass, and legumes, such as red clover, for hay or pasture. A cover of these plants is effective in controlling erosion. Overgrazing reduces plant density and causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates and pasture rotation help to keep the pasture in good condition.

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

Because of slope and shrinking and swelling, this soil is moderately limited as a site for dwellings. Strengthening foundations, footings, and basement walls, backfilling with coarser textured material, and installing foundation drain tile 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. Land shaping is needed in some areas. Removal of vegetation should be kept to a minimum, and exposed areas should be seeded or sodded as soon as possible.

This soil is severely limited as a site for local roads and streets because of frost action and low strength. Strengthening or replacing the base material improves the ability of the roads and streets to support vehicular traffic and helps to prevent frost damage.

Because of the slope, this soil is moderately limited as a site for septic tank absorption fields. Installing the distribution lines across the slope helps to ensure that the absorption field functions properly. Land shaping is needed in some areas.

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

AnB—Alvin fine sandy loam, 2 to 6 percent slopes. This gently sloping, deep, well drained soil is on ridgetops, on side slopes, and in dunelike areas on terraces and uplands. Individual areas are elongated and irregularly shaped and are 8 to 60 acres in size.

In a typical profile, the surface layer is dark brown fine sandy loam about 10 inches thick. The subsoil is about 49 inches thick. In sequence downward, it is yellowish brown and brown, friable fine sandy loam; brown, very friable loamy fine sand; brown, friable fine sandy loam; and brown, very friable loamy fine sand. The substratum to a depth of 65 inches is dark yellowish brown very fine sandy loam. In some areas the subsoil has more clay. In places the slope is less than 2 or more than 6 percent.

Included with this soil in mapping are small areas of the somewhat poorly drained Ayrshire soils on the lower, slightly concave parts of the landscape and adjacent to drainageways. Also included are a few areas of the somewhat excessively drained Bloomfield soils on knolls and the steeper side slopes and a few small areas of the well drained Alford soils, which formed in loess on the slightly higher ridges and generally are farther from the source of eolian material than the Alvin soil. Included soils make up 8 to 10 percent of the unit.

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

Most areas of this soil are used for cultivated crops. Some are used for hay and pasture, and a few are wooded. A few are used as urban land.

This soil is well suited to corn, soybeans, and small grain. Erosion and soil blowing are hazards, and the moderate available water capacity is a limitation. During years when rainfall is below average or is poorly distributed, crops can be damaged by drought. The droughtiness can be minimized by applying a system of conservation tillage that leaves protective amounts of crop residue on the surface and by planting early in spring. Conservation tillage, a crop rotation that includes grasses and legumes, cover crops, diversions, grassed waterways, and grade stabilization structures help to prevent excessive soil loss. Conservation tillage and cover crops also help to maintain tilth and increase the organic matter content.

This soil is well suited to grasses, such as orchardgrass, and legumes, such as red clover and alfalfa, for hay or pasture. A cover of these plants is effective in controlling soil blowing and erosion. Overgrazing reduces plant density and causes excessive runoff and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition. Drought-tolerant species, such as bromegrass, fescue, bluegrass, orchardgrass, birdsfoot trefoil, lespedeza, sweetclover, and alfalfa, should be favored.

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

This soil is suitable as a site for dwellings and septic tank absorption fields. It is moderately limited as a site for local roads and streets because of frost action. Replacing the base material helps to prevent frost damage.

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

AoC—Alvin-Bloomfield complex, 6 to 15 percent slopes. These gently sloping to strongly sloping, deep soils are on ridgetops, on side slopes, and in dunelike areas on terraces and uplands. The Alvin soil is well drained, and the Bloomfield soil is somewhat excessively drained. Slopes are short and choppy. Individual areas are irregularly shaped and are dominantly 40 to 100 acres in size. They are about 60 percent Alvin soil and 30 percent Bloomfield soil. The two soils occur as areas so intricately mixed that mapping them separately is not practical.

In a typical profile of the Alvin soil, the surface layer is brown fine sandy loam about 8 inches thick. The subsoil is about 54 inches thick. It is brown, friable sandy loam and fine sandy loam. The substratum to a depth of 80 inches is pale brown loamy sand and fine sand. In some areas the subsoil has more clay.

In a typical profile of the Bloomfield soil, the surface layer is dark brown sand about 10 inches thick. The subsurface layer is yellowish brown sand about 18 inches thick. The next 12 inches is yellowish brown, very friable sand that has bands of dark brown, friable fine sandy loam. Below this is 40 inches of dark brown, friable loamy sand or fine sand that has bands of yellowish brown fine sand or sand. The substratum to a depth of 100 inches is light yellowish brown sand.

Included with these soils in mapping are a few small areas of the nearly level, well drained Princeton soils on terraces and ridgetops. These included soils contain more clay in the subsoil than the Alvin and Bloomfield soils. Also included are some small areas of the somewhat poorly drained Ayrshire soils and a few areas of poorly drained soils in depressions at the base of the slopes. The poorly drained soils are darker than the Alvin and Bloomfield soils. Included soils make up about 7 to 10 percent of the unit.

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

Most areas of these soils are used for cultivated crops. Some are used for hay and pasture, and a few are wooded. A few are used as urban land.

These soils are fairly well suited to corn, soybeans, and small grain. Erosion and soil blowing are hazards, and the moderate or low available water capacity is a limitation. During years when rainfall is below average or is poorly distributed, crops can be damaged by drought. The droughtiness can be minimized by applying a system of conservation tillage that leaves protective amounts of crop residue on the surface and by planting early in spring. Conservation tillage, a crop rotation that includes grasses and legumes, cover crops, diversions, grassed waterways, and grade stabilization structures help to prevent excessive soil loss. Conservation tillage and cover crops also help to maintain tilth and increase the organic matter content.

These soils are well suited to grasses and legumes for hay or pasture. A cover of grasses and legumes is effective in controlling soil blowing and erosion. Overgrazing reduces plant density and causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition. Drought-tolerant species, such as bromegrass, fescue, bluegrass, orchardgrass, birdsfoot trefoil, lespedeza, sweetclover, and alfalfa, should be favored.

These soils are fairly well suited to trees. Seedling mortality and plant competition are the main management concerns. Seedlings survive and grow well if competing vegetation is controlled by adequate site preparation or by spraying, cutting, or girdling. Special planting stock and overstocking are needed because of the seedling mortality rate on the Bloomfield soil.

Because of the slope, these soils are moderately limited as sites for dwellings. Buildings should be designed so that they conform to the natural slope of the land. Land shaping is needed in some areas. The soils are moderately limited as sites for local roads and streets because of frost action and the slope. Replacing the base material helps to prevent frost damage. Cutting and filling are needed, and the roads should be built on the contour if possible.

The Bloomfield soil is severely limited as a site for septic tank absorption fields because of a poor filtering capacity, which can result in the pollution of ground water supplies. The Alvin soil is moderately limited because of the slope. Installing the distribution lines on the contour helps to ensure that the absorption field functions properly. Land shaping is needed in some areas.

The land capability classification is IIIe. The woodland ordination symbol assigned to the Alvin soil is 4A, and that assigned to the Bloomfield soil is 4S.

Ar—Armiesburg silty clay loam, occasionally flooded. This nearly level, deep, well drained soil is on broad bottom land. It is flooded for brief periods during winter and spring. Individual areas are broad and irregularly shaped and are 50 to 200 acres in size.

In a typical profile, the surface layer and subsurface layer are very dark grayish brown silty clay loam. The surface layer is about 9 inches thick, and the subsurface layer is about 5 inches thick. The subsoil is dark brown and dark yellowish brown, firm silty clay loam about 26 inches thick. The substratum to a depth of 60 inches is dark yellowish brown. The upper part is silt loam, and the lower part is loam that has thin strata of silt loam. In some areas gray mottles are below a depth of 24 inches. In other areas the surface layer is thinner or lighter colored. In places the soil has more sand. In a few places the substratum is fine sandy loam below a depth of 40 inches. In a few areas the surface layer is recent overwash of brown silt loam 6 to 12 inches thick.

Included with this soil in mapping are elongated, narrow areas of the very poorly drained Wilhite and poorly drained Petrolia and Vincennes Variant soils in depressions that formerly were drainage channels. Also included, in some of the slightly lower areas, are the somewhat poorly drained Stendal soils, which do not have a dark surface layer. Included soils make up about 8 to 12 percent of the unit.

Available water capacity is high in the Armiesburg soil. Permeability is moderate. Surface runoff is slow. The organic matter content is moderate in the surface layer. This layer is friable and can be tilled throughout a moderate range in moisture content. Tilling when the soil is too wet results in a cloddy seedbed.

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

This soil is well suited to corn and soybeans, which can be planted and harvested during periods when flooding is least likely. If well managed, the soil is suitable for intensive row cropping. Floodwater occasionally drowns out alfalfa and small grain in winter and early in spring. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves tilth and maintains the organic matter content.

This soil is well suited to most grasses and legumes for hay and pasture. Alfalfa can be damaged by floodwater. Species that can withstand brief periods of flooding should be favored. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

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

Because of flooding, this soil generally is unsuitable as a site for dwellings and septic tank absorption fields. A better site generally can be selected. The soil is severely limited as a site for local roads and streets because of flooding, low strength, and frost action. Strengthening or replacing the base material improves the ability of the roads and streets to support vehicular traffic and helps to prevent frost damage. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by flooding and frost damage.

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

Ay—Ayrshire fine sandy loam, loamy substratum. This nearly level, deep, somewhat poorly drained soil is in slight depressions on uplands. Individual areas are irregularly shaped and are 4 to 30 acres in size.

In a typical profile, the surface layer is dark grayish brown fine sandy loam about 10 inches thick. The subsurface layer is light brownish gray, mottled fine sandy loam about 3 inches thick. The subsoil is about 30 inches thick. It is grayish brown, mottled, friable sandy loam in the upper part; yellowish brown, mottled, firm loam in the next part; and yellowish brown, mottled, firm sandy clay loam in the lower part. The substratum to a depth of 60 inches is light brownish gray, mottled loam that has strata of silt loam. In a few small areas at the base of the steeper slopes, the surface layer is loamy sand.

Included with this soil in mapping are small areas of the somewhat excessively drained Bloomfield and well drained Alvin soils on knolls, small areas of the well drained Princeton soils in the slightly higher landscape positions, and small areas of very poorly drained, dark soils in depressions. Included soils make up 12 to 15 percent of the unit.

Available water capacity is moderate in the Ayrshire soil. Permeability is moderately slow. Surface runoff is slow. A seasonal high water table is at a depth of 1 to 3 feet during winter and early spring. The organic matter content is low in the surface layer. This layer is very friable, but the soil cannot support equipment when it is wet and ruts readily form if the soil is tilled when too wet.

Most areas of this soil are drained by subsurface drains and used for cultivated crops. Some are used for hay or pasture.

If drained, this soil is well suited to corn, soybeans, and small grain. The wetness is the major limitation. Also, soil blowing is a hazard if the soil is not vegetated. A subsurface drainage system can lower the water table, and surface drains can remove ponded water. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves tilth, increases the organic matter content, and helps to control soil blowing.

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

Only a few areas are wooded. This soil is well suited to trees. Plant competition is the main management concern. It can be controlled by special harvest methods and by adequate site preparation.

Because of the wetness, this soil is severely limited as a site for dwellings. The dwellings should be constructed without basements. A drainage system is needed. Constructing the buildings on raised, well compacted fill material helps to overcome the wetness. The soil is severely limited as a site for local roads and streets because of frost action. 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 wetness and frost action.

Because of the wetness and the restricted permeability, this soil is severely limited as a site for septic tank absorption fields. These limitations can be minimized by adding suitable filtering material. Subsurface drains help to lower the water table. Enlarging the absorption field helps to overcome the restricted permeability.

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

Ba—Bartle silt loam. This nearly level, deep, somewhat poorly drained soil is on low stream terraces. Individual areas are irregularly shaped and are 3 to 40 acres in size.

In a typical profile, the surface layer is brown silt loam about 7 inches thick. The subsoil is about 50 inches thick. The upper part is brown and pale brown, mottled, friable silt loam; the next part is light brownish gray, mottled, firm, brittle silt loam; and the lower part is yellowish brown, mottled, firm silty clay loam that has strata of silt loam. The substratum to a depth of 60 inches is gray, mottled silt loam that has strata of silty clay loam.

Included with this soil in mapping are small areas of the moderately well drained Pekin soils on the more sloping terraces and the somewhat poorly drained Belknap and moderately well drained Steff soils on the lower lying flood plains. Included soils make up 5 to 10 percent of the unit.

Available water capacity is high in the Bartle soil. Permeability is very slow. Surface runoff is slow. A perched seasonal high water table is at a depth of 1 to 2 feet during winter and early spring. The organic matter content is moderately low in the surface layer. This layer is friable, but tilling when the soil is too wet results in a cloddy seedbed and the formation of ruts and plowpans.

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

If drained, this soil is well suited to corn, soybeans, and small grain. The wetness is the main limitation. A subsurface drainage system can lower the water table, and surface drains can remove excess surface water. A system of conservation tillage that leaves protective amounts of crop residue on the surface increases the organic matter content; improves tilth, infiltration, and aeration; and helps to prevent compaction.

This soil is well suited to water-tolerant grasses and shallow-rooted legumes for hay and pasture. It is poorly suited to alfalfa and other deep-rooted legumes because root penetration is restricted by the high water table. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and reduces plant density. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

Only a few areas are wooded. This soil is well suited to trees. No major hazards or limitations affect planting or harvesting.

Because of the wetness, this soil is severely limited as a site for dwellings. Buildings should be constructed without basements. Constructing the buildings on raised, well compacted fill material can help to overcome the wetness. The water table can be lowered by subsurface drains, and excess surface water can be removed by surface drains. Because of frost action, 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 frost damage.

Because of the wetness and the restricted permeability, this soil is severely limited as a site for septic tank absorption fields. These limitations can be minimized by filling or mounding the site with suitable filtering material and by installing subsurface drains, which help to lower the water table.

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

Bb—Beaucoup silty clay loam, frequently flooded. This nearly level, deep, poorly drained soil is on flood plains. It is flooded for brief periods late in winter and in spring and is subject to ponding. Individual areas are 15 to 80 acres in size.

In a typical profile, the surface layer is very dark grayish brown silty clay loam about 10 inches thick. The subsoil is gray, mottled, firm silty clay loam about 32 inches thick. The substratum to a depth of 60 inches is dark gray, mottled silt loam that has strata of very fine sandy loam. In some areas near drainageways or at the base of slopes, 4 to 12 inches of lighter colored silt loam overwash is deposited on the surface layer. In some areas the subsoil has more clay. In other areas the soil is only occasionally flooded.

Included with this soil in mapping are a few small areas of the poorly drained Birds and somewhat poorly drained Wakeland soils. These soils have a surface layer that is lighter colored than that of the Beaucoup soil. Also, they are slightly higher on the flood plains. They make up 10 to 15 percent of the unit.

Available water capacity is high in the Beaucoup soil. Permeability is moderately slow. Surface runoff is very slow. A seasonal high water table is near or slightly above the surface late in winter and in spring. The organic matter content is moderate in the surface layer. This layer is friable or has a firm surface layer. It can be tilled throughout a moderate range in moisture content. Tilling when the soil is too wet results in a cloddy seedbed.

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

If drained, this soil is well suited to corn and soybeans. The wetness is the main limitation, and the flooding is a hazard. If drained and otherwise well managed, the soil is suitable for intensive row cropping. Small grain is often damaged or destroyed by floodwater late in winter and in spring. Excess water can be removed by subsurface drains, surface drains, pumps, or a combination of these. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves tilth and helps to maintain the organic matter content.

This soil is well suited to water-tolerant grasses and legumes for hay or pasture. A drainage system is necessary. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Overgrazing also reduces plant density and plant hardiness. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to prevent surface compaction and maintain good tilth and plant density.

This soil is fairly well suited to trees. The equipment limitation, plant competition, seedling mortality, and the windthrow hazard are management concerns. Harvesting and planting equipment should be used only during the drier periods. Seedlings survive and grow well if competing vegetation is controlled by adequate site preparation or by cutting, spraying, or girdling. Special planting stock and overstocking are needed because of the seedling mortality rate. Careful thinning of the stands and harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Windthrown trees should be periodically removed. Species that can withstand the wetness should be favored in the stands.

Because of flooding and ponding, this soil generally is 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 flooding, ponding, and low strength. Replacing or strengthening the upper layer of the soil with better suited material improves the ability of the roads and streets to support vehicular traffic. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by flooding and ponding.

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

Bf—Belknap silt loam, rarely flooded. This nearly level, deep somewhat poorly drained soil is on broad flood plains. Individual areas are 10 to 70 acres in size.

In a typical profile, the surface layer is brown silt loam about 7 inches thick. The substratum to a depth of 60 inches is friable, mottled silt loam. The upper part is brown and grayish brown, and the lower part is light brownish gray and light gray. In some areas the soil contains more clay, and in other areas it is less acid. In a few areas it is occasionally flooded.

Included with this soil in mapping are a few small areas of the poorly drained Bonnie soils in the lower lying swales and small areas of the moderately well drained Steff soils on the slightly higher flood plains. Also included are a few areas of the somewhat poorly drained Bartle and moderately well drained Pekin soils on the higher stream terraces. Bartle soils have more clay than the Belknap soil. Included soils make up 8 to 10 percent of the unit.

Available water capacity is very high in the Belknap soil. Permeability is moderate. Surface runoff is slow. A seasonal high water table is at a depth of 1 to 3 feet in winter and spring. The organic matter content is moderately low in the surface layer. This layer is friable and can be easily tilled throughout a fairly wide range in moisture content.

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

If drained, this soil is well suited to corn, soybeans, and small grain. The wetness is the major limitation. If the drainage system functions properly, a conservation cropping system dominated by row crops is suitable. Small grain is rarely damaged by floodwater. A system of conservation tillage that leaves protective amounts of crop residue on the surface increases the organic matter content and helps to maintain tilth.

This soil is well suited to water-tolerant grasses and legumes for hay and pasture. It is poorly suited to deep-rooted legumes, such as alfalfa, because of the wetness. A drainage system is necessary. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

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

Because of the flooding and the wetness, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields. It is severely limited as a site for local roads and streets because of frost action. A drainage system is needed to lower the water table. Elevating the roadbed helps to prevent the damage caused by frost action and flooding.

The land capability classification is IIw. The woodland ordination symbol is 6A.

Bg—Belknap silt loam, frequently flooded. This nearly level, deep, somewhat poorly drained soil is on broad flood plains. It is flooded for brief or long periods during winter and spring. Individual areas are 10 to 70 acres in size.

In a typical profile, the surface layer is brown silt loam about 10 inches thick. The substratum to a depth of 60 inches is friable, mottled silt loam. The upper part is grayish brown, and the lower part is light brownish gray. In some areas the soil has more sand or more shale and sandstone fragments below a depth of 40 inches. In other areas it has more clay. In some places it is less acid. In other places it is only occasionally flooded.

Included with this soil in mapping are a few small areas of the poorly drained Bonnie soils in the lower lying swales, small areas of the moderately well drained Steff soils along streams, and a few undrained areas. Also included are a few areas of the moderately well drained Pekin and somewhat poorly drained Bartle soils on the higher lying stream terraces and a few small areas of the poorly drained Peoga soils on the higher lying glacial lake plains. Bartle soils have more clay than the Belknap soil. Included soils make up 8 to 15 percent of the unit.

Available water capacity is very high in the Belknap soil. Permeability is moderate. Surface runoff is slow. A seasonal high water table is at a depth of 1 to 3 feet in winter and spring. The organic matter content is moderately low in the surface layer. This layer is friable, but ruts and plowpans readily form if the soil is tilled when too wet and a surface crust often forms after a heavy rain.

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

If drained, this soil is well suited to corn and soybeans. If the drainage system functions properly, a conservation cropping system dominated by row crops is suitable. The soil is poorly suited to small grain, which can be damaged by floodwater during winter and spring. A system of conservation tillage that leaves protective amounts of crop residue on the surface increases the content of organic matter and improves tilth.

This soil is well suited to water-tolerant grasses and legumes for hay and pasture. It is poorly suited to deep-rooted legumes, such as alfalfa, because of the wetness and the damage caused by floodwater. A drainage system is necessary. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

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

Because of flooding and wetness, this soil is generally unsuitable as a site for 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 flooding and frost action. A drainage system is needed to lower the water table. Elevating the roadbed helps to prevent the damage caused by frost action and flooding.

The land capability classification is IIw. The woodland ordination symbol is 6A.

Bh—Birds silt loam, occasionally flooded. This nearly level, deep, poorly drained soil is on flood plains and in valleys filled in with sediments. It is flooded for brief periods late in winter and in spring and is subject to ponding. Individual areas are 25 to 100 acres in size.

In a typical profile, the surface layer is dark grayish brown silt loam about 8 inches thick. The upper part of the substratum is grayish brown, mottled, firm silt loam. The next part is gray and grayish brown, mottled, firm silty clay loam. The lower part to a depth of 60 inches is grayish brown, mottled silt loam that has strata of silty clay loam. In places 6 to 13 inches of lighter colored silt loam overwash is deposited on the surface layer. In a few areas the surface layer is silty clay loam. In some areas the soil is more acid.

Included with this soil in mapping are a few small areas of the dark, poorly drained Beaucoup soils in depressions. Also included are small areas of the somewhat poorly drained Wakeland soils adjacent to stream channels. Included soils make up 8 to 12 percent of the unit.

Available water capacity is very high in the Birds soil. Permeability is moderately slow. Surface runoff is very slow. A seasonal high water table is near or slightly above the surface late in winter and in spring. The organic matter content is moderately low in the surface layer. This layer is friable, but ruts form readily if the soil is tilled when too wet and a surface crust often forms following a heavy rain.

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

If drained, this soil is well suited to corn, soybeans, and small grain. If drained and otherwise well managed, it is suitable for intensive row cropping. The wetness is the main limitation, and the flooding is a hazard. Excess water can be removed by subsurface drains, surface drains, or a combination of these. Small grain is sometimes damaged by floodwater late in winter and in spring. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves tilth and increases the organic matter content.

This soil is well suited to water-tolerant grasses and legumes for hay or pasture. A drainage system is necessary. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Overgrazing also reduces plant density and plant hardiness. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to prevent surface compaction and maintain good tilth and plant density.

This soil is fairly well suited to trees. The equipment limitation, plant competition, the windthrow hazard, and seedling mortality are management concerns. Harvesting and planting equipment should be used only during the drier periods. Seedlings survive and grow well if competing vegetation is controlled by adequate site preparation or by cutting, spraying, or girdling. Special planting stock and overstocking are needed because of the seedling mortality rate. Careful thinning of the stands and harvest methods that do not isolate the remaining trees or leave them widely spaced are needed because of the windthrow hazard. Windthrown trees should be periodically removed. Species that can withstand the wetness should be favored in the stands.

Because of ponding and flooding, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields. Alternative sites should be selected. Because of ponding, flooding, and low strength, the soil is severely limited as a site for local roads and streets. Replacing or strengthening the upper layer of the soil with better suited material improves the ability of the roads and streets to support vehicular traffic. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by flooding and frost action.

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

Bk—Birds silt loam, frequently flooded. This nearly level, deep, poorly drained soil is on broad, slightly concave flood plains. It is flooded for long periods in the spring and is subject to ponding. Individual areas are long and narrow and are 10 to 200 acres in size.

In a typical profile, the surface layer is grayish brown silt loam about 8 inches thick. The substratum to a depth of 60 inches is gray, mottled, friable silt loam. It has strata of silty clay loam in the lower part. In some areas the upper part of the substratum is more acid. In other areas 6 to 8 inches of dark grayish brown or brown recent overwash is deposited on the surface layer.

Included with this soil in mapping are small areas of the somewhat poorly drained Wakeland soils along small creek bottoms. These soils are browner in the upper part of the substratum than the Birds soil. Also included, in depressions, are a few areas of the poorly drained Beaucoup soils, which have a surface layer that is lighter colored than that of the Birds soil. Included soils make up 4 to 12 percent of the unit.

Available water capacity is very high in the Birds soil. Permeability is moderately slow. Surface runoff is very slow. A seasonal high water table is near or slightly above the surface late in winter and in spring. The organic matter content is moderately low in the surface layer. This layer is friable, but ruts form readily if the soil is tilled when too wet and a surface crust often forms after a heavy rain.

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

If drained, this soil is fairly well suited to corn and soybeans. If the drainage system functions properly, a conservation cropping system dominated by row crops is suitable. Small grain crops are often destroyed or damaged by flooding and ponding. A system of conservation tillage that leaves protective amounts of crop residue on the surface increases the organic matter content and improves tilth.

This soil is well suited to water-tolerant grasses and legumes for hay and pasture. It is poorly suited to deep-rooted legumes, such as alfalfa, because of the wetness and the damage caused by floodwater. A drainage system is necessary. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is fairly well suited to trees. The equipment limitation, plant competition, the windthrow hazard, and seedling mortality are management concerns. Harvesting and planting equipment should be used only during the drier periods. Seedlings survive and grow well if competing vegetation is controlled by adequate site preparation or by spraying, cutting, or girdling. Special planting stock and overstocking are needed because of the seedling mortality rate. Careful thinning of the stands and harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Windthrown trees should be periodically removed.

Because of ponding and flooding, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields. Alternative sites should be selected. Because of flooding, low strength, and ponding, the soil is severely limited as a site for local roads and streets. Strengthening or replacing the base material improves the ability of the roads and streets to support vehicular traffic. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by flooding and ponding.

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

BlF—Bloomfield loamy fine sand, 25 to 50 percent slopes. This steep and very steep, deep, somewhat excessively drained soil is on short side slopes next to drainageways. Individual areas are long and narrow and are 3 to 30 acres in size.

In a typical profile, the surface layer is dark brown loamy fine sand about 4 inches thick. The subsurface layer is dark brown loamy sand about 16 inches thick. The next 28 inches is dark yellowish brown and brown, very friable loamy sand that has thin, discontinuous bands of dark brown, friable sandy loam. The substratum to a depth of 60 inches is brown and pale brown sand and loamy sand. In some areas the subsoil has more clay. In other areas the slope is less than 25 percent.

Included with this soil in mapping are small areas of the well drained Alvin, Alford, and Sylvan soils on side slopes at the upper end of drainageways and on the higher lying ridges. Alvin soils do not have textural bands. Alford and Sylvan soils are silty. Also included, at the base of slopes, are small areas of soils that are moderately deep over bedrock. Included soils make up 5 to 10 percent of the unit.

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

Most areas are wooded. This soil generally is unsuited to cropland because of the hazard of erosion and the equipment limitation. The low available water capacity also is a limitation.

This soil is poorly suited to grasses and legumes for pasture because of the slope and the low available water capacity. Overgrazing reduces plant density and causes excessive runoff.

This soil is fairly well suited to trees. The main management concerns are the erosion hazard, the equipment limitation, and seedling mortality. Because of the erosion hazard, logging roads, skid trails, and landings should be established on gentle grades and water should be diverted away from the slopes. Ordinary crawler tractors and rubber-tired skidders cannot be operated safely on these slopes. As a result, special logging methods, such as yarding the logs uphill with a cable, are needed. The seedling mortality rate can be overcome by selection of containerized planting stock, special site preparation in some areas, overstocking, and special harvest methods that leave some mature trees to provide shade and protection for the seedlings.

Because of the slope, this soil is severely limited as a site for dwellings and local roads and streets. Buildings should be designed so that they conform to the natural slope of the land. Land shaping and installing retaining walls also help to overcome the slope. Cutting and filling are needed on sites for roads, and the roads should be built on the contour if possible.

Because of the slope and a poor filtering capacity, this soil is severely limited as a site for septic tank absorption fields. The poor filtering capacity can result in the pollution of ground water supplies. Alternative sites should be selected.

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

Bo—Bonnie silt loam, frequently flooded. This nearly level, deep, poorly drained soil is on slightly concave flood plains. It is flooded for brief or long periods in winter and spring (fig. 6) and is subject to ponding. Individual areas are long and narrow and are 10 to 200 acres in size.

In a typical profile, the surface layer is grayish brown silt loam about 9 inches thick. The substratum to a depth of 60 inches is gray, mottled, friable silt loam. It has strata of silty clay loam in the lower part. In some areas the upper part of the substratum is medium acid. In places the surface layer is silty clay loam.

Included with this soil in mapping are small areas of the somewhat poorly drained Belknap and moderately well drained Steff soils along small creek bottoms. These soils are closer to the stream channels than the Bonnie soil. Also, they have a browner substratum. Also included are a few areas of the poorly drained Peoga soils, which are less acid than the Bonnie soil. Included soils make up 6 to 10 percent of the unit.

Available water capacity is very high in the Bonnie soil. Permeability is moderately slow. Surface runoff is very slow. A seasonal high water table is near or slightly above the surface during winter and spring. The organic matter content is moderately low in the surface layer. Ruts form readily if the soil is tilled when it is too wet. Also, a surface crust often forms after a heavy rain.

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

If drained, this soil is fairly well suited to corn and soybeans. If the drainage system functions properly, a conservation cropping system dominated by row crops is suitable. Small grain crops are often destroyed or damaged by flooding and ponding. A system of

Figure 6.—An area of Bonnie silt loam, frequently flooded.

conservation tillage that leaves protective amounts of crop residue on the surface increases the organic matter content and improves tilth.

This soil is well suited to water-tolerant grasses and legumes for hay and pasture. It is poorly suited to deep-rooted legumes, such as alfalfa, because of the wetness and the damage caused by floodwater. A drainage system is necessary. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is fairly well suited to trees. The equipment limitation, plant competition, seedling mortality, and the windthrow hazard are management concerns. Harvesting and planting equipment should be used only during the drier periods. Seedlings survive and grow well if competing vegetation is controlled by adequate site preparation or by spraying, cutting, or girdling. Special planting stock and overstocking are needed because of the seedling mortality rate. Careful thinning of the stands and harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Windthrown trees should be periodically removed.

Because of the wetness and 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 flooding, low strength, and ponding. Strengthening or replacing the base material improves the ability of the roads and streets to support vehicular traffic. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by flooding and ponding.

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

Bp—Bonnie silt loam, ponded. This nearly level, deep, poorly drained soil is on broad flood plains. It is flooded or ponded for long periods by runoff from the higher lying adjacent areas and by stream overflow. Individual areas are irregularly shaped and are 3 to 200 acres in size.

In a typical profile, the surface layer is grayish brown silt loam about 6 inches thick. The substratum to a depth of 60 inches is mottled silt loam. The upper part is grayish brown, and the lower part is light gray. In places the substratum is less acid.

Included with this soil in mapping are small areas of the somewhat poorly drained Belknap soils in the slightly higher landscape positions. Also included are a few areas that have been drained. Included soils make up 5 to 10 percent of the unit.

Available water capacity is very high in the Bonnie soil. Permeability is moderately slow. Surface runoff is very slow. A seasonal high water table is near or slightly above the surface during winter and spring. The organic matter content is moderate in the surface layer.

Most areas of this soil are wooded or are swampy shallow water areas. Some areas are managed as wildlife habitat.

This soil is unsuited to cultivated crops and to grasses and legumes for hay and pasture because of the ponding. Overcoming the flooding and ponding is extremely difficult because the soil is on the lowest part of the landscape and receives runoff from all adjacent areas.

This soil is fairly well suited to water-tolerant trees. The equipment limitation, seedling mortality, the windthrow hazard, and plant competition are management concerns. Equipment should be used only when the soil is relatively dry or frozen. Special planting stock, overstocking, and special site preparation are needed because of the seedling mortality rate. The windthrow hazard can be reduced by carefully thinning the stands or not thinning them at all and by harvest methods that do not isolate the remaining trees or leave them widely spaced. Windthrown trees should be periodically removed. Special harvest methods and adequate site preparation can control plant competition.

This soil is well suited to wetland wildlife habitat. It is well suited to the plants that provide food or cover for wetland wildlife, such as ducks, geese, herons, rails, kingfishers, muskrat, mink, and beaver. Examples of these plants are smartweed, rushes, sedges, reeds, and cattails. Some domestic perennial grasses can be grown for food and cover. The many shallow water areas are used extensively by wetland wildlife.

Because of flooding and ponding, 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 low strength, ponding, and flooding. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by ponding and flooding. Strengthening or replacing the base material improves the ability of the roads and streets to support vehicular traffic.

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

ClF—Chetwynd silt loam, 25 to 50 percent slopes. This steep and very steep, deep, well drained soil is on side slopes in the uplands. Slopes are short. Individual areas are long and narrow and are 10 to 80 acres in size.

In a typical profile, the surface layer is dark brown silt loam about 3 inches thick. The subsurface layer is yellowish brown silt loam about 4 inches thick. The subsoil is about 45 inches thick. It is yellowish red. The upper part is firm sandy clay loam, the next part is firm sandy loam, and the lower part is very friable loamy sand. The substratum to a depth of 60 inches is dark yellowish brown sand that has bands of loamy sand. A few areas are dissected by small gullies.

Included with this soil in mapping are the well drained Alford and Pike soils in the higher lying, less sloping areas and the well drained Sylvan soils in the less sloping areas at the base of the side slopes. All of these soils formed in more than 40 inches of loess. Also included are long, narrow areas of the somewhat poorly drained Belknap and Wakeland soils, which formed in alluvium at the base of the side slopes, and a few areas of soils that are moderately deep over bedrock. Included soils make up 8 to 10 percent of the unit.

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

Most areas are wooded. Because of the slope and a very severe hazard of erosion, this soil generally is unsuited to corn and soybeans. It is poorly suited to grasses and legumes for forage or pasture. Overgrazing causes surface compaction and excessive runoff. The use of equipment is limited by the steep and very steep slope.

This soil is well suited to trees. The main management concerns are the equipment limitation, the erosion hazard, and plant competition. Locating logging roads on ridgetops helps to overcome the equipment limitation. Removing water with water bars, out-sloping road surfaces, culverts, and drop structures reduces the erosion hazard. Seedlings survive and grow well if competing vegetation is controlled by adequate site preparation or by spraying, cutting, or girdling.

Because of the slope, this soil is severely limited as a site for dwellings, local roads and streets, and septic tank absorption fields. Alternative sites should be selected. Removal of vegetation should be kept to a minimum, and a temporary plant cover should to be established as soon as possible in disturbed areas.

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

DbA—Dubois silt loam, 0 to 2 percent slopes. This nearly level, deep, somewhat poorly drained soil is on broad lake plains. Individual areas are irregularly shaped and are 3 to 830 acres in size.

In a typical profile, the surface layer is brown silt loam about 9 inches thick. The subsurface layer is light yellowish brown, mottled silt loam about 10 inches thick.

The subsoil is about 36 inches thick. It is light brownish gray and yellowish brown and is mottled. The upper part is firm silty clay loam, the next part is a fragipan of very firm silty clay loam, and the lower part is a fragipan of very firm silt loam that has strata of silty clay loam. The substratum to a depth of 70 inches is yellowish brown, mottled silt loam that has strata of silty clay loam. In places the loess is 60 or more inches thick.

Included with this soil in mapping are the poorly drained Peoga soils near the center of the broad flats. These soils do not have a fragipan. Also included are the moderately well drained, nearly level and gently sloping Haubstadt soils on ridges and side slopes and in the higher positions on the flats. Included soils make up 10 to 12 percent of the unit.

Available water capacity is moderate in the Dubois soil. Permeability is very slow. Surface runoff is slow. A seasonal high water table is at a depth of 1 to 3 feet during winter and early spring. The very firm and brittle fragipan at a depth of 24 to 36 inches restricts the downward movement of water and the penetration of roots. The organic matter content is moderately low in the surface layer. This layer is friable, but tilling when the soil is too wet results in a cloddy seedbed and the formation of ruts.

Most areas of this soil are used for cultivated crops. Some are used for hay and pasture, and a few are wooded. A few are used as urban land.

This soil is well suited to corn, soybeans, and small grain. The wetness is the major limitation. It often delays fieldwork in the spring. If adequate outlets are available, surface drains can remove excess water and a subsurface drainage system can lower the water table. 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 increases the organic matter content, improves infiltration and aeration, helps to maintain tilth, and conserves moisture.

This soil is well suited to water-tolerant grasses and shallow-rooted legumes for hay and pasture. It is poorly suited to alfalfa and other deep-rooted legumes because root penetration is restricted by the high water table and by the fragipan. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and reduces plant density. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

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

Because of the wetness, this soil is severely limited as a site for dwellings. Buildings should be constructed without basements. Constructing the buildings on raised, well compacted fill material helps to overcome the wetness. If adequate outlets are available, surface drains can remove excess surface water and subsurface drains can lower the water table.

This soil is severely limited as a site for local roads and streets because of frost action and low strength. Strengthening or replacing the base material improves the ability of the roads and streets to support vehicular traffic and helps to prevent frost damage. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by wetness and frost action.

Because of the wetness and the restricted permeability, this soil is severely limited as a site for septic tank absorption fields. These limitations can be minimized by filling or mounding the site with suitable filtering material and by installing subsurface drains, which help to lower the water table.

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

Du—Dumps, mine. This map unit consists of smoothed or uneven accumulations or piles of waste rock, gob, ash, and general refuse from tipples, abandoned mines, and electric generating plants where coal has been cleaned, sorted, loaded, or burned. Individual areas are irregularly shaped and are 3 to 120 acres in size.

Included with this unit in mapping are small areas of the poorly drained Bonnie, somewhat poorly drained Belknap, and moderately well drained Steff soils along drainageways and areas of the well drained Fairpoint and Bethesda soils next to the mined land. In places a few inches of mine waste is deposited on the Fairpoint and Bethesda soils. Also included are a few coal dumps next to power plants and other facilities where the coal is dumped for future use, some areas that are intermittently covered with water, and some areas of soil material that is neutral when initially deposited but becomes extremely acid as oxidation occurs. Included areas make up 5 to 10 percent of the unit.

The material in the dumps is very erosive. It cannot support vegetation unless major reclamation measures are applied.

No land capability classification or woodland ordination symbol is assigned.

EkA—Elkinsville silt loam, 0 to 2 percent slopes. This nearly level, deep, well drained soil is on terraces. Individual areas are irregularly shaped and are 10 to 50 acres in size.

In a typical profile, the surface layer is dark brown silt loam about 10 inches thick. The subsoil is about 46 inches thick. The upper part is dark yellowish brown and yellowish brown, friable or firm silty clay loam; the next part is yellowish brown, firm clay loam; and the lower part is brown, firm sandy loam. The substratum to a depth of 60 inches is yellowish brown fine sandy loam. In places the surface layer and subsoil have more sand and less silt. In some areas the slope is more than 2 percent. In a few areas the soil is occasionally flooded.

Included with this soil in mapping are small areas of the well drained Alvin soils on small rises. These soils contain more sand throughout the surface layer and subsoil than the Elkinsville soil. Also included are the poorly drained Peoga soils in a few slightly concave areas on the terraces, small areas of the somewhat poorly drained Henshaw soils on the slightly lower parts of the terraces, and the somewhat poorly drained Wakeland soils on the lower lying flood plains. Included soils make up 5 to 10 percent of the unit.

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

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

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

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

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

Because of shrinking and swelling, this soil is moderately limited as a site for dwellings. It is suitable as a site for septic tank absorption fields. Strengthening foundations, footings, and basement walls, backfilling with coarser textured material, and installing foundation drain tile help to prevent the structural damage caused by shrinking and swelling. The soil is severely limited as a site for local roads and streets because of frost action and low strength. Strengthening or replacing the base material improves the ability of the roads and streets to support vehicular traffic and helps to prevent frost damage.

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

FaB—Fairpoint silt loam, reclaimed, 1 to 15 percent slopes. This nearly level to strongly sloping, deep, well drained soil is in surface-mined areas on uplands that have been shaped and smoothed. It formed in medium textured or moderately fine textured material over nonacid mine spoil. The soil material ranges from 6 to 36 inches in thickness. The mine spoil consists of partially weathered soil and rock material and fragments of shale, siltstone, sandstone, and coal. Individual areas are broad and irregular in shape and are 5 to 200 acres in size.

In a typical profile, the surface layer is brown silt loam about 8 inches thick. The subsurface layer is olive brown and light olive brown, mottled silt loam about 12 inches thick. The substratum to a depth of 60 inches is gray very shaly silt loam and gray, mottled shaly loam. In some areas the soil is more acid. In other areas the surface layer is shaly silt loam.

Included with this soil in mapping are severely eroded areas and areas that have a slope of more than 15 percent and have some coarse fragments on the surface. Also included are a few wet soils in seepy areas. Included areas make up 5 to 10 percent of the unit.

Available water capacity is low in the Fairpoint soil. Permeability is moderately slow. Surface runoff is medium or rapid. The organic matter content is very low in the surface layer. This layer is friable. Tillage is often delayed in the spring, however, when water movement is restricted by the moderately slow permeability of the underlying mine spoil or by compaction in the soil layer. Tillage is hindered in some areas by the rock fragments on or near the surface.

Most areas of this soil are used for pasture and hay. Some are used for small grain, and a few are used for corn and soybeans.

This soil is fairly well suited to small grain. It is poorly suited to corn and soybeans. The low available water capacity is a limitation, and erosion is a hazard. Because of the low available water capacity, small grain should be planted in the fall or early in spring. Cover crops and a system of conservation tillage that leaves protective amounts of crop residue on the surface help to control erosion, conserve moisture, increase the organic matter content, and help to maintain tilth and minimize compaction. Slopes that are long and uniform can be terraced (fig. 7). Contour tillage and contour stripcropping slow runoff and conserve moisture.

This soil is well suited to grasses and legumes for hay and pasture. The rooting depth is restricted in some areas by compaction of the underlying mine spoil. Overgrazing causes excessive runoff, surface compaction, and poor tilth and reduces plant density. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

Only a few areas are wooded. This soil is fairly well suited to trees. The high content of coarse fragments is a limitation. Onsite evaluation is needed to determine the tree species suitable for planting and the management practices needed.

Because of shrinking and swelling, this soil is moderately limited as a site for dwellings. Strengthening foundations, footings, and basement walls and backfilling

Figure 7.—Parallel tile-outlet terraces in an area of Fairpoint silt loam, reclaimed, 1 to 15 percent slopes.

with coarser textured material help to prevent the structural damage caused by shrinking and swelling. The sides of shallow excavations can cave in unless they are reinforced.

This soil is moderately limited as a site for local roads and streets because of frost action and shrinking and swelling. Strengthening or replacing the base material improves the ability of the roads and streets to support vehicular traffic and helps to prevent frost damage. The roads should be constructed on the contour where necessary. Land shaping may be needed. Areas of this soil settle at different rates. The design of the roads should compensate for these differences.

Because of the restricted permeability, this soil is severely limited as a site for septic tank absorption fields. This limitation can be minimized by filling or mounding the site with suitable filtering material in areas where land shaping has reduced the slope to 12 percent or less.

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

FbC—Fairpoint-Bethesda complex, 8 to 15 percent slopes. These moderately sloping and strongly sloping, deep, well drained soils occur as mine spoil in surface-mined areas on uplands that have been shaped and smoothed (fig. 8). Individual areas are 6 to 250 acres in size. They are about 45 percent Fairpoint soil and 40 percent Bethesda soil. The two soils occur as areas so intricately mixed that mapping them separately is not practical.

In a typical profile of the Fairpoint soil, the surface layer is dark brown shaly silt loam about 3 inches thick. The substratum to a depth of 60 inches is dark grayish brown, grayish brown, and light olive brown shaly silty clay loam. In some areas the slope is less than 8 or more than 15 percent. In other areas the soil has layers that are mildly alkaline or moderately alkaline.

In a typical profile of the Bethesda soil, the surface layer is dark grayish brown very shaly silty clay loam about 3 inches thick. The substratum to a depth of 60 inches is mottled dark grayish brown and olive brown very shaly silty clay loam. In some areas where the soil has been limed, reaction in the surface layer is neutral.

Figure 8.—A typical area of the Fairpoint-Bethesda complex, 8 to 15 percent slopes.

Included with these soils in mapping are some areas where land shaping was kept to a minimum. Only the peaks were smoothed, leaving elongated pits, most of which contain water. The sides of these pits are very steep, and large sandstone fragments or boulders are exposed. Also included are some abandoned haul roads, which consist mainly of extremely acid, carbonaceous shale and other coal waste material; some mine dumps; and Bonnie and Belknap soils along drainageways next to the mined areas. The abandoned haul roads and mine dumps cannot support vegetation unless major reclamation measures are applied. About 6 to 20 inches of spoil has been washed from the mined areas onto the Bonnie and Belknap soils. Included areas make up 10 to 15 percent of the unit.

Available water capacity is low in the Fairpoint and Bethesda soils. Permeability is moderately slow. Surface runoff is medium or rapid. The organic matter content is very low in the surface layer. This layer is friable, but tillage is restricted in most areas because of the rock fragments.

Most areas of these soils are used for hay or pasture. A few are used for small grain or woodland.

These soils generally are unsuited to corn, soybeans, and small grain because they are droughty and because the rock fragments on or near the surface hinder tillage. Also, erosion is a hazard.

These soils are fairly well suited to a wide variety of grasses and legumes for hay or pasture. A cover of grasses and legumes is effective in controlling erosion. Tillage and harvesting are limited by the rock fragments on or near the surface. Alfalfa and other species that grow best where reaction is neutral should be favored in areas where the Fairpoint soil predominates. Lespedeza and other species that can withstand a rather low pH should be favored in areas where the Bethesda soil predominates. In some areas heavy applications of lime or a cover of better suited soil material is needed. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition. Grassed waterways, diversions, dikes, and drop structures help to control gullying. Slopes that are long and uniform are suitable for terracing, which helps to control erosion.

These soils are suited to trees. Onsite evaluation is needed to determine the tree species suitable for planting and the management practices needed.

Because of slope, large stones, and shrinking and swelling, these soils are moderately limited as sites for dwellings. Buildings should be designed so that they conform to the natural slope of the land. The large stones should be removed during construction. Strengthening foundations and footings helps to prevent the damage caused by shrinking and swelling.

Because of slope, frost action, and shrinking and swelling, these soils are moderately limited as sites for local roads and streets. Constructing the roads and streets on the contour and land shaping help to overcome the slope. Strengthening the base material improves the ability of the roads and streets to support vehicular traffic and helps to prevent frost damage. Areas of these soils settle at different rates, depending on the amount of compaction and the kind of material. The design of foundations and roads should compensate for these differences.

Because of the restricted permeability, these soils are severely limited as sites for septic tank absorption fields. This limitation can be minimized by filling or mounding the site with suitable filtering material in areas where land shaping has reduced the slope to 12 percent or less. The absorption field should be installed on the contour.

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

FbG—Fairpoint-Bethesda complex, 25 to 70 percent slopes. These steep and very steep, deep, well drained soils are in surface-mined areas on uplands. They occur as narrow, elongated mounds of discarded overburden. Individual areas are 10 to a few thousand acres in size. They are about 55 percent Fairpoint soil and 35 percent Bethesda soil. The two soils occur as areas so intricately mixed that mapping them separately is not practical.

In a typical profile of the Fairpoint soil, the surface layer is very dark grayish brown very shaly silt loam about 3 inches thick. The substratum to a depth of 60 inches is mottled dark grayish brown, yellowish brown, and dark yellowish brown very shaly silty clay loam and very shaly silt loam. In some areas the slope is less than 25 or more than 70 percent.

In a typical profile of the Bethesda soil, the surface layer is dark grayish brown shaly silt loam about 3 inches thick. The substratum to a depth of 60 inches is yellowish brown, mottled shaly and very shaly silty clay loam. In some areas the slope is less than 25 or more than 70 percent.

Included with these soils in mapping are abandoned haul roads and narrow, elongated pits that contain water. Some of the pits are filled with carbonaceous shale and low-grade coal waste material from coal preparation and loading docks. The haul roads consist mainly of carbonaceous shale and low-grade coal. The pits and roads are extremely acid and can support little, if any, vegetation unless major reclamation measures are applied. Also included are areas where many large sandstone fragments are on the surface and some small areas of the well drained Hosmer and Gilpin and moderately well drained Zanesville soils on ridges and side slopes and the poorly drained Bonnie and somewhat poorly drained Belknap soils on the lower lying flood plains. Included areas make up 8 to 12 percent of the unit.

Available water capacity is low in the Fairpoint and Bethesda soils. Permeability is moderately slow. Surface runoff is very rapid. The organic matter content is very low in the surface layer. This layer is friable, but tillage is restricted because of the slope and the rock fragments.

Most areas are used as woodland. A few are used for recreational development. These soils are generally unsuited to cultivated crops and to pasture and hay because of the slope and the large rock fragments on the surface, both of which restrict the use of tillage and harvesting machinery. A pasture generally is not improved unless the spoil is partially smoothed, so that farm equipment can be used.

These soils are fairly well suited to trees. They support mostly pine, locust, cottonwood, poplar, and sycamore. The slope hinders the use of planting and logging equipment. Onsite evaluation is needed to determine the tree species suitable for planting and the management practices needed.

Because of the slope and slippage, these soils are generally unsuitable as sites for dwellings and septic tank absorption fields and are severely limited as sites for local roads and streets. Cutting and filling are needed, and the roads should be built on the contour if possible. A minimum of grading is needed in some areas where the roads are designed so that they conform to the natural slope of the land. Strengthening the base material helps to prevent the damage caused by shrinking and swelling and by frost action.

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

GnE—Gilpin silt loam, 15 to 30 percent slopes. This strongly sloping to steep, moderately deep, well drained soil is on side slopes in the uplands. Individual areas are irregularly shaped and are 10 to 40 acres in size.

In a typical profile, the surface layer is very dark grayish brown silt loam about 1 inch thick. The subsurface layer is dark brown silt loam about 5 inches thick. The subsoil is about 29 inches thick. It is yellowish brown. The upper part is friable loam, the next part is firm channery clay loam, and the lower part is friable channery loam. Fractured sandstone bedrock is at a depth of about 35 inches. In some areas the depth to bedrock is more than 40 or less than 20 inches. In other areas the slope is more than 30 percent. In some places the soil is moderately eroded. In other places the subsoil has a higher content of clay or of coarse fragments.

Included with this soil in mapping are small areas of the deep Wellston soils and small areas of the moderately well drained Zanesville soils on the higher, less sloping parts of the landscape. Zanesville soils have a fragipan. Also included are a few areas where rock crops out, small gullies, and small areas of alluvial soils along narrow drainageways. Included areas make up 12 to 15 percent of the unit.

Available water capacity is low in the Gilpin soil. Permeability is moderate. Surface runoff is rapid. The organic matter content in the surface layer is moderate in wooded areas but low in pastured areas.

Most areas of this soil are wooded. A few are used for grasses and legumes for forage or pasture. Because of the slope and a severe hazard of erosion, this soil generally is unsuitable for cultivation. It is poorly suited to grasses and legumes for hay and pasture. The slope and the low available water capacity are limitations, and erosion is a severe hazard. Drought is a hazard during long periods of little or no rainfall. Drought-tolerant species should be considered for pasture and hay. The use of equipment is severely limited because of the slope. Overgrazing reduces plant density and causes surface compaction and excessive runoff and erosion. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

This soil is fairly well suited to trees. The main management concerns are the equipment limitation, the erosion hazard, and plant competition. Because of the erosion hazard, logging roads, skid trails, and landings should be established on gentle grades and on the contour. Diverting runoff also helps to control erosion. Special logging methods, such as yarding the logs uphill with a cable, are needed because rubber-tired and crawler tractors cannot be operated safely on these slopes. Special planting stock and overstocking are needed because of the seedling mortality rate on south aspects. Removal of vegetation should be kept to a minimum, and exposed areas should be revegetated as soon as possible. Special harvest methods and adequate site preparation can control plant competition.

Because of the slope and the depth to bedrock, this soil is severely limited as a site for dwellings, local roads and streets, and septic tank absorption fields. Alternative sites should be selected. Removal of vegetation should be kept to a minimum, and a temporary plant cover should be established as soon as possible in disturbed areas.

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

GnE3—Gilpin silt loam, 15 to 25 percent slopes, severely eroded. This strongly sloping and moderately steep, moderately deep, well drained soil is on narrow side slopes in the uplands. Individual areas are long and narrow and are 5 to 20 acres in size.

In a typical profile, the surface layer is yellowish brown silt loam about 3 inches thick. The subsoil is about 21 inches thick. It is yellowish brown and firm. The upper part is silty clay loam, and the lower part is mottled clay loam. The substratum is yellowish brown, mottled channery clay loam about 5 inches thick. Sandstone bedrock is at a depth of about 29 inches. In places the lower part of the subsoil and the substratum are silty clay or clay. In some areas the surface layer is channery silty clay loam. In other areas the subsoil has a higher content of coarse fragments. In some places the depth to bedrock is 15 to 20 inches or 40 to 50 inches. In other places the slope is less than 15 or more than 25 percent. In some areas the soil is less acid.

Included with this soil in mapping are the moderately well drained, silty Zanesville and well drained, silty Wellston soils on the higher, less sloping parts of the landscape. Also included are some areas of gullied land and some small areas of alluvial soils along narrow drainageways. The gullied areas have been cut several feet below the surface, generally to or near bedrock. Included areas make up about 10 to 15 percent of the unit.

Available water capacity is low in the Gilpin soil. Permeability is moderate. Surface runoff is very rapid. The organic matter content is low in the surface layer because of the loss of topsoil through erosion.

Most areas are pastured. Some areas are wooded or are left idle. This soil generally is unsuited to cultivated crops because of the slope and a severe hazard of erosion. The use of equipment is severely limited because of the slope. The best means of controlling erosion is a permanent plant cover.

This soil is poorly suited to grasses and legumes for hay and pasture. The slope and the low available water capacity are limitations, and erosion is a severe hazard. Drought is a hazard during long periods of little or no rainfall. Drought-tolerant species should be considered for pasture and hay. The use of equipment is severely limited because of the slope. Overgrazing reduces plant density and causes surface compaction and excessive runoff and erosion. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

This soil is fairly well suited to trees. The equipment limitation, the erosion hazard, and plant competition are the main management concerns. Because of the erosion hazard, logging roads, skid trails, and landings should be established on gentle grades and on the contour. Diverting runoff also helps to control erosion. Special logging methods, such as yarding the logs uphill with a cable, are needed because rubber-tired and crawler tractors cannot be operated safely on these slopes. Special planting stock and overstocking are needed because of the seedling mortality rate on south aspects. Special harvest methods and adequate site preparation can control plant competition.

Because of the slope, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields. The depth to bedrock also is a limitation. An alternative site should be selected. The soil is severely limited as a site for local roads because of the slope. Cutting and filling are needed, and the roads should be built on the contour if possible.

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

GoF—Gilpin-Berks loams, 25 to 50 percent slopes. These steep and very steep, moderately deep, well drained soils are on narrow side slopes in the uplands. Individual areas are 10 to 150 acres in size. They are about 60 percent Gilpin soil and 25 percent Berks soil. The two soils occur as areas so intricately mixed that mapping them separately is not practical.

In a typical profile of the Gilpin soil, the surface layer is dark grayish brown loam about 2 inches thick. The subsoil is about 27 inches thick. It is dark yellowish brown, friable channery loam in the upper part; strong brown, firm channery clay loam in the next part; and strong brown, firm shaly silty clay loam in the lower part. The substratum is yellowish brown very shaly silty clay loam about 8 inches thick. Rippable shale bedrock is at a depth of about 37 inches.

In a typical profile of the Berks soil, the surface layer is dark grayish brown loam about 2 inches thick. The subsoil is about 16 inches of yellowish brown, friable loam, channery loam, and very channery loam. The substratum is yellowish brown extremely channery loam about 4 inches thick. Rippable sandstone bedrock is at a depth of about 22 inches. In places the subsoil and substratum are channery or very channery sandy loam.

Included with these soils in mapping are a few areas of shallow soils and rock outcrops on the lower parts of the side slopes along drainageways. Also included are the well drained, deep Wellston and moderately well drained, deep Zanesville soils in the less sloping, higher areas on ridgetops and shoulder slopes and a few areas of alluvial soils along drainageways. Included areas make up 10 to 15 percent of the unit.

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

Nearly all areas are wooded. A few small areas on the less sloping parts of the landscape are pastured. These soils generally are unsuited to cultivated crops and to hay and pasture because of the steep and very steep slope and a severe hazard of erosion. The use of equipment is severely limited because of the slope and the included rock outcrops. The best means of controlling erosion is a permanent plant cover. Access to the pastured areas is limited.

These soils are fairly well suited to trees. The main management concerns are the equipment limitation, the erosion hazard, and seedling mortality. The high content of coarse fragments in the Berks soil is a limitation. Productivity is affected by aspect and by the position of the soils on the side slopes. Special logging methods, such as yarding the logs uphill with a cable, are needed because rubber-tired and crawler tractors cannot be operated safely on these slopes. Erosion can be controlled by selective cutting rather than clearcutting; by establishing haul roads, skid trails, and landings on gentle grades; by preserving as much understory vegetation as possible; and by diverting runoff. The seedling mortality rate can be overcome by selection of containerized planting stock, by special site preparation in some areas, by overstocking, and by special harvest methods that leave some mature trees to provide shade and protection for the seedlings.

Because of the slope, these soils are generally unsuitable as sites for dwellings and septic tank absorption fields. The depth to bedrock also is a limitation in some areas. An alternative site should be selected. The soils are severely limited as sites for local roads and streets because of the slope. Cutting and filling are needed, and the roads should be built on the contour if possible.

The land capability classification is VIIe. The woodland ordination symbol assigned to the Gilpin soil is 4R, and that assigned to the Berks soil is 4F.

HbB—Haubstadt silt loam, 1 to 6 percent slopes. This nearly level and gently sloping, deep, moderately well drained soil is on ridges on loess-capped lake plains. Individual areas are irregularly shaped and are 3 to 180 acres in size.

In a typical profile, the surface layer is dark brown silt loam about 8 inches thick. The subsoil extends to a depth of about 80 inches. The upper part is yellowish brown, mottled, friable or firm silt loam; the next part is a fragipan of yellowish brown, mottled, very firm, brittle silty clay loam; and the lower part is dark yellowish brown and brownish yellow, mottled, firm silt loam that has strata of silty clay loam. In some places the loess is more than 40 inches thick. In other places the soil is shallower to the substratum.

Included with this soil in mapping are the somewhat poorly drained Dubois soils near the head of drainageways and on flats near the center of broad ridges. Also included are the well drained Otwell soils on the narrower ridges and the steeper side slopes and the well drained Hosmer soils on the higher lying knolls and ridges. Included soils make up about 8 to 10 percent of the unit.

Available water capacity is moderate in the Haubstadt soil. Permeability is slow. Surface runoff is medium. A perched seasonal high water table is at a depth of 1.5 to 3.0 feet during winter and early spring. The very firm and brittle fragipan at a depth of 24 to 36 inches restricts the downward movement of water and the penetration of roots. The organic matter content is moderately low in the surface layer. This layer is friable, but tilling when the soil is too wet results in poor tilth and the formation of plowpans.

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

This soil is well suited to corn, soybeans, and small grain. Erosion is the major hazard. Cover crops and a system of conservation tillage that leaves protective amounts of crop residue on the surface reduce the susceptibility to erosion, conserve moisture, increase the organic matter content, and help to maintain good tilth. Grassed waterways, conservation cropping systems that include grasses and legumes, and drop structures also help to control erosion.

This soil is well suited to grasses and shallow-rooted legumes for hay and pasture. It is poorly suited to alfalfa and other deep-rooted legumes because root growth is restricted by the fragipan and the perched water table. Overgrazing or grazing when the soil is too wet causes surface compaction, poor tilth, and excessive runoff and reduces plant density. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is well suited to trees. The windthrow hazard is the main management concern. It can be reduced by carefully thinning the stands or not thinning them at all and by harvest methods that do not isolate the remaining trees or leave them widely spaced. Windthrown trees should be periodically removed.

Because of wetness and shrinking and swelling, this soil is moderately limited as a site for dwellings. Buildings should be constructed without basements. Subsurface drains can help to lower the water table. Constructing the buildings on raised, well compacted fill material also helps to overcome the wetness. Strengthening foundations and footings helps to prevent the damage caused by shrinking and swelling. The soil is severely limited as a site for local roads and streets because of low strength. Strengthening or replacing the base material improves the ability of the roads and streets to support vehicular traffic.

Because of the wetness and the restricted permeability, this soil is severely limited as a site for septic tank absorption fields. These limitations can be minimized by filling or mounding the site with suitable filtering material and by installing subsurface drains, which help to lower the water table.

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

Hd—Haymond silt loam, frequently flooded. This nearly level, deep, well drained soil is on broad bottom land. It is flooded for brief periods during winter and spring. Individual areas are broad and irregularly shaped and are 20 to 150 acres in size.

In a typical profile, the surface layer is dark yellowish brown silt loam about 10 inches thick. The subsoil is yellowish brown, friable silt loam about 44 inches thick. The substratum to a depth of 60 inches is yellowish brown silt loam. In some places the surface layer and subsoil have more clay. In other places the soil is only occasionally flooded. In some areas it has layers that are mildly alkaline or moderately alkaline. In other areas it has more sand throughout.

Included with this soil in mapping are small, narrow, elongated areas of the poorly drained Petrolia soils in depressions that formerly were stream channels. Also included are some areas where 10 to 20 inches of fine sand to sandy loam overwash is deposited on the surface layer. These areas are dissected by channels and are on the lower parts of the landscape. Included soils make up 6 to 12 percent of the unit.

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

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

This soil is well suited to corn and soybeans, which can be planted and harvested during periods when flooding is least likely. If well managed, the soil is suitable for intensive row cropping. Floodwater frequently drowns out alfalfa and small grain in winter and early in spring. A system of conservation tillage that leaves protective amounts of crop residue on the surface helps to maintain tilth and increases the organic matter content.

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

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

Because of the flooding, this soil generally is unsuitable as a site for dwellings and septic tank absorption fields. Alternative sites generally can be selected. The soil is severely limited as a site for local roads and streets because of flooding and frost action. Strengthening or replacing the base material improves the ability of the roads and streets to support vehicular traffic and helps to prevent frost damage. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by flooding and frost action.

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

HeA—Henshaw silt loam, 0 to 3 percent slopes. This nearly level, deep, somewhat poorly drained soil is on lacustrine terraces. Individual areas are irregularly shaped and are 3 to 50 acres in size.

In a typical profile, the surface layer is dark brown silt loam about 9 inches thick. The subsoil is about 39 inches thick. It is yellowish brown and mottled. The upper part is friable silt loam, the next part is firm silty clay loam, and the lower part is friable silt loam. The substratum to a depth of 60 inches is yellowish brown, mottled silt loam. In places the subsoil contains more clay. In some areas the substratum is not calcareous. In other areas the slope is more than 3 percent.

Included with this soil in mapping are some areas of the well drained Markland soils on the steeper side slopes and a few areas of the well drained Elkinsville and Princeton soils in the slightly higher positions on the terraces. Also included, along the part of the Patoka River on the west side of the county, are areas of Henshaw soils that are frequently flooded. Crops are often destroyed or damaged on these soils. Included soils make up 8 to 12 percent of the unit.

Available water capacity is high in the Henshaw soil. Permeability is moderately slow. Surface runoff is slow. A seasonal high water table is at a depth of 1 to 2 feet from late fall to early spring. The organic matter content is moderate in the surface layer. This layer is friable, but tilling when the soil is too wet results in a cloddy seedbed and in compaction.

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

If drained, this soil is well suited to corn, soybeans, and small grain. The wetness is the main limitation. Fieldwork is restricted during wet periods. A subsurface drainage system can lower the water table. Excess water also can be removed by surface drains if adequate outlets are available. Cover crops and a system of conservation tillage that leaves protective amounts of crop residue on the surface increase the organic matter content; improve tilth, infiltration, and aeration; and help to prevent compaction.

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

This soil is well suited to trees. The main management concerns are the windthrow hazard, plant competition, and the equipment limitation. The windthrow hazard can be reduced by carefully thinning the stands or not thinning them at all and by harvest methods that do not isolate the remaining trees or leave them widely spaced. Windthrown trees should be periodically removed. Special harvest methods and adequate site preparation can control plant competition. Equipment should be used only when the soil is relatively dry or frozen.

Because of the wetness, this soil is severely limited as a site for dwellings and generally is unsuitable as a site for dwellings with basements. Constructing the buildings on raised, well compacted fill material can help to overcome the wetness. The water table can be lowered by subsurface drains, and excess surface water can be removed by surface drains. Because of low strength, the soil is severely limited as a site for local roads and streets. Strengthening or replacing the base material improves the ability of the roads and streets to support vehicular traffic.

Because of the wetness and the restricted permeability, this soil is severely limited as a site for septic tank absorption fields. These limitations can be minimized by filling or mounding the site with suitable filtering material and by installing subsurface drains, which help to lower the water table.

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

HkF—Hickory silt loam, 18 to 50 percent slopes. This moderately steep to very steep, deep, well drained soil is on side slopes on glacial plains. Individual areas are narrow and irregularly shaped and are 5 to 30 acres in size.

In a typical profile, the surface layer is dark brown silt loam about 2 inches thick. The subsurface layer is yellowish brown silt loam about 5 inches thick. The subsoil is about 43 inches thick. The upper part is dark yellowish brown, friable and firm silt loam; the next part is yellowish brown, firm silty clay loam; and the lower part is yellowish brown and dark yellowish brown, mottled, firm clay loam. The substratum to a depth of 60 inches is yellowish brown, mottled loam that has strata of sandy loam. In some places the loess is more than 30 or less than 13 inches thick. In other places the lower part of the subsoil is redder. In a few areas the subsoil is extremely acid.

Included with this soil in mapping are the well drained Otwell soils on the higher lying ridges and less sloping side slopes. These soils have a fragipan. Also included are a few areas on the lower parts of the slopes where bedrock is at a depth of 30 to 72 inches and a few areas of alluvial soils along drainageways. Included soils make up 12 to 15 percent of the unit.

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

Most areas are wooded. A few of the less sloping areas are pastured. This soil generally is unsuited to cultivated crops and to hay and pasture because of the slope and a severe hazard of erosion. The use of equipment is severely limited by the slope. The best means of controlling erosion is a permanent plant cover.

Establishing stands of pasture plants commonly is difficult. Overgrazing causes surface compaction and excessive runoff.

This soil is well suited to trees. The main management concerns are the equipment limitation, the erosion hazard, and plant competition. Special logging methods, such as yarding the logs uphill with a cable, are needed because rubber-tired and crawler tractors cannot be operated safely on these slopes. Erosion can be controlled by selective cutting rather than clearcutting; establishing haul roads, skid trails, and landings on gentle grades; preserving as much of the understory as possible; and diverting runoff. Special harvest methods and adequate site preparation can control plant competition.

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 and streets because of low strength and the slope. Strengthening or replacing the base material improves the ability of the roads and streets to support vehicular traffic and helps to prevent frost damage. Cutting and filling are needed, and the roads should be built on the contour if possible.

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

HoA—Hosmer silt loam, 0 to 2 percent slopes. This nearly level, deep, well drained soil is on broad ridgetops in the uplands. Individual areas are long and narrow and are 2 to 20 acres in size.

In a typical profile, the surface layer is brown silt loam about 8 inches thick. The subsurface layer is dark yellowish brown silt loam about 3 inches thick. The subsoil is about 54 inches thick. It is yellowish brown. The upper part is firm silty clay loam, and the lower part is a fragipan of very firm, brittle silt loam. The substratum to a depth of 70 inches is yellowish brown silt loam. In a few areas the soil is mottled below a depth of 20 inches. In some areas it is gently sloping.

Included with this soil in mapping are small areas of the somewhat poorly drained Iva soils at the head of small drainageways and a few areas of the moderately well drained Haubstadt soils on the slightly lower lake plains. Included soils make up 8 to 10 percent of the unit.

Available water capacity is moderate in the Hosmer soil. Permeability is moderate above the fragipan and very slow in the fragipan. Surface runoff is slow. The very firm and brittle fragipan at a depth of 24 to 36 inches restricts the downward movement of water and the penetration of roots. A perched seasonal high water table is in or above the fragipan during late winter and early spring. The organic matter content is moderately low in the surface layer. This layer is friable, but tilling when the soil is too wet results in poor tilth and the formation of plowpans.

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

This soil is well suited to corn, soybeans, and small grain. The very slowly permeable fragipan and the moderate available water capacity are limitations. Water perched on the fragipan early in spring commonly causes some delay in fieldwork. During years when rainfall is below average or poorly distributed, crops can be damaged by drought. Conservation tillage and cover crops conserve moisture, improve tilth, and increase the organic matter content.

This soil is well suited to most grasses and shallow-rooted legumes for hay or pasture. It is poorly suited to alfalfa and other deep-rooted crops because the fragipan restricts the penetration of roots. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and reduces plant density. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is well suited to trees. The main management concerns are the windthrow hazard and plant competition. Seedlings survive and grow well if competing vegetation is controlled by adequate site preparation or by spraying, cutting, or girdling. The windthrow hazard can be reduced by carefully thinning the stands or not thinning them at all, by use of special equipment that does not damage surficial root systems, and by harvest methods that do not isolate the remaining trees or leave them widely spaced. Windthrown trees should be periodically removed.

Because of wetness and shrinking and swelling, this soil is moderately limited as a site for dwellings. Strengthening foundations, footings, and basement walls, backfilling with coarser textured material, and installing foundation drain tile help to prevent the structural damage caused by wetness and by shrinking and swelling. The soil is severely limited as a site for local roads and streets because of frost action. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent frost damage.

Because of the wetness and the restricted permeability, this soil is severely limited as a site for septic tank absorption fields. These limitations can be minimized by filling or mounding the site with suitable filtering material and by installing subsurface drains, which help to lower the water table.

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

HoB2—Hosmer silt loam, 2 to 6 percent slopes, eroded. This gently sloping, deep, well drained soil is on broad, convex ridgetops and long side slopes in the uplands. Individual areas are broad and irregularly shaped and are 10 to 50 acres in size.

In a typical profile, the surface layer is brown silt loam about 8 inches thick. The subsoil is about 65 inches thick. In sequence downward, it is yellowish brown, firm silty clay loam; yellowish brown, firm silt loam; a fragipan of strong brown and yellowish brown, very firm, brittle silt loam; and yellowish brown, friable silt loam. The substratum to a depth of 76 inches is yellowish brown silt loam. In some places the subsoil is mottled below a depth of 20 inches. In other places the slope is less than 2 or more than 6 percent. In some of the more sloping areas, the soil is severely eroded. In places the loess is less than 60 inches thick.

Included with this soil in mapping are small areas of the well drained Alford soils on small knolls, some areas of the moderately well drained Haubstadt and Pekin soils on the lower lying lake plains and stream terraces, and a few small areas of the somewhat poorly drained Iva soils at the head of drainageways. Alford soils do not have a fragipan. Also included are some areas where the topsoil and some of the subsoil have been removed. These areas are adjacent to surface-mined areas. Included soils make up 10 to 12 percent of the unit.

Available water capacity is moderate in the Hosmer soil. Permeability is moderate above the fragipan and very slow in the fragipan. Surface runoff is medium. The very firm and brittle fragipan at a depth of 20 to 32 inches restricts the downward movement of water and the penetration of roots. A perched seasonal high water table is in or above the fragipan during late winter and early spring. The organic matter content is moderately low in the surface layer. This layer is friable and can be easily tilled throughout a fairly wide range in moisture content.

Most areas of this soil are used for cultivated crops. Many are used for hay and pasture, and some are wooded. A few are used for urban development or orchards.

This soil is well suited to corn, soybeans, and small grain. The very slowly permeable fragipan and the moderate available water capacity are limitations, and erosion is a hazard. During years when rainfall is below average or is poorly distributed, crops can be damaged by drought. Measures that help to control erosion and runoff are needed if cultivated crops are grown. Examples are a crop rotation that includes grasses and legumes, a system of conservation tillage that leaves protective amounts of crop residue on the surface, grassed waterways, and grade stabilization structures. If slopes are long and uniform, terraces and contour farming also can help to control runoff and erosion. Conservation tillage and cover crops help to maintain tilth and the organic matter content.

This soil is well suited to most grasses and shallow-rooted legumes for hay or pasture. It is poorly suited to alfalfa and other deep-rooted crops because the fragipan restricts the penetration of roots. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates and pasture rotation help to keep the pasture in good condition.

This soil is well suited to trees. The main management concerns are plant competition and the windthrow hazard. Seedlings survive and grow well if competing vegetation is controlled by adequate site preparation or by spraying, cutting, or girdling. The windthrow hazard can be reduced by carefully thinning the stands or not thinning them at all, by use of special equipment that does not damage surficial root systems, and by harvest methods that do not isolate the remaining trees or leave them widely spaced. Windthrown trees should be periodically removed.

Because of wetness and shrinking and swelling, this soil is moderately limited as a site for dwellings. Strengthening foundations, footings, and basement walls, backfilling with coarser textured material, and installing foundation drain tile help to prevent the structural damage caused by wetness and by shrinking and swelling. The soil is severely limited as a site for local roads and streets because of frost action. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent frost damage.

Because of the restricted permeability and the wetness, this soil is severely limited as a site for septic tank absorption fields. These limitations can be minimized by filling or mounding the site with suitable filtering material and by installing subsurface drains, which help to lower the water table.

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

HoC3—Hosmer silt loam, 6 to 12 percent slopes, severely eroded. This moderately sloping, deep, well drained soil is on short side slopes in the uplands. Individual areas are long and irregularly shaped and are 10 to 60 acres in size.

In a typical profile, the surface layer is yellowish brown silt loam about 6 inches thick. The subsoil to a depth of 80 inches is dark brown, yellowish brown, or dark yellowish brown. The upper part is firm silty clay loam, the next part is a fragipan of very firm, brittle silt loam, and the lower part is firm silty clay loam. In some areas the fragipan is within a depth of 20 inches. In other areas the slope is less than 6 or more than 12 percent. In places the loess is less than 60 inches thick.

Included with this soil in mapping are small areas of the somewhat poorly drained Iva soils at the head of drainageways and a few gullied areas where the fragipan is exposed. Also included are the somewhat poorly drained Belknap and Wakeland soils in small alluvial areas adjacent to drainageways. Included soils make up 6 to 10 percent of the unit.

Available water capacity is moderate in the Hosmer soil. Permeability is moderate above the fragipan and very slow in the fragipan. Surface runoff is rapid. The very firm and brittle fragipan at a depth of 20 to 32 inches restricts the downward movement of water and the penetration of roots. A perched seasonal high water table is in or above the fragipan early in spring or late in winter. The organic matter content is low in the surface layer because of the loss of surface soil through erosion. Unless the soil is tilled within a somewhat narrow range in moisture content, compaction and clodding can occur. Seedbeds are often low in moisture content. As a result, seed germination is poor.

Most areas of this soil are used for cultivated crops. Some are used for hay and pasture, and a few are wooded. A few are used as urban land.

This soil is poorly suited to corn, soybeans, and small grain because of a severe hazard of further erosion. The very slowly permeable fragipan and the moderate available water capacity are limitations. During years when rainfall is below average or is poorly distributed, crops can be damaged by drought. The droughtiness can be minimized by applying a system of conservation tillage that leaves protective amounts of crop residue on the surface and by planting early in spring. Conservation tillage, a crop rotation that includes grasses and legumes, grassed waterways, and grade stabilization structures help to control erosion and runoff. Conservation tillage and cover crops improve tilth and increase the organic matter content.

This soil is fairly well suited to most grasses and shallow-rooted legumes for hay or pasture. It is poorly suited to alfalfa and other deep-rooted crops because the fragipan restricts the penetration of roots. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates and pasture rotation help to keep the pasture in good condition.

This soil is well suited to trees. The main management concerns are plant competition and the windthrow hazard. Seedlings survive and grow well if competing vegetation is controlled by adequate site preparation or by spraying, cutting, or girdling. The windthrow hazard can be reduced by carefully thinning the stands or not thinning them at all, by use of special equipment that does not damage surficial root systems, and by harvest methods that do not isolate the remaining trees or leave them widely spaced. Windthrown trees should be periodically removed.

Because of slope, shrinking and swelling, and wetness, this soil is moderately limited as a site for dwellings. Buildings should be designed so that they conform to the natural slope of the land. Land shaping is needed in some areas. Strengthening foundations, footings, and basement walls, backfilling with coarser textured material, and installing foundation drain tile help to prevent the structural damage caused by wetness and by shrinking and swelling. Removal of vegetation should be kept to a minimum, and exposed areas should be reseeded or sodded as soon as possible.

This soil is severely limited as a site for local roads and streets because of frost action. Replacing or covering the upper soil layers with suitable base material helps to prevent frost damage. Cutting and filling are needed, and the roads should be built on the contour if possible.

Because of the restricted permeability and the wetness, this soil is severely limited as a site for septic tank absorption fields. These limitations can be minimized by filling or mounding the site with suitable filtering material and by installing subsurface drains, which help to lower the water table. The absorption field should be designed so that it conforms to the natural slope of the land.

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

HoD3—Hosmer silt loam, 12 to 18 percent slopes, severely eroded. This strongly sloping, deep, well drained soil is on side slopes in the uplands. Individual areas are elongated and irregularly shaped and are 2 to 60 acres in size.

In a typical profile, the surface layer is yellowish brown silt loam about 6 inches thick. The subsoil is more than 80 inches thick. The upper part is strong brown, firm silty clay loam, and the lower part is a fragipan of brown and dark yellowish brown, very firm, brittle silt loam. In a few areas the depth to the fragipan is 10 to 15 inches. In places the lower part of the fragipan and substratum are weathered sandstone and shale or stratified glacial drift. In some areas the soil is eroded.

Included with this soil in mapping are small areas of the well drained Wellston soils on the lower part of the side slopes. These soils do not have a fragipan. Also included are a few areas that have gullies 1 to 3 feet deep. Included areas make up 10 to 12 percent of the unit.

Available water capacity is moderate in the Hosmer soil. Permeability is moderate above the fragipan and is very slow in the fragipan. Surface runoff is very rapid. The very firm and brittle fragipan at a depth of 20 to 30 inches restricts the downward movement of water and the penetration of roots. A perched seasonal high water table is in or above the fragipan late in winter and early in spring. The organic matter content is low in the surface layer because of the loss of the surface soil through erosion. Unless the soil is tilled within a somewhat narrow range in moisture content, compaction and clodding can occur.

Most areas are used for hay and pasture or are wooded. Some are used for cultivated crops. This soil generally is unsuited to cultivated crops because of a very severe hazard of erosion. The very slowly permeable fragipan and the moderate available water capacity are limitations.

This soil is fairly well suited to most grasses and shallow-rooted legumes for hay or pasture. It is poorly suited to alfalfa and other deep-rooted crops because the fragipan restricts the penetration of roots. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates and pasture rotation help to keep the pasture in good condition.

This soil is fairly well suited to trees. Plant competition, the erosion hazard, the equipment limitation, and the windthrow hazard are management concerns. Seedlings survive and grow well if competing vegetation is controlled by adequate site preparation or by spraying, cutting, or girdling. Locating logging roads and skid trails on gentle slopes and on ridgetops and removing water with water bars, culverts, and drop structures help to control erosion. Special logging methods are needed because rubber-tired and crawler tractors should be limited on these slopes. The windthrow hazard can be reduced by carefully thinning the stands or not thinning them at all, by use of special equipment that does not damage surficial root systems, and by harvest methods that do not isolate the remaining trees or leave them widely spaced. Windthrown trees should be periodically removed.

Because of the slope, this soil is severely limited as a site for dwellings. Buildings should be designed so that they conform to the natural slope of the land. Land shaping is needed in some areas. Strengthening foundations, footings, and basement walls, backfilling with coarser textured material, and installing foundation drain tile help to prevent the structural damage caused by wetness and by shrinking and swelling. Removal of vegetation should be kept to a minimum, and exposed areas should be revegetated as soon as possible.

This soil is severely limited as a site for local roads and streets because of the slope and frost action. Cutting and filling are needed, and the roads should be built on the contour if possible. Replacing or covering the upper soil layers with suitable base material helps to prevent frost damage.

Because of the wetness, the very slowly permeable fragipan, and the slope, this soil is severely limited as a site for septic tank absorption fields. Lateral seepage from the absorption field is a severe hazard. Alternative sites should be considered. Land shaping and installing the distribution lines across the slope help to ensure that the absorption field functions properly. Subsurface drains can lower the water table.

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

Hu—Huntsville silt loam, rarely flooded. This nearly level, deep, well drained soil is on broad bottom land. It is flooded for brief periods during winter and spring in some years. Individual areas are broad and elongated and are 100 to 200 acres in size.

In a typical profile, the surface layer is very dark grayish brown loam about 8 inches thick. The subsurface layer is very dark grayish brown, very dark brown, and dark brown silt loam about 23 inches thick. The subsoil is dark yellowish brown, friable silt loam about 11 inches thick. The substratum to a depth of 60 inches is yellowish brown, mottled silt loam that has strata of fine sandy loam. In places the surface layer is thinner. In some areas the soil has a higher content of sand and clay.

Included with this soil in mapping are small areas of the poorly drained Vincennes Variant soils in the lower positions on the landscape, adjacent to drainage channels. Also included are a few small areas of the well drained Haymond soils on the slightly lower flood plains. These soils have a surface layer that is thinner and lighter colored than that of the Huntsville soil. Included soils make up about 4 to 8 percent of the unit.

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

Nearly all areas are cultivated. This soil is well suited to corn, soybeans, and small grain. A system of conservation tillage that leaves protective amounts of crop residue on the surface helps to maintain tilth and the organic matter content.

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

Only a few areas are wooded. This soil is well suited to trees. Plant competition is the main management concern. Seedlings survive and grow well if competing vegetation is controlled by adequate site preparation or by spraying, cutting, or girdling.

Because of the flooding, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields. It is severely limited as a site for local roads and streets because of low strength and frost action. Strengthening or replacing the base material improves the ability of the roads and streets to support vehicular traffic and helps to prevent frost damage. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by flooding and frost action.

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

IoA—Iona silt loam, 0 to 2 percent slopes. This nearly level, deep, moderately well drained soil is on broad ridgetops in the uplands. Individual areas are broad and irregularly shaped and are 10 to 60 acres in size.

In a typical profile, the surface layer is dark grayish brown silt loam about 10 inches thick. The subsoil is about 36 inches thick. The upper part is yellowish brown, firm silty clay loam; the next part is yellowish brown, mottled, firm silty clay loam; and the lower part is light yellowish brown, mottled, friable silt loam. The substratum to a depth of 60 inches is light yellowish brown, mottled silt loam. In a few places it is slightly acid at a depth of 50 to 60 inches. In some areas the depth to the substratum is more than 50 inches.

Included with this soil in mapping are a few areas of the well drained Sylvan soils on gently sloping knolls and sloping side slopes and small areas of the somewhat poorly drained Reesville soils at the head of small drainageways. Included soils make up 5 to 8 percent of the unit.

Available water capacity is very high in the Iona soil. Permeability is moderately slow. Surface runoff is slow in cultivated areas. A seasonal high water table is at a depth of 2 to 4 feet during late winter and early spring. The organic matter content is moderate in the surface layer. This layer is friable and can be easily tilled throughout a fairly wide range in moisture content.

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

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

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

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

Because of wetness and shrinking and swelling, this soil is moderately limited as a site for dwellings. Buildings should be constructed without basements. Constructing the buildings on raised, well compacted fill material and installing subsurface drains help to overcome the wetness. Strengthening foundations and footings and installing foundation drain tile help to prevent the structural damage caused by shrinking and swelling.

This soil is severely limited as a site for local roads and streets because of frost action and low strength. Roadside ditches help to lower the water table and thus help to prevent the damage caused by frost action. Strengthening or replacing the base material improves the ability of the roads and streets to support vehicular traffic and helps to prevent frost damage.

Because of the restricted permeability and the wetness, this soil is severely limited as a site for septic tank absorption fields. These limitations can be minimized by filling or mounding the site with suitable filtering material and by installing subsurface drains, which help to lower the water table. Enlarging the absorption field helps to overcome the restricted permeability.

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

IvA—Iva silt loam, 0 to 2 percent slopes. This nearly level, deep, somewhat poorly drained soil is on broad flats in the uplands. Individual areas are broad and irregularly shaped and are 4 to 60 acres in size.

In a typical profile, the surface layer is grayish brown silt loam about 11 inches thick. The subsurface layer is light brownish gray silt loam about 7 inches thick. The subsoil is about 36 inches thick. It is light brownish gray and yellowish brown, mottled, firm silty clay loam and friable silt loam. The substratum to a depth of 60 inches is mottled yellowish brown and gray silt loam. In some small areas at the head of drainageways and in slightly depressional areas on broad flats, the soil is grayer throughout. In places, the surface soil and subsoil are less acid and the substratum is calcareous.

Included with this soil in mapping are small areas of the well drained Hosmer and Alford soils on the more sloping side slopes adjacent to drainageways. Some of these areas are severely eroded. Also included are a few small areas of the moderately well drained Muren soils on small rises. Included soils make up about 6 to 10 percent of the unit.

Available water capacity is very high in the Iva soil. Permeability is moderate. Surface runoff is slow. A seasonal high water table is at a depth of 1 to 3 feet during winter and early spring. The organic matter content is moderately low in the surface layer. This layer is friable, but tilling when the soil is too wet results in the formation of ruts and plowpans.

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

This soil is well suited to corn, soybeans, and small grain. The wetness is the major limitation. If the soil is drained, a conservation cropping system dominated by row crops is suitable. Installing random tile in depressional areas that collect runoff reduces the wetness. Conservation tillage improves tilth and increases the organic matter content.

If drained, this soil is well suited to grasses and legumes for hay or pasture. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition. Water-tolerant species should be favored.

This soil is well suited to trees. The main management concerns are plant competition and the equipment limitation. Seedlings survive and grow well if competing vegetation is controlled by adequate site preparation or by spraying, cutting, or girdling. Equipment should be used only when the soil is relatively dry or frozen.

Because of the wetness, this soil is severely limited as a site for dwellings. Buildings should be constructed without basements. Constructing the buildings on raised, well compacted fill material and installing subsurface drains help to overcome the wetness. Strengthening foundations and footings and installing foundation drain tile help to prevent the structural damage caused by wetness.

This soil is severely limited as a site for local roads and streets because of frost action and low strength. Surface and subsurface drainage systems lower the water table and thus help to prevent the damage caused by frost action. Strengthening or replacing the base material improves the ability of the roads and streets to support vehicular traffic and helps to prevent frost damage.

Because of the wetness, this soil is severely limited as a site for septic tank absorption fields. The water table can be lowered by subsurface drainage systems, or the site can be filled or mounded with suitable filtering material, which increases the depth to the water table.

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

Ln—Lindside silt loam, frequently flooded. This nearly level, deep, moderately well drained soil is on flood plains. It is flooded for brief periods in winter and spring. Individual areas are long and narrow and are 5 to 60 acres in size.

In a typical profile, the surface layer is dark brown silt loam about 9 inches thick. The subsoil is about 40 inches thick. The upper part is dark brown, firm silt loam; the next part is dark brown, mottled, firm silty clay loam; and the lower part is brown, mottled, firm and friable silty clay loam. The substratum to a depth of 60 inches is brown silty clay loam. In places the subsoil has less clay. In some areas the soil is more acid. In other areas it is only occasionally flooded.

Included with this soil in mapping are some areas of the well drained Nolin soils on the higher parts of the landscape. Also included are the somewhat poorly drained Stendal soils in the broader, flatter areas. Included soils make up 5 to 10 percent of the unit.

Available water capacity is high in the Lindside soil. Permeability is moderate. Surface runoff is slow. A seasonal high water table is at a depth of 1.5 to 3.0 feet during winter and spring. The organic matter content is moderate in the surface layer. This layer is friable, but tilling when the soil is too wet results in a cloddy seedbed and the formation of plowpans.

Most areas of this soil are used for cultivated crops. Some are wooded.

This soil is well suited to corn and soybeans. It is poorly suited to small grain, which can be damaged by floodwater during winter and spring. The wetness is a major limitation, and the flooding is a major hazard. If a good surface drainage system is installed, crops can be planted after the floodwater recedes. Cover crops and a system of conservation tillage that leaves protective amounts of crop residue on the surface increase the organic matter content, help to maintain tilth, and improve infiltration and aeration.

This soil is well suited to most grasses and shallow-rooted legumes for hay and pasture. It is poorly suited to deep-rooted legumes, such as alfalfa, because of the wetness and the damage caused by floodwater. A drainage system is necessary. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and reduces plant density. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is the main management concern. It can be controlled by special harvest methods and by adequate site preparation.

Because of flooding and wetness, this soil is generally unsuitable as a site for 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 flooding and frost action. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by flooding and frost action.

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

MbC3—Markland silty clay loam, 6 to 15 percent slopes, severely eroded. This moderately sloping and strongly sloping, deep, well drained soil is on narrow side slopes on lacustrine terraces. Individual areas are 3 to 30 acres in size.

In a typical profile, the surface layer is yellowish brown silty clay loam about 6 inches thick. The subsoil is yellowish brown, very firm silty clay about 25 inches thick. The substratum to a depth of 60 inches is light olive brown, mottled silty clay loam that has strata of silt loam and silty clay. In places the surface layer and subsoil have less clay. In some areas the slope is less than 6 or more than 15 percent.

Included with this soil in mapping are small areas of the nearly level, somewhat poorly drained McGary and Henshaw soils on the higher lying, broad terraces and the somewhat poorly drained Wakeland and poorly drained Birds soils on the lower lying flood plains. Also included are a few wooded areas that are not eroded and some cropped areas where calcareous material is at the surface. Included soils make up 5 to 10 percent of the unit.

Available water capacity is moderate in the Markland soil. Permeability is slow. Surface runoff is very rapid. A perched seasonal high water table is at a depth of 3 to 6 feet during late winter and early spring. The organic matter content is low in the surface layer because of the loss of surface soil through erosion. This layer is firm and becomes cloddy and hard to work if it is tilled when the soil is too wet or too dry.

Most areas are used for cultivated crops. A few are pastured, wooded, or left idle. This soil generally is unsuited to cultivated crops because of a severe hazard of erosion. Poor tilth and the moderate available water capacity are limitations.

This soil is fairly well suited to most grasses and legumes for hay or pasture. A cover of grasses and legumes is effective in controlling erosion. Overgrazing or grazing when the soil is too wet causes surface compaction, poor tilth, and excessive runoff and erosion. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is fairly well suited to trees. The main management concerns are seedling mortality, the windthrow hazard, and plant competition. Special planting stock, overstocking, and special site preparation are needed because of the seedling mortality rate. The windthrow hazard can be reduced by carefully thinning the stands or not thinning them at all and by harvest methods that do not isolate the remaining trees or leave them widely spaced. Windthrown trees should be periodically removed. The use of equipment is limited when the soil is wet and sticky. Special harvest methods and adequate site preparation can control plant competition. Seedlings survive and grow well if competing vegetation is controlled by cutting, spraying, or girdling.

Because of shrinking and swelling, this soil is severely limited as a site for dwellings. Strengthening foundations, footings, and basement walls and backfilling with coarser textured material help to prevent the structural damage caused by shrinking and swelling. Foundation drain tile should be used to collect excess water. The soil is severely limited as a site for local roads and streets because of low strength and shrinking and swelling. Strengthening or replacing the base material improves the ability of the roads and streets to support vehicular traffic.

Because of the wetness and the restricted permeability, this soil is severely limited as a site for septic tank absorption fields. Alternative sites should be considered. The wetness can be reduced by installing subsurface drains. The restricted permeability can be minimized by filling or mounding the site with suitable filtering material in areas where the slope is less than 12 percent. The absorption field should be designed so that it conforms to the natural slope of the land.

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

MgA—McGary silty clay loam, 0 to 2 percent slopes. This nearly level, deep, somewhat poorly drained soil is on lacustrine terraces. Individual areas are broad and irregularly shaped and are 2 to 40 acres in size.

In a typical profile, the surface layer is dark grayish brown silty clay loam about 8 inches thick. The subsoil is about 30 inches thick. It is firm and mottled. The upper part is olive brown and grayish brown silty clay, and the lower part is grayish brown silty clay loam. The substratum to a depth of 60 inches is light brownish gray, mottled silty clay that has strata of silty clay loam and silt loam. In some areas the surface layer and subsoil are grayer. In other areas they have more silt and less clay.

Included with this soil in mapping are areas of the well drained Markland soils on short breaks near alluvial soils and drainageways. Also included, in depressions, are the very poorly drained Montgomery soils, which have a dark surface layer. Included soils make up 3 to 5 percent of the unit.

Available water capacity is moderate in the McGary soil. Permeability is slow. Surface runoff also is slow. A seasonal high water table is at a depth of 1 to 3 feet during winter and early spring. The organic matter content is moderately low in the surface layer. This layer is firm and becomes cloddy and hard to work if it is tilled when the soil is too wet.

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

If drained, this soil is well suited to corn, soybeans, and small grain. The wetness is the main limitation. Excess water can be removed by subsurface drains, surface drains, or a combination of these. If the drainage system functions properly, a conservation cropping system dominated by row crops is suitable. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves tilth and increases the organic matter content.

If drained, this soil is fairly well suited to most grasses and shallow-rooted legumes for hay or pasture. It is poorly suited to alfalfa and other deep-rooted legumes because the high water table restricts root growth and shrinking and swelling often heave taprooted plants. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition. Water-tolerant species should be favored.

This soil is fairly well suited to trees. Seedling mortality, the windthrow hazard, the equipment limitation, and plant competition are management concerns. Special planting stock and overstocking are needed because of the seedling mortal,ty rate. The windthrow hazard can be reduced by harvest methods that do not isolate the remaining trees or leave them widely spaced. Windthrown trees should be periodically removed. Equipment should be used only when the soil is relatively dry or frozen. Seedlings survive and grow well if competing vegetation is controlled by adequate site preparation or by cutting, spraying, or girdling.

Because of wetness and shrinking and swelling, this soil is severely limited as a site for dwellings. Constructing the buildings on raised, well compacted fill material and installing subsurface drains help to overcome the wetness. The buildings should be constructed without basements. Strengthening foundations and footings helps to prevent the structural damage caused by shrinking and swelling. The soil is severely limited as a site for local roads and streets because of shrinking and swelling and low strength. Strengthening or replacing the base material improves the ability of the roads and streets to support vehicular traffic.

Because of the wetness and the restricted permeability, this soil is severely limited as a site for septic tank absorption fields. These limitations can be minimized by filling or mounding the site with suitable filtering material and by installing subsurface drains, which help to lower the water table.

The land capability classification is IIIw. The woodland ordination symbol is 4W.

Mt—Montgomery silty clay. This nearly level, deep, very poorly drained soil is on terraces and lacustrine plains. It is subject to ponding. Individual areas are broad and are 10 to 60 acres in size.

In a typical profile, the surface layer and subsurface layer are very dark grayish brown silty clay. The surface layer is about 8 inches thick, and the subsurface layer is about 7 inches thick. The subsoil is mottled, firm silty clay about 35 inches thick. It is dark gray in the upper part and gray in the lower part. The substratum to a depth of 60 inches is gray, mottled silty clay that has thin strata of silty clay loam and silt loam. In some small areas the surface soil and subsoil have less clay. In places the surface layer is lighter colored.

Included with this soil in mapping are small areas of the somewhat poorly drained McGary soils in the higher positions on the landscape. Included soils make up 8 to 10 percent of the unit.

Available water capacity is moderate in the Montgomery soil. Permeability is slow. Surface runoff is very slow. A seasonal high water table is near or slightly above the surface during winter and spring. The organic matter content is moderate in the surface layer. This layer is firm and becomes cloddy and hard to work if it is tilled when the soil is too dry or too wet.

Nearly all areas are cultivated. This soil is fairly well suited to corn, soybeans, and small grain. If drained and otherwise well managed, it is suitable for intensive row cropping. The wetness is the major limitation. Surface drains are needed to remove excess water. Subsurface drains also can be used. Because of the slow permeability, however, they cannot work properly unless surface drains also are installed. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves tilth and helps to maintain the organic matter content.

This soil is fairly well suited to water-tolerant grasses and legumes for hay or pasture. A drainage system is necessary. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is fairly well suited to trees. The equipment limitation, plant competition, seedling mortality, and the windthrow hazard are management concerns. Harvesting and planting equipment should be used only during the drier periods. Seedlings survive and grow well if competing vegetation is controlled by adequate site preparation or by spraying, cutting, or girdling. Special planting stock and overstocking are needed because of the seedling mortality rate. Careful thinning of the stands and harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Windthrown trees should be periodically removed. Species that can withstand the wetness should be favored in the stands.

Because of the ponding, 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 ponding, low strength, and shrinking and swelling. A drainage system is needed to lower the water table and divert runoff to a suitable outlet. Strengthening or replacing the base material improves the ability of the roads and streets to support vehicular traffic. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by ponding and by shrinking and swelling.

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

MuA—Muren silt loam, 0 to 2 percent slopes. This nearly level, deep, moderately well drained soil is on uplands. Individual areas are narrow and irregularly shaped and are 4 to 250 acres in size.

In a typical profile, the surface layer is dark brown silt loam about 8 inches thick. The subsoil is about 39 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, mottled, friable silt loam. The substratum to a depth of 60 inches is yellowish brown, mottled silt loam. In places the subsoil is less acid. In some areas the slope is more than 2 percent.

Included with this soil in mapping are the well drained Alford soils on the more sloping ridges and side slopes. Also included are the somewhat poorly drained Iva soils in slightly concave areas at the head of drainageways. Included soils make up 8 to 10 percent of the unit.

Available water capacity is very high in the Muren soil. Permeability is moderate. Surface runoff is slow. A seasonal high water table is at a depth of 2 to 6 feet during late winter and early spring. The organic matter content is moderately low in the surface layer. This layer is friable and can be easily tilled throughout a fairly wide range in moisture content.

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

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

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

This soil is well suited to trees. Plant competition is the main management concern. It can be controlled by special harvest methods and by adequate site preparation.

Because of the wetness and shrinking and swelling, 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. Subsurface drains can lower the water table. Strengthening foundations and footings and backfilling with coarser textured material help to prevent the structural damage caused by shrinking and swelling. The dwellings should be built without basements. 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 material improves the ability of the roads and streets to support vehicular traffic and helps to prevent frost damage.

Because of the wetness, this soil is severely limited as a site for septic tank absorption fields. This limitation can be overcome by filling the site with suitable filtering material or by installing subsurface drains, which help to lower the water table.

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

No—Nolin silty clay loam, frequently flooded. This nearly level, deep, well drained soil is on broad bottom land. It is flooded for brief to long periods in winter and early spring. Individual areas are 30 to 150 acres in size.

In a typical profile, the surface layer is dark brown silty clay loam about 10 inches thick. The subsoil is silt loam about 40 inches thick. The upper part is yellowish brown and dark yellowish brown and is firm, and the lower part is yellowish brown and friable. The substratum to a depth of 60 inches is yellowish brown silt loam that has thin strata of fine sandy loam. In some places the surface layer and subsoil have less clay. In other places grayish brown mottles are below a depth of 24 inches. In some areas the soil is only occasionally flooded.

Included with this soil in mapping are some areas of the well drained Armiesburg and Stonelick soils in the slightly higher landscape positions. Armiesburg soils have a surface layer that is darker than that of the Nolin soil. Stonelick soils contain more sand throughout than the Nolin soil. Also included are small, elongated areas of the poorly drained Petrolia and very poorly drained Wilhite soils in old channels and a few areas of the moderately well drained Lindside soils in the slightly lower landscape positions. Included soils make up 3 to 10 percent of the unit.

Available water capacity is high in the Nolin soil. Permeability is moderate. Surface runoff is slow. A seasonal high water table is at a depth of 3 to 6 feet during winter and early spring. The organic matter content is moderate in the surface layer. This layer is friable but should be tilled only within a moderate range in moisture content. Tilling when the soil is too wet results in a cloddy seedbed and the formation of plowpans.

Most areas of this soil are used for cultivated crops. Some of the slightly higher areas are used for small grain. A few areas are wooded.

This soil is well suited to corn and soybeans, which can be planted and harvested during periods when flooding is least likely. If well managed, the soil is suitable for intensive row cropping. In most areas it is poorly suited to small grain, which can be damaged by floodwater in winter and early in spring. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves tilth and increases the organic matter content.

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

This soil is well suited to trees. The main management concerns are plant competition and the equipment limitation. Seedlings survive and grow well if competing vegetation is controlled by adequate site preparation or by spraying, cutting, or girdling. Equipment should be used only when the soil is relatively dry or frozen.

Because of the flooding, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields. Areas used for these purposes should be protected from flooding, or alternative sites should be selected. The soil is severely limited as a site for local roads and streets because of low strength and flooding. Strengthening or replacing the base material improves the ability of the roads and streets to support vehicular traffic. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by flooding.

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

OtB2—Otwell silt loam, 2 to 6 percent slopes, eroded. This gently sloping, deep, well drained soil is on narrow ridgetops on loess-capped lake plains. Individual areas are narrow and irregularly shaped and are 5 to 20 acres in size.

In a typical profile, the surface layer is dark yellowish brown silt loam about 6 inches thick. The subsoil is about 73 inches thick. The upper part is yellowish brown, firm silty clay loam; the next part is a fragipan of yellowish brown, very firm, brittle silt loam; and the lower part is yellowish brown, strong brown, and yellowish red, firm, stratified silt loam and silty clay loam. The substratum to a depth of 90 inches is yellowish brown, mottled silt loam that has strata of loam. In places the loess is more than 40 inches thick.

Included with this soil in mapping are the moderately well drained Haubstadt soils on the broader ridgetops and on the upper end of drainageways. Also included are the somewhat poorly drained Dubois soils near the head of drainageways and on the lower parts of the landscape. Included soils make up about 5 to 8 percent of the unit.

Available water capacity is moderate in the Otwell soil. Permeability is very slow. Surface runoff is medium. The very firm and brittle fragipan at a depth of 24 to 36 inches restricts the downward movement of water and the penetration of roots. A perched seasonal high water table is in or above the fragipan during winter and spring. The organic matter content is moderately low in the surface layer. This layer is friable and can be easily tilled throughout a fairly wide range in moisture content.

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

This soil is well suited to corn, soybeans, and small grain. Erosion is the major hazard. Cover crops and a system of conservation tillage that leaves protective amounts of crop residue on the surface reduce the susceptibility to erosion, increase the organic matter content, and help to maintain good tilth. Grassed waterways, conservation cropping systems that include grasses and legumes, and drop structures also help to control erosion.

This soil is well suited to most grasses and shallow-rooted legumes for hay and pasture. It is poorly suited to alfalfa and other deep-rooted legumes because root growth is restricted by the fragipan and the perched water table. Overgrazing or grazing when the soil is too wet causes excessive water runoff, surface compaction, and poor tilth and reduces plant density. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

This soil is well suited to trees. The main management concerns are seedling mortality and the windthrow hazard. The root zone is restricted mainly to the part of the soil above the fragipan. The seedling mortality rate can be overcome by selection of special planting stock, overstocking, special site preparation before planting, and harvest methods that leave some mature trees to provide shade and protection for the seedlings. The windthrow hazard can be reduced by carefully thinning the stands or not thinning them at all, by use of special equipment that does not damage surficial root systems, and by harvest methods that do not isolate the remaining trees or leave them widely spaced. Windthrown trees should be periodically removed.

Because of wetness and shrinking and swelling, this soil is moderately limited as a site for dwellings. Subsurface drains can lower the water table. Strengthening foundations, footings, and basement walls and installing foundation drain tile help to prevent the structural damage caused by wetness. Backfilling with coarser textured material helps to prevent the structural damage caused by shrinking and swelling. 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 material improves the ability of the roads and streets to support vehicular traffic and helps to prevent frost damage.

Because of the wetness and the restricted permeability, this soil is severely limited as a site for septic tank absorption fields. The absorption fields function very poorly. The limitations can be minimized by filling or mounding the site with suitable filtering material and by installing subsurface drains, which help to lower the water table.

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

OtC3—Otwell silt loam, 6 to 12 percent slopes, severely eroded. This moderately sloping, deep, well drained soil is on short side slopes on glacial lake plains. Individual areas are long and irregularly shaped and are 10 to 60 acres in size.

In a typical profile, the surface layer is yellowish brown silt loam about 6 inches thick. The subsoil is about 60 inches thick. The upper part is dark yellowish brown, firm silty clay loam; the next part is a fragipan of dark yellowish brown and dark brown, very firm, brittle silt loam; and the lower part is yellowish brown, firm silt loam. The substratum to a depth of 70 inches is brown silt loam that has strata of loam. In some places the fragipan is directly below the plow layer. In other places the soil does not have a fragipan. In some areas the loess cap is more than 40 inches thick. In other areas the soil is underlain by glacial till.

Included with this soil in mapping are some areas of the moderately well drained, gently sloping Haubstadt soils on the higher lying ridges and the well drained Pike and Hickory soils on the steeper, narrow side slopes. Pike and Hickory soils do not have a fragipan. Also included are the somewhat poorly drained Belknap and Wakeland soils in small, narrow alluvial areas adjacent to drainageways and the somewhat poorly drained Dubois soils on the higher lying flats. Included soils make up 8 to 10 percent of the unit.

Available water capacity is moderate in the Otwell soil. Permeability is very slow. Surface runoff is rapid. The very firm and brittle fragipan at a depth of 10 to 24 inches restricts the downward movement of water and the penetration of roots. A perched seasonal high water table is in or above the fragipan in winter and spring. The organic matter content is low in the surface layer because of the loss of surface soil through erosion. Unless the soil is tilled within a somewhat narrow range in moisture content, compaction and clodding can occur.

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

This soil is poorly suited to corn, soybeans, and small grain because of a severe hazard of further erosion. The very slowly permeable fragipan and the moderate available water capacity are limitations. During years when rainfall is below average or is poorly distributed, crops can be damaged by drought. The droughtiness can be minimized by applying a system of conservation tillage that leaves protective amounts of crop residue on the surface and by planting as early in spring as possible. A crop rotation that includes grasses and legumes and conservation tillage help to prevent excessive soil loss. Diversions, grassed waterways, and grade stabilization structures help to prevent gullying. Conservation tillage and cover crops improve tilth and increase the organic matter content.

This soil is fairly well suited to most grasses and shallow-rooted legumes for hay and pasture. It is poorly suited to alfalfa and other deep-rooted crops because the fragipan restricts the penetration of roots. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates and pasture rotation help to keep the pasture in good condition.

This soil is fairly well suited to trees. The main management concerns are seedling mortality and the windthrow hazard. The seedling mortality rate can be overcome by selection of special planting stock, overstocking, and special site preparation. The windthrow hazard can be reduced by carefully thinning the stands or not thinning them at all and by use of harvest methods that do not isolate the remaining trees or leave them widely spaced. Windthrown trees should be periodically removed.

Because of slope, wetness, and shrinking and swelling, this soil is moderately limited as a site for dwellings. Buildings should be designed so that they conform to the natural slope of the land. Land shaping is needed in some areas. Strengthening foundations, footings, and basement walls, backfilling with coarser textured material, and installing foundation drain tile help to prevent the structural damage caused by shrinking and swelling. Removal of vegetation should be kept to a minimum, and exposed areas should be reseeded or sodded as soon as possible.

Because of low strength and frost action, this soil is severely limited as a site for local roads and streets. Strengthening or replacing the base material improves the ability of the roads and streets to support vehicular traffic and helps to prevent frost damage. Cutting and filling are needed, and the roads should be built on the contour if possible.

Because of the restricted permeability and the wetness, this soil is severely limited as a site for septic tank absorption fields. The absorption fields function very poorly. The limitations can be minimized by filling or mounding the site with suitable filtering material and by installing subsurface drains, which help to lower the water table. The absorption field should be designed so that it conforms to the natural slope of the land.

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

OtD3—Otwell silt loam, 12 to 18 percent slopes, severely eroded. This strongly sloping, deep, well drained soil is on side slopes on glacial lake plains. Individual areas generally are elongated and irregularly shaped and are 10 to 60 acres in size.

In a typical profile, the surface layer is yellowish brown silt loam about 5 inches thick. The subsoil is about 49 inches thick. The upper part is dark yellowish brown, firm silty clay loam; the next part is a fragipan of dark brown, very firm, brittle silt loam and loam; and the lower part is dark brown, firm loam. The substratum to a depth of 60 inches is yellowish brown, stratified loam and sandy loam. In places the loess cap is thicker. In some areas the fragipan is directly below the plow layer. In other areas the soil does not have a fragipan. In places it is underlain by glacial till.

Included with this soil in mapping are some areas of the moderately well drained, gently sloping Haubstadt soils on the higher lying ridges and the well drained Pike and Hickory soils on the steeper, narrow side slopes. Pike and Hickory soils do not have a fragipan. Also included are narrow areas of alluvial soils adjacent to drainageways. Included soils make up 8 to 10 percent of the unit.

Available water capacity is moderate in the Otwell soil. Permeability is very slow. Surface runoff is very rapid. The very firm and brittle fragipan at a depth of 10 to 24 inches restricts the downward movement of water and the penetration of roots. A perched seasonal high water table is in or above the fragipan in winter and spring. The organic matter content is low in the surface layer because of the loss of surface soil through erosion. Unless the soil is tilled within a narrow range in moisture content, compaction and clodding can occur.

Most areas are used for cultivated crops. Some are used for hay and pasture. A few are wooded. This soil generally is unsuited to cultivated crops because of a very severe hazard of erosion. The very slowly permeable fragipan and the moderate available water capacity are limitations.

This soil is fairly well suited to most grasses and shallow-rooted legumes for hay or pasture. It is poorly suited to alfalfa and other deep-rooted crops because the fragipan restricts the penetration of roots. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates and pasture rotation help to keep the pasture in good condition.

This soil is fairly well suited to trees. The erosion hazard, the equipment limitation, seedling mortality, and the windthrow hazard are management concerns. Special planting stock, overstocking, and special site preparation are needed because of the seedling mortality rate. The windthrow hazard can be reduced by carefully thinning the stands or not thinning them at all and by harvest methods that do not isolate the remaining trees or leave them widely spaced. Windthrown trees should be periodically removed. Locating logging roads, skid trails, and landings on gentle grades and removing water with water bars, culverts, and drop structures help to control erosion. Special logging methods are needed because the use of rubber-tired and crawler tractors is limited on these slopes.

Because of the slope, this soil is severely limited as a site for dwellings. Buildings should be designed so that they conform to the natural slope of the land. Land shaping is needed in some areas. Strengthening foundations, footings, and basement walls, backfilling with coarser textured material, and installing foundation drain tile help to prevent the structural damage caused by wetness and by shrinking and swelling. Removal of vegetation should be kept to a minimum, and exposed areas should be revegetated as soon as possible.

Because of low strength, slope, and frost action, this soil is severely limited as a site for local roads and streets. Strengthening or replacing the base material improves the ability of the roads and streets to support vehicular traffic and helps to prevent frost damage. Cutting and filling are needed, and the roads should be built on the contour if possible.

Because of the very slowly permeable fragipan, the wetness, and the slope, this soil is severely limited as a site for septic tank absorption fields. Alternative sites should be considered because the absorption fields function very poorly. Land shaping, enlarging the distribution area, and installing the distribution lines across the slope help to ensure that the absorption field functions properly. Subsurface drains can lower the water table.

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

PcB—Pekin silt loam, 2 to 6 percent slopes. This gently sloping, deep, moderately well drained soil is on low stream terraces. Individual areas are narrow and irregularly shaped and are 5 to 20 acres in size.

In a typical profile, the surface layer is dark yellowish brown silt loam about 8 inches thick. The subsoil is about 48 inches thick. It is yellowish brown and mottled. The upper part is friable and firm silt loam, and the lower part is a fragipan of very firm, brittle silt loam. The substratum to a depth of 60 inches is yellowish brown, mottled silt loam that has strata of silty clay loam. In places the depth to the substratum is more than 60 inches. In some areas the slope is less than 2 or more than 6 percent.

Included with this soil in mapping are the well drained Hosmer soils on the higher lying knolls and ridges; the somewhat poorly drained, nearly level Bartle soils on stream terraces; and the somewhat poorly drained Belknap and moderately well drained Steff soils on the lower lying flood plains. Belknap and Steff soils do not have a fragipan. Included soils make up 8 to 12 percent of the unit.

Available water capacity is moderate in the Pekin soil. Permeability is moderate above the fragipan and very slow in the fragipan. Surface runoff is medium. A seasonal high water table is at a depth of 2 to 6 feet during late winter and early spring. The very firm and brittle fragipan at a depth of 27 to 33 inches restricts the downward movement of water and the penetration of roots. The organic matter content is moderately low in the surface layer. This layer is friable, but tilling when the soil is too wet results in poor tilth and compaction.

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

This soil is well suited to corn, soybeans, and small grain. Erosion is the major hazard. Cover crops and a system of conservation tillage that leaves protective amounts of crop residue on the surface help to control erosion, conserve moisture, increase the organic matter content, and help to maintain good tilth. Grassed waterways, rock chutes, or drop structures are needed in some areas to control runoff and prevent gully erosion.

This soil is well suited to most grasses and shallow-rooted legumes for hay and pasture. It is poorly suited to alfalfa and other deep-rooted legumes because root growth is restricted by the fragipan. Overgrazing or grazing when the soil is too wet causes surface compaction, poor tilth, and excessive runoff 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.

The soil is well suited to trees. Plant competition is the main management concern. It can be controlled by special harvest methods and by adequate site preparation.

Because of the wetness, this soil is moderately limited as a site for dwellings without basements and severely limited as a site for dwellings with basements. Subsurface drains can lower the water table. Constructing the buildings on raised, well compacted fill material and strengthening foundations and footings also help to prevent the damage caused by wetness. The soil is severely limited as a site for local roads and streets because of frost action and low strength. Strengthening or replacing the base material improves the ability of the roads and streets to support vehicular traffic and helps to prevent frost damage.

Because of the wetness and the restricted permeability, this soil is severely limited as a site for septic tank absorption fields. Under normal conditions, the absorption fields function poorly. The limitations can be minimized by filling or mounding the site with suitable filtering material and by installing subsurface drains, which help to lower the water table.

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

Pe—Peoga silt loam. This nearly level, deep, poorly drained soil is on broad glacial lake plains and low alluvial terraces. Individual areas are broad and irregularly shaped and are 10 to 80 acres in size.

In a typical profile, the surface layer is dark grayish brown silt loam about 9 inches thick. The subsoil is about 61 inches thick. It is mottled. The upper part is light brownish gray, friable silt loam; the next part is light brownish gray, firm silty clay loam; and the lower part is gray, firm silt loam that has strata of silty clay loam. The substratum to a depth of 80 inches is gray, mottled silt loam that has strata of silty clay loam. In some areas the soil is shallower to the substratum and is less acid. In places the loess is more than 60 inches thick.

Included with this soil in mapping are small areas of the somewhat poorly drained, nearly level Dubois soils on lake plains next to more sloping ridges and side slopes; the somewhat poorly drained Belknap and poorly drained Bonnie soils on the lower flood plains; and the somewhat poorly drained Iva soils on the slightly higher uplands. Belknap and Bonnie soils do not have a subsoil. Also included are a few areas of the well drained Elkinsville soils on the slightly higher terraces. Included soils make up about 5 to 12 percent of the unit.

Available water capacity is high in the Peoga soil. Permeability is slow. Surface runoff also is slow. A seasonal high water table is at or slightly below the surface during winter and spring. The organic matter content is moderately low in the surface layer. This layer is friable, but ruts and plowpans readily form if the soil is tilled when too wet.

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

If drained, this soil is well suited to corn, soybeans, and small grain. Most areas have been drained by surface drains. Subsurface drains can lower the water table if adequate outlets are available. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves tilth and increases the organic matter content.

This soil is well suited to water-tolerant grasses and legumes for hay or pasture. An adequate drainage system is necessary. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Overgrazing also reduces plant density and plant hardiness. Proper stocking rates, timely deferment of grazing, and restricted use during wet periods help to prevent surface compaction and maintain good tilth and plant density.

This soil is suited to trees. The equipment limitation, plant competition, seedling mortality, and the windthrow hazard are management concerns. The trees should be harvested only during dry periods or when the ground is frozen. Seedlings survive and grow well if competing vegetation is controlled by adequate site preparation or by spraying, cutting, or girdling. Special planting stock and overstocking are needed because of the seedling mortality rate. The windthrow hazard can be reduced by harvest methods that do not isolate the remaining trees or leave them widely spaced. Windthrown trees should be periodically removed.

Because of the wetness, this soil is severely limited as a site for dwellings. Buildings should be constructed without basements. Subsurface drains can lower the water table. Constructing the buildings on raised, well compacted fill material and strengthening foundations and footings also help to prevent the structural damage caused by wetness.

This soil is severely limited as a site for local roads and streets because of wetness, frost action, and low strength. Drainage ditches are needed to lower the water table and thus to help prevent the damage caused by frost action. Replacing or strengthening the upper layer of the soil with better suited material improves the ability of the roads and streets to support vehicular traffic. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent damage caused by wetness and frost action.

Because of the wetness and the restricted permeability, this soil is severely limited as a site for septic tank absorption fields. Sanitary facilities should be connected to commercial sewers and treatment facilities, or alternative sites should be selected.

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

Ph—Petrolia silty clay loam, frequently flooded. This nearly level, deep, poorly drained soil is in narrow, elongated sloughs on flood plains. It is subject to ponding and is flooded for long periods during late winter and early spring. Individual areas are 5 to 150 acres in size.

In a typical profile, the surface layer is dark grayish brown silty clay loam about 7 inches thick. The subsoil is gray, mottled, firm silty clay loam about 20 inches thick. The substratum to a depth of 60 inches is gray, mottled silty clay loam. In some areas silt loam, loam, or sandy loam overwash is deposited on the surface layer. In other areas the soil is browner directly below the surface layer. In places the subsoil has more clay.

Included with this soil in mapping are the somewhat poorly drained Stendal soils in the slightly higher areas adjacent to the broader sloughs and the well drained Haymond, Nolin, and Armiesburg soils on the higher parts of the landscape. Also included are some areas where the soil is undrained. Included soils make up 8 to 10 percent of the unit.

Available water capacity is high in the Petrolia soil. Permeability is moderately slow. Surface runoff is slow. A seasonal high water table is near or slightly above the surface during the spring. The organic matter content is moderate in the surface layer. This layer is firm. It should be tilled only at the proper moisture content. Otherwise, compaction can occur and tilth can deteriorate.

Nearly all areas of this soil are drained and are used for cultivated crops. A few are used for hay, pasture, or woodland.

If drained, this soil is well suited to corn and soybeans. The wetness is the major limitation, and the flooding is a hazard. Small grain and hay crops are often drowned out by floodwater in winter and early in spring. Corn and soybeans are sometimes damaged by flooding or ponding during the growing season (fig. 9). A subsurface drainage system can lower the water table if adequate outlets are available. If a good surface drainage system is installed, crops can be planted after the floodwater recedes. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves tilth and increases the organic matter content.

If drained, this soil is fairly well suited to certain grasses for hay and pasture. Some species, such as alfalfa, can be damaged by floodwater. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is fairly well suited to trees. The main management concerns are plant competition, the equipment limitation, and seedling mortality. The use of equipment is limited when the soil is wet and sticky. The equipment should be used only when the soil is relatively dry or frozen. Special harvest methods and adequate site preparation can control plant competition. Special planting stock and overstocking are needed because of the seedling mortality rate. Species that can withstand the wetness should be favored in the stands.

Because of flooding and ponding, this soil is generally unsuitable as a site for buildings 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 flooding, ponding, and low strength. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by flooding, ponding, and frost action. Strengthening or replacing the base material helps to overcome the low strength.

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

Pm—Petrolia silty clay loam, frequently flooded, very long duration. This nearly level, deep, poorly drained soil is in depressions and sloughs on broad flood plains. It is subject to flooding from late winter to early summer and is often covered by water for more than 30 days. Individual areas are broad and are 4 to 240 acres in size.

In a typical profile, the surface layer is dark grayish brown silty clay loam about 10 inches thick. The subsoil is gray, mottled, firm silty clay loam about 17 inches thick. The substratum to a depth of 60 inches is light gray, mottled silty clay loam. In many areas 3 or 4 inches of medium acid silt loam is deposited on the surface layer. In some places the subsoil is thicker and browner. In other places the substratum is not calcareous. In some areas the subsoil has more clay. In places some layers are more acid.

Included with this soil in mapping are the somewhat poorly drained Henshaw soils on the slightly higher swells. Also included are the somewhat poorly drained Wakeland and Belknap soils, which are closer to stream channels and drainageways than the Petrolia soil. Included soils make up 8 to 12 percent of the unit.

Available water capacity is high in the Petrolia soil. Permeability is moderately slow. Surface runoff is very slow. A seasonal high water table is near or slightly above the surface from late winter to early summer. The

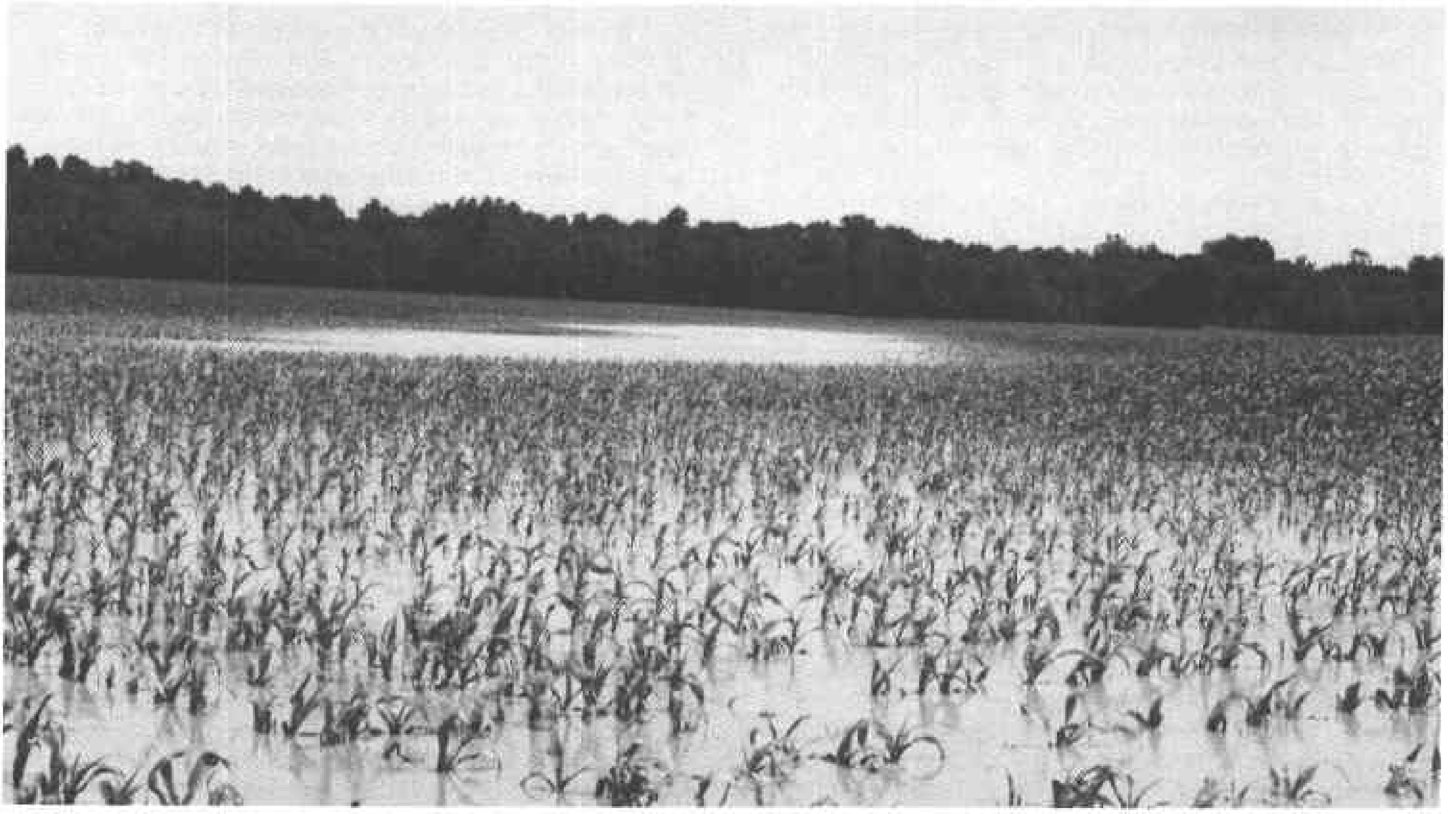


Figure 9.—Ponding in a low lying area of Petrolia silty clay loam, frequently flooded. The water has drained from Haymond and Nolin soils in the background.

organic matter content is moderate in the surface layer. This layer is firm and can be tilled only within a narrow range in moisture content. Tilling when the soil is too dry or too wet results in a cloddy seedbed.

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

This soil is poorly suited to corn, soybeans, and small grain. The flooding is a hazard, and the wetness is a limitation. Planting is delayed in most years. As a result, short-season varieties of crops are better suited than other varieties. Because of the shortened growing season, the most common crop is soybeans. Corn and soybeans are often damaged or destroyed by flooding or ponding during the growing season. Small grain is not planted on this soil because it drowns out in winter and spring. If a good surface drainage system is installed, crops can be planted after the floodwater recedes. A subsurface drainage system can lower the water table if adequate outlets are available. Levees can control the flooding, but constructing and maintaining them is extremely expensive. Tilling at the proper moisture content helps to prevent compaction and thus helps to maintain good soil structure. A system of conservation tillage that leaves all or part of the crop residue on the surface increases the organic matter content and improves tilth.

This soil is poorly suited to grasses and legumes for hay and pasture. Stands can be damaged by floodwater in winter and spring. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition. Species that can withstand the wetness should be favored. A drainage system is needed. The soil is rarely used for hay or pasture.

This soil is fairly well suited to trees. The main management concerns are seedling mortality, plant competition, and the equipment limitation. Special planting stock and overstocking are needed because of the seedling mortality rate. Special harvest methods and adequate site preparation can control plant competition. The use of equipment is limited when the soil is wet and sticky. The equipment should be used only when the soil is relatively dry or frozen. Species that can withstand the wetness should be favored in the stands.

Because of flooding and ponding, 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 low strength, flooding, and ponding. Strengthening or replacing the base material improves the ability of the roads and streets to support vehicular traffic. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by flooding and ponding.

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

PpD3—Pike silt loam, 12 to 18 percent slopes, severely eroded. This strongly sloping, deep, well drained soil is on side slopes on terraces and uplands. Individual areas are long and irregularly shaped and are 4 to 60 acres in size.

In a typical profile, the surface layer is yellowish brown silt loam about 6 inches thick. The subsoil is more than 74 inches thick. The upper part is brown, firm silty clay loam; the next part is brown, friable silt loam and loam; and the lower part is reddish brown, friable sandy loam that has strata of sandy clay loam. In places the lower part of the subsoil is not so red. In some areas the soil is silty to a depth of more than 60 or less than 40 inches. In other areas the slope is more than 18 or less than 12 percent. In some wooded areas the soil is less eroded or uneroded.

Included with this soil in mapping are the well drained Chetwynd soils, which formed in outwash material on the steeper slopes; small areas of the well drained Alford and Otwell soils on the less sloping side slopes and ridges; and a few areas of the somewhat poorly drained Wakeland soils along natural drainageways at the base of the side slopes. Alford soils formed in loess. Otwell soils do not have a fragipan. Also included are some small areas of soils that are gullied and a few areas of the well drained Wellston soils on the lower part of the side slopes. Wellston soils are 40 to 72 inches deep over bedrock. Included soils make up 7 to 15 percent of the unit.

Available water capacity is high in the Pike soil. Permeability is moderate. Surface runoff is very rapid in cultivated areas. The organic matter content is low in the surface layer because of the loss of surface soil through erosion. The surface layer is friable or firm. Unless this layer is tilled within a narrow range in moisture content, compaction and clodding can occur.

Most areas are used for cultivated crops. Some are wooded. Others are used for forage or pasture. This soil generally is unsuited to corn and soybeans because of a very severe hazard of further erosion. Small grain is occasionally grown so that stands of grasses and legumes can be reestablished.

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

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

Because of the slope, this soil is severely limited as a site for dwellings. Buildings should be designed so that they conform to the natural slope of the land. Land shaping is needed in some areas. Removal of vegetation should be kept to a minimum, and disturbed areas should be sodded or reseeded as soon as possible. The soil is severely limited as a site for local roads and streets because of slope, low strength, and frost action. Cutting and filling are needed, and the roads should be built on the contour if possible. Strengthening or replacing the base material improves the ability of the roads and streets to support vehicular traffic and helps to prevent frost damage.

Because of the slope, this soil is severely limited as a site for septic tank absorption fields. The absorption field should be designed so that it conforms to the natural slope of the land, or an alternative site should be selected.

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

PrA—Princeton fine sandy loam, 0 to 2 percent slopes. This nearly level, deep, well drained soil is on terraces and ridges in the uplands. Individual areas are broad and irregularly shaped and are 5 to 100 acres in size.

In a typical profile, the surface layer is dark brown fine sandy loam about 8 inches thick. The subsoil is about 48 inches thick. The upper part is brown, very friable fine sandy loam; the next part is strong brown, firm and friable loam and sandy clay loam; and the lower part is strong brown, very friable sandy loam. The substratum to a depth of 60 inches is strong brown loamy sand that has bands of loamy fine sand. In some areas the subsoil has layers of clay loam. In places the surface layer and subsoil have more silt and less sand.

Included with this soil in mapping are small areas of the somewhat poorly drained Ayrshire and Wakeland soils along drainageways and the somewhat excessively drained Bloomfield soils on knolls and the more sloping parts of the landscape. Also included are a few areas of the somewhat poorly drained Henshaw soils in the slightly lower positions on the terraces. Included soils make up 10 to 12 percent of the unit.

Available water capacity is high in the Princeton soil. Permeability is moderate in the upper part of the soil and moderately rapid in the substratum. Surface runoff is slow. The organic matter content is moderately low in the surface layer. This layer is very friable and can be easily tilled throughout a wide range in moisture content.

Most areas of this soil are used for cultivated crops. Some are used for hay and pasture, and a few are used as woodland or urban land.

This soil is well suited to corn, soybeans, and small grain. Cover crops and a system of conservation tillage that leaves protective amounts of crop residue on the surface help to maintain tilth, increase the organic matter content, and help to control soil blowing.

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

This soil is well suited to trees. Plant competition is the main management concern. It can be controlled by special harvest methods and by adequate site preparation.

This soil is suitable as a site for dwellings and septic tank absorption fields. It is moderately limited as a site for local roads and streets because of frost action. Replacing or covering the upper soil layers with suitable base material helps to prevent frost damage.

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

ReA—Reesville silt loam, 0 to 2 percent slopes. This nearly level, deep, somewhat poorly drained soil is on flats on uplands and terraces. Individual areas are broad and irregularly shaped and are 3 to 50 acres in size.

In a typical profile, the surface layer is dark grayish brown silt loam about 9 inches thick. The subsurface layer is grayish brown, mottled silt loam about 3 inches thick. The subsoil is about 27 inches thick. It is mottled. The upper part is yellowish brown and light olive brown, firm silty clay loam, and the lower part is light olive brown, friable silt loam. The substratum to a depth of 60 inches is light olive brown, mottled silt loam. In places, the subsoil is more acid and the substratum is not calcareous within a depth of 55 inches. In some areas on terraces, lacustrine or outwash material is at a depth of 40 to 60 inches.

Included with this soil in mapping are small areas of the well drained Sylvan and moderately well drained Iona soils adjacent to drainageways and small areas of dark, poorly drained soils in depressions at the head of drainageways. Also included, on the slightly lower lake plains, are a few areas of the somewhat poorly drained McGary soils, which contain more clay throughout than the Reesville soil. Included soils make up 8 to 10 percent of the unit.

Available water capacity is high in the Reesville soil. Permeability is moderately slow. Surface runoff is slow. A seasonal high water table is at a depth of 1.0 to 2.5 feet during winter and early spring. The organic matter content is moderate in the surface layer. This layer is friable, but tilling when the soil is too wet results in the formation of ruts and plowpans.

Most areas of this soil are used for corn, soybeans, or small grain. Some are used for hay or pasture. A few are wooded.

This soil is well suited to corn, soybeans, and small grain. The wetness is the major limitation. A subsurface drainage system can lower the water table if adequate outlets are available. A system of conservation tillage that leaves protective amounts of crop residue on the surface improves tilth and helps to maintain the organic matter content.

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

This soil is well suited to trees. Plant competition and the equipment limitation are the main management concerns. Special harvest methods and adequate site preparation can control plant competition. Equipment should be used only when the soil is relatively dry or frozen.

Because of the wetness, this soil is severely limited as a site for dwellings. Buildings should be constructed without basements. Subsurface drains can help to lower the water table. Constructing the buildings on raised, well compacted fill material also helps to overcome the wetness. 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 material improves the ability of the roads and streets to support vehicular traffic and helps to prevent frost damage. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by wetness and frost action.

Because of the wetness and the restricted permeability, this soil is severely limited as a site for septic tank absorption fields. These limitations can be minimized by filling or mounding the site with suitable filtering material and by installing subsurface drains, which help to lower the water table.

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

Se—Steff silt loam, rarely flooded. This nearly level, deep, moderately well drained soil is on flood plains. Individual areas are narrow and irregularly shaped and are 3 to 50 acres in size.

In a typical profile, the surface layer is dark brown silt loam about 8 inches thick. The subsoil is friable silt loam about 30 inches thick. The upper part is dark yellowish brown, and the lower part is yellowish brown and mottled. The substratum to a depth of 60 inches is grayish brown, mottled silt loam and channery silt loam.

In places the soil has layers that are not acid. In a few areas it is occasionally flooded.

Included with this soil in mapping are the somewhat poorly drained Belknap soils in the slightly lower or more concave areas on the flood plains. Also included, on the higher stream terraces, are the somewhat poorly drained Bartle and moderately well drained Pekin soils, which have a fragipan. Included soils make up 5 to 8 percent of the unit.

Available water capacity is high in the Steff soil. Permeability is moderate. Surface runoff is slow. A seasonal high water table is at a depth of 1.5 to 3.0 feet during winter and spring. The organic matter content is moderately low in the surface layer. This layer is friable and can be easily tilled throughout a fairly wide range in moisture content.

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

This soil is well suited to corn, soybeans, and small grain. Cover crops and a system of conservation tillage that leaves protective amounts of crop residue on the surface increase the organic matter content, help to maintain tilth, and improve infiltration and aeration.

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

This soil is well suited to trees. Plant competition is the main management concern. It can be controlled by special harvest methods and by adequate site preparation.

Because of the flooding and the wetness, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields. It is severely limited as a site for local roads and streets because of low strength and frost action. Strengthening or replacing the base material improves the ability of the roads and streets to support vehicular traffic and helps to prevent frost damage. 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 flooding.

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

Sf—Steff silt loam, frequently flooded. This nearly level, deep, moderately well drained soil is on flood plains. It is flooded for brief periods in winter and spring. Individual areas are long and narrow and are 5 to 60 acres in size.

In a typical profile, the surface layer is dark brown silt loam about 10 inches thick. The subsoil is friable silt loam about 23 inches thick. The upper part is dark yellowish brown, and the lower part is yellowish brown and mottled. The substratum to a depth of 60 inches is yellowish brown, mottled silt loam. In some areas the soil has layers that are not acid. In other areas it has more sand or silt and less clay. In some places it is only occasionally flooded. In other places the subsoil has no gray mottles.

Included with this soil in mapping are the somewhat poorly drained Belknap soils on the lower, nearly level or slightly concave areas on the flood plains and the poorly drained Bonnie soils in the lower swales. Included soils make up 5 to 8 percent of the unit.

Available water capacity is high in the Steff soil. Permeability is moderate. Surface runoff is slow. A seasonal high water table is at a depth of 1.5 to 3.0 feet during winter and spring. The organic matter content is moderate in the surface layer. This layer is friable, but tilling when the soil is too wet results in the formation of ruts and plowpans.

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

This soil is well suited to corn and soybeans. It is poorly suited to small grain, which can be damaged by floodwater during winter and spring. The wetness is a major limitation, and the flooding is a major hazard. If adequate drainage outlets are available, ponded water can be removed by surface drains and the water table can be lowered by subsurface drains. If a good surface drainage system is installed, crops can be planted after the floodwater recedes. A system of conservation tillage that leaves protective amounts of crop residue on the surface increases the organic matter content, helps to maintain tilth, and improves infiltration and aeration.

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

This soil is well suited to trees. Plant competition is the main management concern. It can be controlled by special harvest methods and by adequate site preparation.

Because of the flooding and the wetness, this soil is generally unsuitable as a site for 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 low strength and flooding. Strengthening or replacing the base material improves the ability of the roads and streets to support vehicular traffic. 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 4A.

So—Stendal silt loam, frequently flooded. This nearly level, deep, somewhat poorly drained soil is on flood plains. It is flooded for brief periods in winter and spring. Individual areas are broad and are 5 to 120 acres in size.

In a typical profile, the surface layer is dark brown silt loam about 9 inches thick. The subsoil is mottled, firm silty clay loam about 28 inches thick. The upper part is pale brown, and the lower part is grayish brown. The substratum to a depth of 60 inches is grayish brown and gray, mottled silty clay loam. In some areas the subsoil has more clay or sand. In a few areas the soil is less acid throughout. In places it is only occasionally flooded.

Included with this soil in mapping are the well drained Armiesburg soils in the slightly higher areas and the moderately well drained Lindside and poorly drained Petrolia and Vincennes Variant soils in the lower areas. Included soils make up 3 to 12 percent of the unit.

Available water capacity is very high in the Stendal soil. Permeability is moderate. Surface runoff is slow. A seasonal high water table is at a depth of 1 to 3 feet during winter and spring. The organic matter content is moderate in the surface layer. This layer is friable, but tilling when the soil is too wet results in a cloddy seedbed and the formation of plowpans.

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

This soil is well suited to corn and soybeans. It is poorly suited to small grain, which can be damaged by floodwater during winter and spring. The wetness is a major limitation, and the flooding is a major hazard. If adequate drainage outlets are available, ponded water can be removed by surface drains and the high water table can be lowered by subsurface drains. If a good surface drainage system is installed, crops can be planted after the floodwater recedes. A system of conservation tillage that leaves protective amounts of crop residue on the surface increases the organic matter content, helps to maintain tilth, and improves infiltration and aeration.

This soil is well suited to water-tolerant grasses and shallow-rooted legumes for hay and pasture. It is poorly suited to deep-rooted legumes, such as alfalfa, because of the wetness and the damage caused by floodwater. A drainage system is necessary. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth and reduces plant density. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is well suited to trees. The main management concerns are plant competition and the equipment limitation. Seedlings survive and grow well if competing vegetation is controlled by adequate site preparation or by spraying, cutting, or girdling. Equipment should be used only when the soil is relatively dry or frozen.

Because of the flooding and the wetness, this soil is generally unsuitable as a site for 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 frost action and flooding. Strengthening or replacing the base material improves the ability of the roads and streets to support vehicular traffic and helps to prevent frost damage. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by flooding and frost action.

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

Sw—Stonelick fine sandy loam, frequently flooded. This nearly level, deep, well drained soil is on broad flood plains. It is flooded for very brief periods in winter and spring. Individual areas are irregularly shaped and are 3 to 175 acres in size.

In a typical profile, the surface layer is dark brown fine sandy loam about 11 inches thick. The subsoil is about 26 inches thick. It is yellowish brown, very friable loamy sand and fine sandy loam. The substratum to a depth of 60 inches is yellowish brown loamy fine sand. In some areas the soil is gently sloping, and in other areas it is only occasionally flooded. In places the surface layer and subsoil contain less clay and more silt. In a few areas fine sand is below a depth of 40 inches.

Included with this soil in mapping are the well drained Haymond and Nolin soils in the slightly lower areas, generally farther from the rivers. These soils contain more silt than the Stonelick soil. Also included are some areas where 20 to 40 inches of fine sand is deposited on the surface layer and some areas where the soil is underlain by silt loam at a depth of 10 to 20 inches. Included soils make up about 10 to 15 percent of the unit.

Available water capacity is low in the Stonelick soil. Permeability is moderately rapid. Surface runoff is slow. The organic matter content is moderately low in the surface layer. This layer is very friable and can be easily tilled throughout a wide range in moisture content.

Most areas of this soil are used for cultivated crops. Some are used for forage crops, and a few are wooded.

This soil is fairly well suited to corn and soybeans. The flooding is a hazard, and the low available water capacity is a limitation. Small grain is frequently drowned out in winter and spring. Some crops can be planted after the floodwater recedes. Cover crops and a system of conservation tillage that leaves protective amounts of crop residue on the surface conserve moisture, help to maintain tilth, increase the organic matter content, and help to control soil blowing.

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

This soil is fairly well suited to trees. Plant competition is the main management concern. It can be controlled by special harvest methods and by adequate site preparation. Drought-tolerant species should be favored in stands.

Because of the flooding, this soil is generally unsuitable as a site for 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 IIIw. The woodland ordination symbol is 4A.

SyB2—Sylvan silt loam, 2 to 6 percent slopes, eroded. This gently sloping, deep, well drained soil is on convex ridgetops and side slopes on uplands and terraces. Individual areas are broad and irregularly shaped 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 subsoil is about 31 inches thick. It is dark yellowish brown, firm silty clay loam and yellowish brown, friable silt loam. The substratum to a depth of 60 inches is light brownish gray, mottled silt loam. In some places the depth to the substratum is more than 40 inches. In a few areas on side slopes along drainageways, the soil is severely eroded. In some areas the slope is less than 2 or more than 6 percent.

Included with this soil in mapping are small areas of the nearly level, moderately well drained Iona soils on the higher lying ridges and the somewhat poorly drained Reesville soils at the head of drainageways. Included soils make up about 8 to 12 percent of the unit.

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

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

This soil is well suited to corn, soybeans, and small grain. Erosion is the main hazard. A system of conservation tillage that leaves protective amounts of crop residue on the surface and a crop rotation that includes grasses and legumes help to control erosion and runoff. Terraces, diversions, and contour farming can control erosion if slopes are long and uniform. Grassed waterways and grade stabilization structures help to prevent gullying. Crop residue management and cover crops help to maintain tilth and increase the organic matter content.

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

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

Because of shrinking and swelling, this soil is moderately limited as a site for dwellings. It is suitable as a site for septic tank absorption fields. Strengthening foundations, footings, and basement walls, backfilling with coarser textured material, and installing foundation drain tile help to prevent the structural damage caused by shrinking and swelling. The soil is severely limited as a site for local roads and streets because of frost action and low strength. Strengthening or replacing the base material improves the ability of the roads and streets to support vehicular traffic and helps to prevent frost action.

The land capability classification is IIe. The woodland ordination symbol is 6A.

SyC3—Sylvan silt loam, 6 to 12 percent slopes, severely eroded. This moderately sloping, deep, well drained soil is on convex or concave, linear side slopes on uplands and terraces. Individual areas are long and irregularly shaped and are 8 to 30 acres in size.

In a typical profile, the surface layer is yellowish brown silt loam about 6 inches thick. The subsoil is about 23 inches thick. It is yellowish brown, firm silty clay loam and yellowish brown, mottled, friable silt loam. The substratum to a depth of 60 inches is mottled, yellowish brown and light brownish gray silt loam. In places calcareous material is at the surface. In a few areas the slope is more than 12 percent. In some small areas on the higher parts of the landscape, the soil is deeper to the substratum. In some areas on terraces, the lower part of the soil has more sand.

Included with this soil in mapping are small areas of the somewhat poorly drained Reesville soils at the head of drainageways and the moderately well drained Iona soils on the higher lying ridges. Included soils make up 6 to 8 percent of the unit.

Available water capacity is very high in the Sylvan soil. Permeability is moderate. Surface runoff is rapid. The organic matter content is low in the surface layer because of the loss of surface soil through erosion. The surface layer is friable. Unless this layer is tilled within a moderate range in moisture content, compaction and clodding can occur.

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

Because of a severe hazard of further erosion, this soil is poorly suited to corn and soybeans. It is fairly well suited to small grain. A system of conservation tillage that leaves protective amounts of crop residue on the surface and a crop rotation that includes grasses and legumes help to control erosion and runoff. Terraces, diversions, and contour farming can control erosion if slopes are long and uniform. Grassed waterways and grade stabilization structures help to prevent gully erosion. Conservation tillage and cover crops improve tilth and increase the organic matter content.

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

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

Because of slope and shrinking and swelling, this soil is moderately limited as a site for dwellings. Buildings should be designed so that they conform to the natural slope of the land. Land shaping is needed in some areas. Strengthening foundations, footings, and basement walls, backfilling with coarser textured material, and installing foundation drain tile help to prevent the structural damage caused by shrinking and swelling. Removal of vegetation should be kept to a minimum, and exposed areas should be revegetated as soon as possible.

This soil is severely limited as a site for local roads and streets because of frost action and low strength. Strengthening or replacing the base material improves the ability of the roads and streets to support vehicular traffic and helps to prevent frost damage.

Because of the slope, this soil is moderately limited as a site for septic tank absorption fields. Installing the distribution lines on the contour helps to ensure that the absorption field functions properly. Land shaping is needed in some areas.

The land capability classification is IVe. The woodland ordination symbol is 6A.

SyF—Sylvan silt loam, 25 to 50 percent slopes. This steep and very steep, deep, well drained soil is on side slopes in the uplands. Slopes are short. Individual areas are long and narrow and are 5 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 dark brown silt loam about 3 inches thick. The subsoil is dark yellowish brown and yellowish brown, firm and friable silt loam about 25 inches thick. The substratum to a depth of 60 inches is yellowish brown silt loam. In some areas the soil is deeper to the substratum. In other areas it is more acid. In places it is less sloping.

Included with this soil in mapping are small areas of the somewhat excessively drained Bloomfield and well drained Chetwynd and Hickory soils, which formed mainly in outwash or glacial till. These soils are in landscape positions similar to those of the Sylvan soil. Also included are small areas of the somewhat poorly drained Wakeland soils along small drainage channels; small areas of sandy soils at the crest of slopes adjacent to terraces; and, on some of the shorter, steeper slopes, small areas of soils that are 40 to 72 inches deep over bedrock. Included soils make up 12 to 15 percent of the unit.

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

Most areas are wooded. A few are used for forage or pasture. Because of the slope and a very severe hazard of erosion, this soil generally is unsuited to corn and soybeans. It is poorly suited to grasses and legumes for forage or pasture because of the slope. Establishing stands of grasses and legumes is difficult. The use of equipment is limited by the slope. Overgrazing causes surface compaction and excessive runoff. Proper stocking rates, pasture rotation, and timely deferment of grazing help to keep the pasture in good condition.

This soil is fairly well suited to trees. The erosion hazard, the equipment limitation, seedling mortality, and plant competition are management concerns. Locating logging roads and skid trails on ridgetops and removing water with water bars, culverts, and drop structures help to control erosion. Special logging methods, such as yarding the logs uphill with a cable, are needed because rubber-tired and crawler tractors cannot be operated safely on these slopes. Overstocking and special site preparation are needed because of the seedling mortality rate. Special harvest methods and adequate site preparation can control plant competition.

Because of the slope, this soil is generally unsuitable as a site for dwellings, local roads and streets, and septic tank absorption fields. Alternative sites should be selected. Removal of vegetation should be kept to a minimum, and a temporary plant cover should be established as soon as possible in disturbed areas.

The land capability classification is VIIe. The woodland ordination symbol is 6R.

Vn—Vincennes Variant clay loam, occasionally flooded. This nearly level, deep, poorly drained soil is on broad slack water terraces and flood plains. It is flooded for brief periods during winter and spring. Individual areas are elongated and irregularly shaped and are 30 to 100 acres in size.

In a typical profile, the surface layer is dark grayish brown clay loam about 9 inches thick. The subsoil is dark gray and gray, mottled, friable and firm clay loam about 42 inches thick. The substratum to a depth of 60 inches is mottled gray and yellowish brown sandy loam that has strata of clay loam. In a few areas the soil has a darker surface layer and contains more sand. In some areas it is frequently flooded.

Included with this soil in mapping are small areas of the very poorly drained Wilhite soils in the slightly lower landscape positions and the somewhat poorly drained Stendal soils in the slightly higher positions. Also included are the dark, well drained Armiesburg and Huntsville soils in the higher positions. Included soils make up 6 to 10 percent of the unit.

Available water capacity is high in the Vincennes Variant soil. Permeability is slow. Surface runoff also is slow. A seasonal high water table is at or slightly below the surface during winter and spring. The organic matter content is moderately low in the surface layer. This layer is friable or firm. Tilling when the soil is too wet results in a cloddy seedbed and the formation of plowpans.

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

If drained, this soil is well suited to corn and soybeans. A drainage system has been installed in most areas. Many large surface drains and shallow surface drains reduce the wetness. If the drainage system functions properly, a conservation cropping system dominated by row crops is suitable. The soil is poorly suited to small grain, which can be damaged by floodwater during winter and spring. A system of conservation tillage that leaves protective amounts of crop residue on the surface increases the organic matter content and improves tilth.

This soil is fairly well suited to water-tolerant grasses and legumes for hay or pasture. A drainage system is necessary. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is fairly well suited to trees. The equipment limitation, plant competition, seedling mortality, and the windthrow hazard are management concerns. Harvesting and planting equipment should be used only during the drier periods. Seedlings survive and grow well if competing vegetation is controlled by adequate site preparation or by spraying, cutting, or girdling. Special planting stock and overstocking are needed because of the seedling mortality rate. Careful thinning of the stands and harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Windthrown trees should be periodically removed.

Because of the wetness and the flooding, this soil is generally unsuitable as a site for 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 wetness, frost action, and flooding. Replacing or strengthening the base material improves the ability of the roads and streets to support vehicular traffic and helps to prevent frost damage. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by flooding, frost action, and wetness.

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

Wa—Wakeland silt loam, frequently flooded. This nearly level, deep, somewhat poorly drained soil is on bottom land. It is flooded for brief or long periods during winter and spring. Individual areas are long and irregularly shaped and are 10 to 60 acres in size.

In a typical profile, the surface layer is brown silt loam about 8 inches thick. The substratum to a depth of 60 inches is brown and grayish brown, mottled, friable silt loam. It has strata of loam in the lower part. In some areas the substratum has more clay. In other areas the soil is more acid. In some places it is not frequently flooded. In other places a buried soil is below a depth of 20 inches.

Included with this soil in mapping are small areas of the poorly drained Birds and Beaucoup soils in slight depressions on the lower lying flood plains. Also included are a few small areas of the well drained Elkinsville soils on the higher lying terraces. Included soils make up 10 to 12 percent of the unit.

Available water capacity is very high in the Wakeland soil. Permeability is moderate. Surface runoff is slow. A seasonal high water table is at a depth of 1 to 3 feet during winter and spring. The organic matter content is moderately low in the surface layer. This layer is friable, but ruts readily form if the soil is tilled when wet and a surface crust often forms after a heavy rain.

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

If drained, this soil is well suited to corn and soybeans. It is poorly suited to small grain, which can be damaged by floodwater during winter and spring. If the drainage system functions properly, a conservation cropping system dominated by row crops is suitable. A system of conservation tillage that leaves protective amounts of crop residue on the surface increases the organic matter content and improves tilth.

This soil is well suited to water-tolerant grasses for hay and pasture. It is poorly suited to deep-rooted legumes, such as alfalfa, because of the wetness and the damage caused by floodwater. A drainage system is necessary. Overgrazing or grazing when the soil is too wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

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

Because of the flooding and the wetness, this soil is generally unsuitable as a site for 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 flooding and frost action. A drainage system is needed to lower the water table. Elevating the roadbed helps to prevent the damage caused by frost action and flooding.

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

WeE—Wellston silt loam, 15 to 30 percent slopes. This strongly sloping to steep, deep, well drained soil is on side slopes in the uplands. Slopes are short and irregular. Individual areas are narrow and elongated and are 10 to 80 acres in size.

In a typical profile, the surface layer is very dark grayish brown silt loam about 3 inches thick. The subsurface layer is brown silt loam about 5 inches thick. The subsoil is about 41 inches thick. The upper part is brown, friable silt loam; the next part is strong brown, firm silt loam; and the lower part is strong brown, firm loam and friable fine sandy loam. The substratum to a depth of 60 inches is yellowish brown fine sandy loam. Sandstone bedrock is at a depth of about 60 inches. In some areas the slope is less than 15 or more than 30 percent.

Included with this soil in mapping are small areas of the well drained Hosmer and moderately well drained Zanesville soils on the higher ridges and side slopes and the well drained, moderately deep Gilpin and Berks soils on the lower, more sloping side slopes. Hosmer and Zanesville soils have a fragipan. Also included are a few gullied areas and a few areas where the soil is severely eroded and the surface layer is mostly yellowish brown subsoil material. Included soils make up about 8 to 15 percent of the unit.

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

Most areas are wooded. A few are used for hay and pasture. Because of the slope and a severe hazard of erosion, this soil generally is unsuited to corn and soybeans. It is fairly well suited to grasses and legumes for hay or permanent pasture. Overgrazing causes surface compaction 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 trees. The main management concerns are the hazard of erosion, the equipment limitation, and plant competition. Seedlings survive and grow well if competing vegetation is controlled by adequate site preparation or by spraying, cutting, or girdling. Removal of vegetation should be kept to a minimum, and exposed areas should be revegetated as soon as possible. Special logging methods, such as yarding the logs uphill with a cable, are needed because rubber-tired and crawler tractors cannot be operated safely on these slopes.

Because of the slope, this soil is generally unsuitable as a site for dwellings, local roads and streets, and septic tank absorption fields. Alternative sites should be selected. Removal of vegetation should be kept to a minimum, and a temporary plant cover should be established as soon as possible in disturbed areas.

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

Wh—Wilhite silty clay loam, frequently flooded. This nearly level, deep, very poorly drained soil is in narrow, elongated areas that formerly were stream channels or sloughs on flood plains and on the broader slack water terraces. The soil is flooded for brief or long periods during winter and spring and is subject to ponding. Individual areas are long and narrow and are 50 to 600 acres in size.

In a typical profile, the surface layer is dark gray silty clay loam about 9 inches thick. The subsoil is about 38 inches thick. It is mottled. The upper part is dark gray, firm silty clay loam, and the lower part is gray and dark gray, very firm silty clay. The substratum to a depth of 60 inches is mottled gray and grayish brown silty clay. In places it has thin strata of silt loam to fine sand below a depth of 40 inches. In a few areas loam or sandy loam overwash is deposited on the surface layer. Most of these areas are adjacent to sandy upland soils. In some areas the subsoil has less clay.

Included with this soil in mapping are small areas of well drained Armiesburg and Nolin soils in the higher landscape positions and the poorly drained Vincennes Variant soils in the slightly higher positions. Also included are a few undrained areas. Included soils make up about 10 to 15 percent of the unit.

Available water capacity is moderate in the Wilhite soil. Permeability is very slow. Surface runoff also is very slow. A seasonal high water table is near or slightly above the surface during winter and spring. The organic matter content is moderate in the surface layer. This layer is firm and becomes cloddy and hard to work if it is tilled when the soil is too dry or too wet.

Most areas of this soil are drained and are used for cultivated crops. The lower areas where the overflow hazard is more severe and the areas that have not been drained are used as woodland.

If drained, this soil is fairly well suited to corn and soybeans. The wetness is the major limitation, and the flooding is a hazard. If the drainage system functions properly, a conservation cropping system dominated by row crops is suitable. Floodwater frequently drowns out small grain and hay crops in winter and early in spring. It sometimes destroys corn and soybeans. Shallow surface drains reduce the wetness. Fall plowing and a system of conservation tillage that leaves protective amounts of crop residue on the surface increase the organic matter content and improve tilth.

This soil is fairly well suited to water-tolerant grasses for hay and pasture. A drainage system is necessary. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is fairly well suited to trees. The equipment limitation, plant competition, seedling mortality, and the windthrow hazard are management concerns. Harvesting and planting equipment should be used only during the drier periods. Seedlings survive and grow well if competing vegetation is controlled by adequate site preparation or by spraying, cutting, or girdling. Special planting stock and overstocking are needed because of the seedling mortality rate. Careful thinning of the stands and harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Windthrown trees should be periodically removed.

Because of ponding and 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 low strength, ponding, and flooding. A drainage system helps to lower the water table and thus helps to prevent the damage caused by frost action. Strengthening or replacing the base material improves the ability of the roads and streets to support vehicular traffic and helps to prevent frost damage. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent the damage caused by flooding, ponding, and frost action.

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

ZaB—Zanesville silt loam, 2 to 6 percent slopes. This gently sloping, deep, moderately well drained soil is on ridgetops in the uplands. Individual areas are long and irregularly shaped and are 3 to 100 acres in size.

In a typical profile, the surface layer is dark yellowish brown silt loam about 7 inches thick. The subsoil is about 61 inches thick. It is yellowish brown. The upper part is firm silty clay loam; the next part is mottled, firm silt loam; and the lower part is a fragipan of mottled, very firm, brittle silt loam. The substratum is yellowish brown, mottled loam about 10 inches thick. Sandstone bedrock is at a depth of about 78 inches. In some areas the loess is more than 48 inches thick or the depth to bedrock is more than 80 inches. In some small areas the slope is less than 2 or more than 6 percent. In places the soil is moderately eroded.

Included with this soil in mapping are a few small areas of a somewhat poorly drained soil on the nearly level or slightly concave parts of the landscape. Also included are a few areas of the well drained Wellston soils on the steeper side slopes and a few areas where the soil is severely eroded. Wellston soils do not have a fragipan. Included soils make up about 8 to 10 percent of the unit.

Available water capacity is moderate in the Zanesville soil. Permeability is moderate above the fragipan and slow in the fragipan. Surface runoff is medium. The very firm and brittle fragipan at a depth of 24 to 32 inches restricts the downward movement of water and the penetration of roots. A perched seasonal high water table is in or above the fragipan during winter and early spring. The organic matter content is moderately low in the surface layer. This layer is friable and can be easily tilled throughout a fairly wide range in moisture content.

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

This soil is well suited to corn, soybeans, and small grain. Erosion is the major hazard, and the moderate available water capacity is a limitation. Crops can be damaged by drought during years when rainfall is below average or is poorly distributed. Water perched on the fragipan early in spring commonly causes some delay in fieldwork. Cover crops and a system of conservation tillage that leaves protective amounts of crop residue on the surface help to control erosion, increase the organic matter content, help to maintain good tilth, and conserve moisture. Grassed waterways, conservation cropping systems that include grasses and legumes, and drop structures also help to control erosion.

This soil is well suited to grasses and shallow-rooted legumes for hay and pasture. It is poorly suited to alfalfa and other deep-rooted legumes because root growth is restricted by the fragipan. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth and reduces plant density. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is fairly well suited to trees. Plant competition is the main management concern. It can be controlled by special harvest methods and by adequate site preparation.

Because of the wetness, this soil is moderately limited as a site for dwellings without basements and severely limited as a site for dwellings with basements. Subsurface drains help to lower the water table.

Constructing the buildings on raised, well compacted fill material also helps to overcome the wetness. Dwellings should be constructed without basements. The soil is severely limited as a site for local roads and streets because of low strength. Strengthening or replacing the base material improves the ability of the roads and streets to support vehicular traffic.

Because of the restricted permeability and the wetness, this soil is severely limited as a site for septic tank absorption fields. These limitations can be minimized by filling or mounding the site with suitable filtering material and by installing subsurface drains, which help to lower the water table.

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

ZaC3—Zanesville silt loam, 6 to 12 percent slopes, severely eroded. This moderately sloping, deep, moderately well drained soil is on side slopes in the uplands. Individual areas are long and narrow and are 5 to 25 acres in size.

In a typical profile, the surface layer is yellowish brown silt loam about 7 inches thick. The subsoil is about 43 inches thick. The upper part is strong brown and yellowish brown, firm silt loam and silty clay loam, and the lower part is a fragipan of yellowish brown, very firm, brittle silt loam. The substratum to a depth of 60 inches is dark brown and yellowish brown silt loam. In some areas the soil has a thicker loess cap and is deeper to bedrock. In other areas the lower part of the subsoil has glacial deposits. In some places the fragipan is at or near the surface or is poorly expressed. In other places the slope is less than 6 or more than 12 percent.

Included with this soil in mapping are areas of the well drained, moderately deep Berks and Gilpin soils on the steeper, lower lying side slopes and the well drained Wellston soils on the steeper side slopes and nose slopes. Wellston soils do not have a fragipan. Also included are small areas of gullies as much as 4 feet wide and narrow areas of the somewhat poorly drained Belknap soils in drainageways. Included soils make up 10 to 12 percent of the unit.

Available water capacity is moderate in the Zanesville soil. Permeability is moderate above the fragipan and slow in the fragipan. Surface runoff is rapid in cultivated areas. The slowly permeable fragipan at a depth of about 2 feet restricts root penetration and the downward movement of water. A perched seasonal high water table is above the fragipan during winter and early spring. The soil tends to be wet in spring and droughty in late summer. The organic matter content is low in the surface layer. This layer is friable. Unless the soil is tilled at the proper moisture content, however, compaction and clodding can occur.

Some areas of this soil are used for cultivated crops. Some are used for hay and pasture, and a few are wooded. A few are used as urban land.

This soil is poorly suited to corn, soybeans, and small grain. The slowly permeable fragipan is a major limitation, and erosion is a major hazard. A system of conservation tillage that leaves protective amounts of crop residue on the surface and a crop rotation that includes grasses and legumes help to control erosion and runoff. Diversions, grassed waterways, and grade stabilization structures also help to control erosion. Conservation tillage and cover crops improve tilth and increase the organic matter content.

This soil is fairly well suited to most grasses and shallow-rooted legumes for hay or pasture. It is poorly suited to deep-rooted legumes, such as alfalfa, because the fragipan restricts the penetration of roots. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is fairly well suited to trees. The seedling mortality rate is the main management concern. It can be overcome by overstocking and by special site preparation.

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. Buildings should be constructed without basements and designed so that they conform to the natural slope of the land. Land shaping is needed in some areas. Strengthening foundations and footings and installing foundation drain tile help to prevent the structural damage caused by wetness. Removal of vegetation should be kept to a minimum, and exposed areas should be resodded or seeded as soon as possible.

This soil is severely limited as a site for local roads and streets because of low strength. Strengthening the base material helps to overcome this limitation. Cutting and filling are needed, and the roads should be built on the contour if possible.

Because of the restricted permeability and the wetness, this soil is severely limited as a site for septic tank absorption fields. These limitations can be minimized by filling or mounding the site with suitable filtering material and by installing subsurface drains, which help to lower the water table. The absorption field should be designed so that it conforms to the natural slope of the land.

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

ZaD3—Zanesville silt loam, 12 to 18 percent slopes, severely eroded. This strongly sloping, deep, moderately well drained soil is on narrow side slopes in the uplands. Individual areas are long and narrow and are 5 to 20 acres in size.

In a typical profile, the surface layer is yellowish brown silt loam about 6 inches thick. The subsoil is about 36 inches thick. The upper part is strong brown, firm silty clay loam, and the lower part is a fragipan of yellowish brown, very firm, brittle silt loam and loam. The substratum to a depth of 60 inches is yellowish brown loam. In some areas the soil has a thicker loess cap and is deeper to bedrock. In other areas the lower part of the subsoil has glacial deposits. In some places the fragipan is at or near the surface or is poorly expressed. In other places the slope is more than 18 or less than 12 percent.

Included with this soil in mapping are small areas of the well drained Gilpin, Berks, and Wellston soils, which do not have a fragipan and are on the steeper slopes. Also included are small areas of gullies as much as 5 feet deep. Included soils make up 6 to 8 percent of the unit.

Available water capacity is moderate in the Zanesville soil. Permeability is moderate above the fragipan and slow in the fragipan. Surface runoff is very rapid in cultivated areas. The slowly permeable, brittle fragipan at a depth of about 2 feet restricts root penetration and the downward movement of water. A perched seasonal high water table is in or above the fragipan in winter and early spring. The organic matter content is low in the surface layer. This layer is friable. Unless the soil is tilled within the proper range in moisture content, however, compaction and clodding can occur.

Most areas are used for hay or pasture. Some are used for cultivated crops. A few are wooded. This soil generally is unsuited to cultivated crops. The slowly permeable fragipan is a major limitation, and erosion is a major hazard. The areas that are farmed are narrow. They are farmed along with the adjoining soils. Small grain is occasionally grown to reestablish grasses and legumes.

This soil is fairly well suited to most grasses and shallow-rooted legumes for hay or pasture. It is poorly suited to deep-rooted legumes, such as alfalfa, because the slowly permeable fragipan restricts the penetration of roots. Overgrazing or grazing when the soil is too wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is fairly well suited to trees. The main management concerns are the erosion hazard, the equipment limitation, and seedling mortality. Locating logging roads and skid trails on gentle slopes and removing water with water bars, culverts, and drop structures help to control erosion. Special logging methods are needed because rubber-tired and crawler tractors cannot be operated safely on these slopes. Overstocking and special site preparation are needed because of the seedling mortality rate.

Because of the wetness and the slope, this soil is severely limited as a site for dwellings. Strengthening foundations and footings and installing foundation drain tile help to prevent the structural damage caused by wetness. The buildings should be designed so that they conform to the natural slope of the land. Land shaping is needed in some areas. The soil is severely limited as a site for local roads and streets because of low strength and slope. Strengthening the base material improves the ability of the roads and streets to support vehicular traffic and helps to prevent frost damage. Cutting and filling are needed, and the roads should be built on the contour if possible.

Because of the slope, the wetness, and the restricted permeability, this soil is severely limited as a site for septic tank absorption fields. Alternative sites should be considered. Land shaping, enlarging the distribution area, and installing the distribution lines across the slope help to ensure that the absorption field functions properly. Subsurface drains can lower the water table.

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

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 108,000 acres in the survey area, or nearly 49 percent of the total acreage, meets the soil requirements for prime farmland. Scattered areas of this land are throughout the county. Most of the prime farmland is used for corn, soybeans, and winter wheat. Some is hayland, pasture, or woodland.

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

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

Soils that have limitations, such as a seasonal high water table, frequent flooding during the growing season, or inadequate rainfall, qualify for prime farmland only in areas where these limitations have been overcome by such measures as drainage, flood control, or irrigation. 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

Pat Larr, district conservationist, and Phil Bousman, 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.

About 118,000 acres in the county was used for crops and pasture in 1967 (*4*). Of this total, about 57,000 acres was used for row crops, mainly corn and soybeans; 23,500 acres for permanent pasture; 16,754 acres for close-grown crops, mainly wheat; and 6,600 acres for a crop rotation including hay or pasture. The rest was idle cropland or was used for conservation purposes.

The main concerns in managing the soils in the county for crops and pasture are erosion, soil blowing, wetness, fertility, and tilth.

Soil erosion is the major management concern on about 60 percent of the cropland and pasture in the county. It is a hazard if the slope is more than 2 percent.

Loss of the surface layer through erosion is damaging for two reasons. First, productivity is reduced as the surface layer is lost and part of the subsoil is exposed. The subsoil is lower in content of organic matter and plant nutrients than the surface layer. Also, it tends to be more droughty and in poorer tilth when farmed. A soil loss of more than 5 tons per acre per year is considered excessive, even for the best soils in the county, and will eventually reduce the productive capacity of the soil. Many of the soils in the county are severely eroded. They are less than 40 inches deep to a fragipan or to bedrock. They cannot sustain crop production if the amount of soil lost is more than 2 tons per acre per year.

Secondly, erosion results in sedimentation in streams, rivers, and ditches. Sediment reduces the capacity of streams and ditches to carry water. If it chokes streams and rivers, it increases the frequency of flooding. It is the main pollutant, by volume, entering streams and reservoirs. It lowers the quality of water for municipal use, for recreation, and for fish and other wildlife.

The raindrop is the primary cause of erosion. As it hits bare ground, it dislodges soil particles and tends to break down soil structure. The surface becomes compacted and sealed. As a result, the rate of water infiltration is reduced and more water runs off the surface, carrying soil particles away. A good vegetative cover reduces the force of the raindrop as it hits the ground, thus checking the main cause of erosion. Measures that control erosion provide a protective cover, reduce the runoff rate, and increase the rate of water infiltration.

No-till planting of row crops into sod or into crop residue is very effective in controlling erosion and in maintaining productivity. It is becoming increasingly popular in the county. Approximately 50 percent of the soils in Pike County are suitable for no-till farming. The best suited soils are well drained or moderately well drained. No-till planting is especially beneficial on droughty soils.

Aerial seeding of cover crops in fields of corn or soybeans prior to leaf drop in the fall helps to control erosion in the winter. The cover crops provide an ideal no-till planting environment the following spring.

No-till farming permits row cropping year after year on the more sloping soils. If these soils are plowed by conventional moldboards, a cropping sequence that includes grasses and legumes is needed to control erosion. The grasses and legumes increase the content of organic matter and improve tilth.

A cropping system that keeps crop residue on the surface for extended periods can minimize soil losses. Chisel plowing, a widely accepted method of seedbed preparation, helps to keep residue on the surface. Disking prior to planting, however, reduces the extent of the protective cover of crop residue in areas that have been chisel plowed. Sloping, well drained soils are better suited to spring chiseling than to fall chiseling, which increases the susceptibility to erosion during the winter. Chisel plowing should be on the contour as much as possible.

Ridge-till planting is another form of reduced tillage that leaves crop residue on the surface. Corn and soybeans are planted on ridges made the previous year. The ridges usually are prepared in the fall, after harvest or during the time of cultivation. Ridge-till is suitable on about 30 percent of the soils in Pike County. It is best suited to nearly level soils in which wetness is a problem. The ridges on wet soils dry out and warm up more quickly in the spring than conventional seedbeds. Ridge-till is not suited to sloping soils because the furrow will form an erosive water channel if crops are planted up and down the hill.

Terraces reduce the length of slopes and thus the susceptibility to erosion. They are most practical on deep, well drained soils that have uniform slopes of less than 12 percent. Alford silt loam is a good example of a soil that is suitable for terracing. In most areas terraces should be used in combination with a conservation tillage or cropping system. In many areas of the county, slopes are too short and irregular for contour farming and terracing. On these soils minimizing tillage and leaving crop residue on the surface increase the rate of water infiltration and help to prevent excessive runoff and erosion.

Grassed waterways, diversions, grade stabilization structures, and dry-dam earthen structures are used throughout the county to help control erosion and remove runoff safely.

Erosion can be controlled to the point where it does not diminish the productive capacity of the soils. No single erosion-control measure can control erosion on all of the soils in Pike County. A combination of suitable conservation practices can control both rill and gully erosion and keep the soils productive. Further information about erosion-control measures and tillage systems can be obtained from local offices of the Soil Conservation Service.

Soil blowing is a hazard on Stonelick, Alvin, Ayrshire, Bloomfield, and Princeton soils. It can damage young crops in a few hours if winds are strong and the soils are dry and have no vegetation or surface mulch. Maintaining a cover of vegetation or mulch or keeping the surface rough through proper tillage methods helps to control soil blowing on these soils.

Soil drainage is the major management concern on about 30 percent of the cropland and pasture in the county. Unless drained, some of the soils are naturally so wet that the production of crops is difficult if not impossible. Examples are Birds, Bonnie, Montgomery, Beaucoup, Peoga, Petrolia, Vincennes Variant, and Wilhite soils.

The design of both surface and subsurface drainage systems varies with the different kinds of soil. A combination of surface and subsurface drains is needed in the somewhat poorly drained, poorly drained, and very poorly drained soils used for intensive row cropping. Drains should be more closely spaced in slowly permeable soils than in the more permeable soils. Information about the design of drainage systems for each kind of soil can be obtained from local offices of the Soil Conservation Service.

Soil fertility is naturally low in most of the soils on uplands and terraces in the county. Except for Iona, Markland, McGary, Montgomery, Reesville, and Sylvan soils, the soils on uplands and terraces are naturally acid. Some of the soils on flood plains, such as Beaucoup, Birds, Haymond, Nolin, Petrolia, Huntsville, and Wakeland soils, range from medium acid to mildly alkaline and are naturally higher in content of plant nutrients than most upland soils. Other soils on flood plains, such as Bonnie, Steff, and Belknap soils, are strongly acid or very strongly acid.

Many soils naturally are very strongly acid unless they are limed. Applications of ground limestone are needed to raise the pH level sufficiently for good crop growth. Available phosphorus and potash levels are naturally low in most of these soils. On all soils additions of lime and fertilizer should be based on the results of soil tests, the needs of the crops, and the desired level of yields. The

Cooperative Extension Service can help to determine the kinds and amounts of fertilizer and lime needed.

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

In Pike County most of the soils used as cropland have a silt loam surface layer that is light in color and low in content of organic matter. Generally, the structure of these soils is weak, and intense rainfall can cause the formation of a crust on the surface. This crust becomes hard and nearly impervious to water when dry. It hinders seedling emergence. A system of conservation tillage that covers at least 30 pecent of the surface with crop residue, manure, or cover crops can improve tilth and prevent crusting. Working the soil as little as possible and only when moisture conditions are favorable can reduce the extent of compaction (fig. 10).

Fall plowing generally is not suitable on light colored, sloping soils because of the erosion hazard and crusting. Only a few soils benefit from fall plowing. They are the nearly level, poorly drained and very poorly drained soils in depressions. These soils are high in content of clay. Examples are Montgomery, Beaucoup, Wilhite, and Petrolia soils. Freezing and thawing tends to improve the tilth of these soils and allows them to warm up earlier in the spring.

The action of chemical herbicides is affected by the type of soil. The content of organic matter affects the ability of many chemicals to control weeds. Some chemicals deteriorate slowly on clayey soils. As a result, they can cause damage to subsequent crops, particularly cover crops. On sandy soils, which are porous, only certain chemicals can be used without significant crop damage. Many chemicals do not work properly when the pH is too low. The kinds and amounts of chemical herbicide should be adjusted to the soil type, the tillage method, and the crop rotation. Further information about the reaction of chemicals on various types of soil can be obtained from the Cooperative Extension Service or the Soil Conservation Service.

Field crops suited to the soils and climate in Pike County include many that are not now commonly grown. Corn, wheat, and soybeans are the main crops. Grain sorghum, sunflowers, sugar beets, popcorn, rye, oats, and similar crops can be grown if economic conditions are favorable. Also, seed could be produced from fescue, redtop, bluegrass, bromegrass, red clover, and similar grasses and legumes.

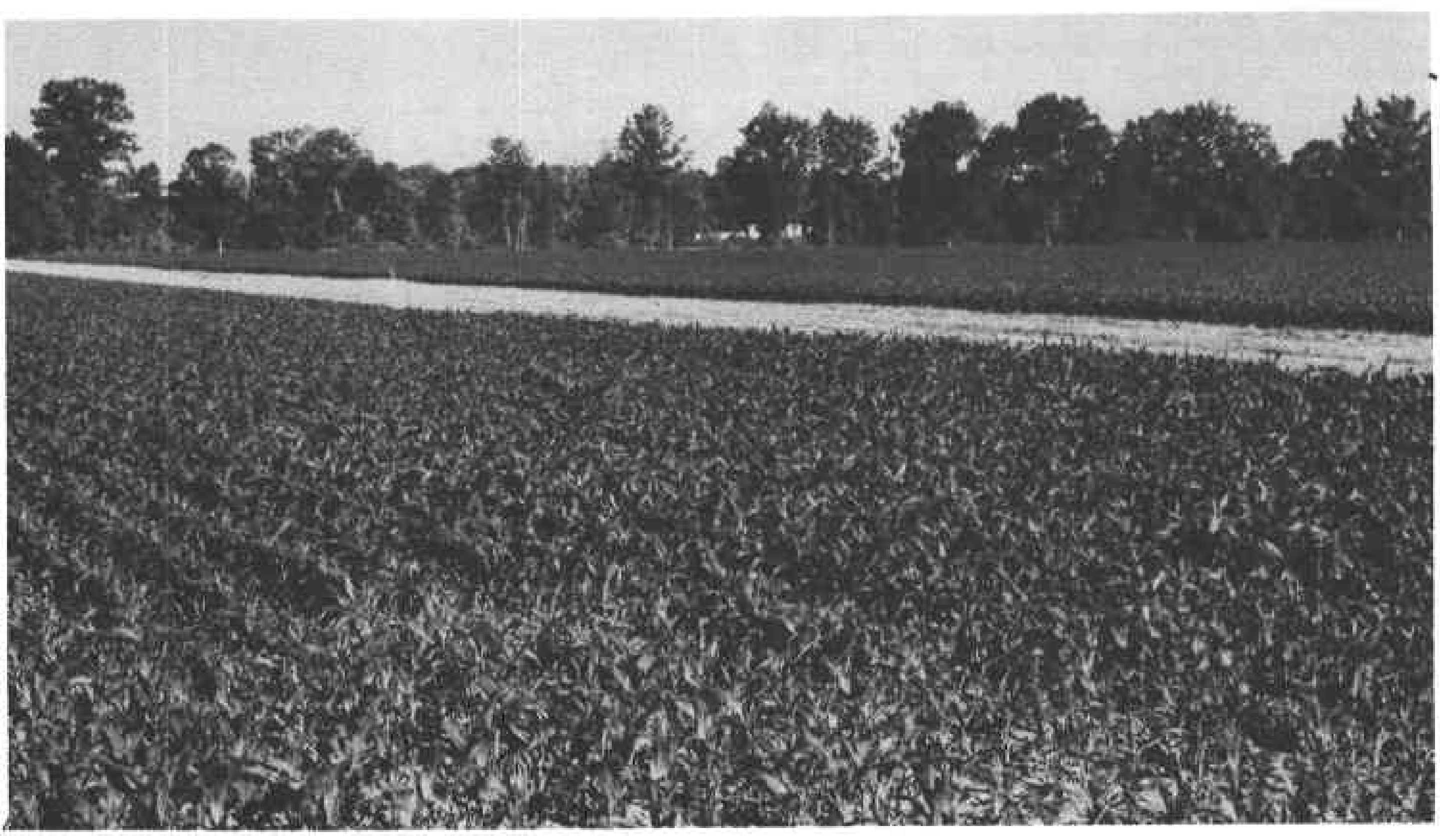


Figure 10.—Crop damage caused by compaction in an area of Wakeland silt loam, frequently flooded, in the foreground.

Specialty crops are not grown extensively in the county. Some areas could be used for such crops as strawberries, grapes, vegetables, apples, and peaches. Deep, well drained soils, such as Alford soils, which warm up early in spring, are well suited to specialty crops. Alvin and Bloomfield soils are well suited to melons. Soils in low landscape positions where frost is frequent and air drainage is poor are poorly suited to early vegetables, small fruits, and orchards. The latest information about specialty crops can be obtained from the local office of the Cooperative Extension Service.

Pasture and hay crops commonly grown in the county are mixtures of fescue, timothy, orchardgrass, alfalfa, white clover, and red clover. Other suitable plants are bluegrass, reed canarygrass, redtop, ladino clover, lespedeza, alsike clover, sweet clover, and birdsfoot trefoil. The kind of forage needed and the soil type determine the species to be selected for planting.

On well drained and moderately well drained soils that do not have a fragipan and are not frequently flooded, most of the forage crops commonly grown in the county grow well. Lespedeza, Canada bluegrass, fescue, or red top should be selected for planting on soils that are droughty and low in fertility or pH. Alfalfa, sweet clover, birdsfoot trefoil, orchardgrass, and bromegrass grow well in droughty soils if the fertility level is medium or high.

Soils that have a fragipan, a clayey subsoil, or a high water table are not suited to alfalfa or other deep-rooted legumes. Root growth is greatly restricted in these soils. Because of freezing and thawing, the legumes can heave out of the soil. Soils that have a fragipan are best suited to grasses and shallow-rooted legumes, such as lespedeza, ladino clover, and white clover.

On somewhat poorly drained soils, the best suited species are reed canarygrass, tall fescue, red top, ladino clover, white clover, alsike clover, timothy, birdsfoot trefoil, and Canada bluegrass. On poorly drained and very poorly drained soils, the best suited species are reed canarygrass, red top, and alsike clover. Installing a drainage system improves productivity and allows other species to be grown.

Soils that are flooded for long periods are poorly suited to most grasses and legumes. Reed canarygrass, tall fescue, and timothy can withstand flooding of more than 30 days.

Yields Per Acre

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

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

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

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

Land Capability Classification

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

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

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

Class I soils have few limitations that restrict their use.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Seedling mortality refers to the death of naturally occurring or planted tree seedlings, as influenced by the kinds of soil, soil wetness, 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* 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 first species listed under *common trees* for a soil is the indicator species for that soil. It is the dominant species on the soil and the one that determines the ordination class.

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

Windbreaks and Environmental Plantings

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

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

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

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

Recreation

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

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

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

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

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

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

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

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

Wildlife Habitat

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

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

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

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

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

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

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, timothy, bromegrass, bluegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, ragweed, pokeweed, sheep sorrel, docks, crabgrass, and dandelion.

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

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, dove, meadowlark, field sparrow, cottontail, red fox, and woodchuck.

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

Habitat for wetland wildlife consists of marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, rails, kingfishers, muskrat, mink, and beaver.

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

Engineering

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

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

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

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

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

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

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

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

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

Building Site Development

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

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

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 13 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

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

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

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

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

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

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

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

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

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to 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 14 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

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

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

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

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

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

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

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

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

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

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

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

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

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

Water Management

Table 15 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and for embankments, dikes, and levees. 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, irrigation, 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.

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.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

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.

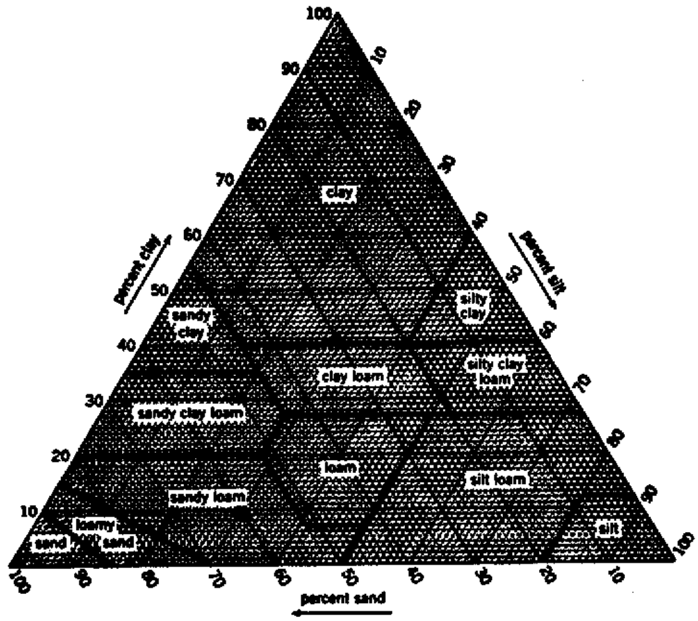


Figure 11.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

Engineering Index Properties

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

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

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter (fig. 11). "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

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

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

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

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

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

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

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

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

Physical and Chemical Properties

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

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

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and 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 17, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

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

Soil and Water Features

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

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

The four hydrologic soil groups are:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*10*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 19 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

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

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

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

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

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

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

Soil Series and Their Morphology

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

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the *Soil Survey Manual* (*9*). Many of the technical terms used in the descriptions are defined in *Soil Taxonomy* (*10*). 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."

Alford Series

The Alford series consists of deep, well drained, moderately permeable soils on loess-covered uplands and terraces. These soils formed in loess. Slopes range from 0 to 12 percent.

These soils have a lower base saturation than is definitive for the Alford series. This difference, however, does not alter the usefulness or behavior of the soils.

Alford soils are similar to Sylvan soils and commonly are adjacent to Alvin, Hosmer, Iva, Muren, and Pike soils. Sylvan soils have a solum that is thinner than that of the Alford soils. They formed in calcareous loess.

Alvin soils have more sand throughout than the Alford soils. Also, they are in more hummocky areas that generally are closer to the source of the eolian material. Hosmer soils have a fragipan at a depth of 20 to 36 inches. Iva soils have a mottled subsoil. They are on flats or at the head of drainageways. Muren soils are shallower to gray mottles than the Alford soils. They are nearly level and are on ridges. Pike soils formed in loess and glacial drift. They are on the steeper slopes.

Typical pedon of Alford silt loam, 2 to 6 percent slopes, eroded, in a cultivated field; 400 feet west and 950 feet south of the northeast corner of sec. 33, T. 1 N., R. 8 W.

Ap—0 to 7 inches; dark brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; weak medium granular structure; friable; many fine roots; very strongly acid; abrupt smooth boundary.

Bt1—7 to 22 inches; brown (7.5YR 4/4) silty clay loam; moderate medium subangular blocky structure; firm; few fine roots; thin continuous reddish brown (5YR 4/4) clay films on faces of peds; very strongly acid; gradual wavy boundary.

Bt2—22 to 38 inches; strong brown (7.5YR 5/6) silt loam; moderate medium subangular blocky structure; firm; few fine roots; thin continuous reddish brown (5YR 4/4) clay films on faces of peds; few medium black (10YR 2/1) iron and manganese oxide accumulations; very strongly acid; gradual wavy boundary.

Bt3—38 to 50 inches; brown (7.5YR 4/4) silt loam; moderate coarse subangular blocky structure; friable; thin discontinuous reddish brown (5YR 4/4) clay films on faces of peds; very strongly acid; gradual wavy boundary.

BC—50 to 73 inches; brown (7.5YR 4/4) silt loam; weak coarse subangular blocky structure; friable; thin discontinuous reddish brown (5YR 4/4) clay films on faces of peds; strongly acid; clear wavy boundary.

C—73 to 80 inches; dark yellowish brown (10YR 4/4) silt loam; massive; friable; medium acid.

The solum and the loess are 60 to more than 80 inches thick. Except where limed, the solum is medium acid to extremely acid.

The Ap horizon has chroma of 3 or 4. The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 8. The C horizon has hue of 10YR or 7.5YR and value of 4 or 5. It is very strongly acid to slightly acid.

Alvin Series

The Alvin series consists of deep, well drained, moderately rapidly permeable soils on uplands and terraces. These soils formed in windblown sands and silts. Slopes range from 2 to 15 percent.

Alvin soils commonly are adjacent to Alford, Ayrshire, Bloomfield, Elkinsville, and Princeton soils. Alford soils have more silt and clay throughout than the Alford soils. Also, they are in less hummocky areas that generally are farther from the source of eolian material. Ayrshire soils are in the lower positions on the landscape. They have a subsoil that is grayer than that of the Alvin soils. Bloomfield soils have a banded argillic horizon. They are on knolls and side slopes. Elkinsville soils contain less sand in the solum than the Alvin soil. Also, they generally are on terraces that are farther from the source of eolian material. Princeton soils contain more clay in the subsoil than the Alvin soils. They are nearly level and are on terraces and ridgetops.

Typical pedon of Alvin fine sandy loam, 2 to 6 percent slopes, in a cultivated field; 25 feet north and 550 feet east of the southwest corner of sec. 22, T. 1 N., R. 8 W.

Ap—0 to 10 inches; dark brown (10YR 4/3) fine sandy loam, pale brown (10YR 6/3) dry; weak fine granular structure; very friable; many fine roots; strongly acid; abrupt smooth boundary.

Bt1—10 to 18 inches; yellowish brown (10YR 5/4) fine sandy loam; weak medium subangular blocky structure; friable; many fine roots; thin patchy brown (7.5YR 4/4) clay films on faces of peds; strongly acid; clear smooth boundary.

Bt2—18 to 24 inches; brown (7.5YR 4/4) fine sandy loam; moderate medium subangular blocky structure; friable; common fine roots; thin reddish brown (5YR 4/4) clay films on faces of peds; medium acid; clear smooth boundary.

Bt3—24 to 34 inches; brown (7.5YR 4/4) loamy fine sand; weak medium subangular blocky structure; very friable; few fine roots; thin reddish brown (5YR 4/4) clay films on faces of peds; slightly acid; gradual smooth boundary.

Bt4—34 to 42 inches; brown (7.5YR 4/4) fine sandy loam; weak coarse subangular blocky structure; friable; thin dark reddish brown (5YR 4/4) clay films on faces of peds; slightly acid; clear smooth boundary.

BC—42 to 59 inches; brown (7.5YR 4/4) loamy fine sand; weak coarse subangular blocky structure; very friable; thin patchy dark reddish brown (5YR 3/4) clay bridges; neutral; clear smooth boundary.

C—59 to 65 inches; dark yellowish brown (10YR 4/4) very fine sandy loam; massive; very friable; neutral.

The solum is 45 to 65 inches thick. Unless limed, the Ap horizon is slightly acid to strongly acid. The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. It is very fine sandy loam, fine sandy loam, loamy fine sand, or sandy loam. It is medium acid or strongly acid in the upper part and ranges to neutral in the lower part. The C horizon has value of 4 to 6 and chroma of 3 or 4. It is slightly acid to mildly alkaline. It is very fine sandy loam, sandy loam, loamy fine sand, or fine sand. In some pedons it is stratified.

Armiesburg Series

The Armiesburg series consists of deep, well drained, moderately permeable soils on broad bottom land. These soils formed in silty alluvial sediments. Slopes range from 0 to 2 percent.

Armiesburg soils are similar to Huntsville soils and commonly are adjacent to Nolin, Petrolia, Stendal, Vincennes Variant, and Wilhite soils. Huntsville soils contain more sand in the solum than the Armiesburg soils and have a thicker surface layer. Nolan, Petrolia, Stendal, Vincennes Variant, and Wilhite soils do not have a dark surface layer. Nolin soils are in the slightly lower landscape positions. Petrolia, Vincennes Variant, and Wilhite soils have a gray, mottled subsoil. They are in the lower landscape positions. Stendal soils have a subsoil that is grayer than that of the Armiesburg soils. They are in the slightly lower landscape positions.

Typical pedon of Armiesburg silty clay loam, occasionally flooded, in a cultivated field; 1,340 feet south and 2,550 feet west of the northeast corner of sec. 16, T. 1 N., R. 9 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; moderate fine and medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

A—9 to 14 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; moderate medium angular blocky structure; firm; many fine roots; neutral; clear wavy boundary.

Bw1—14 to 20 inches; dark brown (10YR 4/3) silty clay loam; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; many fine roots; very dark grayish brown (10YR 3/2) organic coatings on faces of peds; slightly acid; clear smooth boundary.

Bw2—20 to 31 inches; dark brown (10YR 4/3) silty clay loam; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; common fine roots; dark brown (7.5YR 3/4) organic coatings on faces of peds; medium acid; gradual wavy boundary.

Bw3—31 to 40 inches; dark yellowish brown (10YR 4/4) silty clay loam; weak coarse subangular blocky structure; firm; few fine roots; brown (10YR 4/3) coatings on faces of peds; medium acid; gradual wavy boundary.

C1—40 to 47 inches; yellowish brown (10YR 5/4) silt loam; massive; friable; medium acid; gradual wavy boundary.

C2—47 to 60 inches; dark yellowish brown (10YR 4/4) loam that has thin strata of silt loam; few fine faint pale brown (10YR 6/3) mottles; massive; friable; strongly acid.

The solum is 32 to 50 inches thick. The A horizon has chroma of 2 or 3. It is 10 to 20 inches thick. The Bw horizon has value of 4 or 5 and chroma of 3 or 4. The C horizon is silty clay loam within a depth of 40 inches and loam and silt loam below that depth.

Ayrshire Series

The Ayrshire series consists of deep, somewhat poorly drained, moderately slowly permeable soils on uplands. These soils formed in windblown sand and coarse silt. Slopes range from 0 to 2 percent.

Ayrshire soils commonly are adjacent to Alvin, Bloomfield, and Princeton soils. The adjacent soils have a brown subsoil that is free of mottles. They are in the higher, more sloping landscape positions.

Typical pedon of Ayrshire fine sandy loam, loamy substratum, in a cultivated field; 1,200 feet east and 1,400 feet south of the northwest corner of sec. 9, T. 1 N., R. 7 W.

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) fine sandy loam, light brownish gray (10YR 6/2) dry; weak medium granular structure; very friable; common fine roots; medium acid; abrupt smooth boundary.

E—10 to 13 inches; light brownish gray (10YR 6/2) fine sandy loam; common medium distinct yellowish brown (10YR 5/4) mottles; weak thick platy structure parting to weak coarse granular; very friable; few fine roots; slightly acid; clear smooth boundary.

BE—13 to 19 inches; grayish brown (10YR 5/2) sandy loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; slightly acid; clear smooth boundary.

Bt1—19 to 34 inches; yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) loam; weak medium prismatic structure parting to moderate medium subangular blocky; firm; thin discontinuous gray (10YR 6/1) clay films on faces of peds; few black (10YR 2/1) iron and manganese oxide accumulations; strongly acid; clear wavy boundary.

Bt2—34 to 43 inches; gray (10YR 5/1) sandy clay loam; many coarse prominent yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; thin discontinuous gray (10YR 6/1) clay films on faces of peds; neutral; clear smooth boundary.

C—43 to 60 inches; light brownish gray (10YR 6/2) loam that has strata of silt loam; many coarse prominent yellowish brown (10YR 5/6) mottles; massive; friable; strong effervescence; moderately alkaline.

The solum is 40 to 60 inches thick. The Ap horizon is medium acid to neutral. The E horizon also is medium acid to neutral. It has value of 5 or 6. The BE horizon is strongly acid to slightly acid. The Bt horizon has value of 5 or 6 and chroma of 2 to 6. It is strongly acid to slightly acid in the upper part and ranges to neutral in the lower part. The C horizon has value of 5 or 6 and chroma of 2 to 6. It is stratified loam, silt loam, or fine sandy loam.

Bartle Series

The Bartle series consists of deep, somewhat poorly drained, very slowly permeable soils on low stream terraces. These soils formed in acid, silty alluvium. Slopes range from 0 to 2 percent.

These soils have finer structure in the subsoil than is definitive for the Bartle series. This difference, however, does not alter the usefulness or behavior of the soils.

Bartle soils are similar to Dubois soils and commonly are adjacent to Belknap, Pekin, and Steff soils. Dubois soils have a strongly expressed fragipan, have more clay in the subsoil than the Bartle soils, and have a loess cap. Belknap soils do not have a subsoil. They are on flood plains. Pekin and Steff soils have a subsoil that is browner than that of the Bartle soils. Pekin soils are in the more sloping landscape positions. Steff soils are on flood plains.

Typical pedon of Bartle silt loam, in a cultivated field; 1,250 feet east and 1,500 feet north of the southwest corner of sec. 9, T. 3 S., R. 7 W.

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

BA—7 to 14 inches; brown (10YR 5/3) silt loam; common fine faint grayish brown (10YR 5/2) and common fine prominent yellowish brown (10YR 5/8) mottles; weak medium and coarse subangular blocky structure; friable; common fine roots; thin patchy light brownish gray (10YR 6/2) clay films on faces of peds; strongly acid; clear smooth boundary.

Bt—14 to 27 inches; pale brown (10YR 6/3) silt loam; common fine faint light brownish gray (10YR 6/2) and common fine prominent yellowish brown (10YR 5/8) mottles; moderate medium and coarse subangular blocky structure; friable; few fine roots; thin discontinuous brown (10YR 5/3) and grayish brown (10YR 5/2) clay films on faces of peds; very strongly acid; clear smooth boundary.

Btx—27 to 39 inches; light brownish gray (10YR 6/2) silt loam; common fine faint pale brown (10YR 6/3) and common fine prominent yellowish brown (10YR 5/8) mottles; moderate coarse prismatic structure parting to moderate coarse subangular blocky; firm; brittle; few fine roots; thin discontinuous pale brown (10YR 6/3) clay films on faces of peds; discontinuous light gray (10YR 7/2) silt coatings on faces of peds; common black (10YR 2/1) iron and manganese oxide accumulations; very strongly acid; gradual smooth boundary.

BC—39 to 57 inches; yellowish brown (10YR 5/4) silty clay loam that has strata of silt loam; common medium distinct light brownish gray (10YR 6/2) and yellowish brown (10YR 5/8) mottles; weak coarse prismatic structure parting to weak coarse subangular blocky; firm; thin patchy pale brown (10YR 6/3) and brown (10YR 5/3) clay films on faces of peds; patchy light gray (10YR 7/2) silt coatings on faces of peds; common black (10YR 2/1) iron and manganese oxide accumulations; strongly acid; clear smooth boundary.

C—57 to 60 inches; gray (10YR 6/1) silt loam that has strata of silty clay loam; common medium faint light brownish gray (10YR 6/2) and common medium prominent yellowish brown (10YR 5/8) mottles; massive; firm; few very dark grayish brown (10YR 3/2) iron and manganese oxide accumulations; strongly acid.

The solum is 50 to 60 inches thick. The Ap horizon has value of 4 or 5 and chroma of 2 or 3. It is neutral to strongly acid. The BA horizon has chroma of 3 or 4. The Bt and Btx horizons have value of 5 or 6 and chroma of 2 to 4. They are silt loam or silty clay loam. They are strongly acid or very strongly acid. The BC horizon is similar in color and reaction to the Bt and Btx horizons. The C horizon has value of 5 or 6 and chroma of 1 to 6.

Beaucoup Series

The Beaucoup series consists of deep, poorly drained, moderately slowly permeable soils on flood plains. These soils formed in silty sediments. Slopes range from 0 to 2 percent.

Beaucoup soils are similar to Montgomery soils and commonly are adjacent to Birds and Wakeland soils. Montgomery soils contain more clay throughout than the Beaucoup soils. Birds soils do not have a dark surface layer or a B horizon. They have less clay throughout than the Beaucoup soils. They are on the slightly higher flood plains. Wakeland soils do not have a dark surface layer, have subhorizons that are browner than those of the Beaucoup soils, and have less clay throughout. Also, they are in slightly higher areas that generally are farther from stream channels.

Typical pedon of Beaucoup silty clay loam, frequently flooded, in a cultivated field; 550 feet north and 300 feet west of the center of sec. 9, T. 1 N., R. 7 W.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure parting to weak medium granular; firm; few fine roots; neutral; abrupt smooth boundary.

Bg1—10 to 25 inches; gray (10YR 5/1) silty clay loam; common fine distinct yellowish brown (10YR 5/4) mottles; weak coarse and medium subangular blocky structure; firm; few fine roots; neutral; gradual smooth boundary.

Bg2—25 to 42 inches; gray (10YR 5/1) silty clay loam; common medium distinct yellowish brown (10YR 5/4) mottles; weak coarse subangular blocky structure; firm; neutral; gradual smooth boundary.

Cg—42 to 60 inches; dark gray (10YR 4/1) silt loam that has strata of very fine sandy loam; many medium faint light gray (10YR 6/1) and common fine prominent light olive brown (2.5Y 5/4) mottles; massive; firm; few shells; strong effervescence; mildly alkaline.

The solum is 36 to 42 inches thick. The Ap horizon has value of 2 or 3 and chroma of 1 or 2. The Bg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 or 5, and chroma of 1 or 2. It is slightly acid to mildly alkaline. The C horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 or 2. It is stratified silty clay loam, silt loam, loam, or very fine sandy loam.

Belknap Series

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

Belknap soils are similar to Wakeland soils and commonly are adjacent to Bartle, Bonnie, Pekin, Peoga, and Steff soils. Wakeland soils are medium acid to neutral to a depth of 40 inches. Bartle soils have a well developed subsoil and have more clay than the Belknap soils. They are on stream terraces. Bonnie soils are grayer than the Belknap soils; they have a matrix with chroma of 1 or 2 to a depth of 30 inches. They are in swales. Pekin soils are browner than the Belknap soils and have a well developed subsoil. They are on stream terraces. Peoga soils are grayer than the Belknap soils and have a B horizon. They are on glacial lake plains. Steff soils are browner than the Belknap soils; they have chroma of 3 or more directly below the Ap horizon. They are on swells next to stream channels.

Typical pedon of Belknap silt loam, frequently flooded, in a cultivated field; 2,790 feet south and 1,250 feet west of the northeast corner of sec. 10, T. 1 S., R. 8 W.

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

Cg1—10 to 24 inches; grayish brown (10YR 5/2) silt loam; common medium faint dark brown (10YR 4/3) mottles; weak fine granular structure; friable; common fine roots; very strongly acid; clear smooth boundary.

Cg2—24 to 35 inches; grayish brown (10YR 5/2) silt loam; many coarse faint dark brown (10YR 4/3) mottles; weak very coarse subangular blocky structure; friable; few fine roots; strongly acid; gradual smooth boundary.

Cg3—35 to 48 inches; light brownish gray (10YR 6/2) silt loam; common medium prominent yellowish brown (10YR 5/6) and common medium faint light gray (10YR 7/2) mottles; massive; friable; strongly acid; gradual smooth boundary.

Cg4—48 to 60 inches; light brownish gray (10YR 6/2) silt loam; common medium prominent yellowish brown (10YR 5/6) and common medium faint light gray (10YR 7/2) mottles; massive; friable; slightly acid.

The Ap horizon has value of 4 or 5 and chroma of 2 or 3. It is very strongly acid to slightly acid. The C horizon has value of 5 or 6 and chroma of 1 to 3. It is strongly acid or very strongly acid to a depth of 40 inches.

Berks Series

The Berks series consists of moderately deep, well drained, moderately rapidly permeable soils on upland side slopes. These soils formed in material weathered from sandstone, siltstone, and shale. Slopes range from 25 to 50 percent.

Berks soils are similar to Gilpin soils and commonly are adjacent to Gilpin, Wellston, and Zanesville soils. Gilpin soils have more clay in the subsoil than the Berks soils and have a lower content of coarse fragments in the solum. Wellston soils are deep and have more silt and clay and less sand and fewer coarse fragments in the subsoil than the Berks soils. They are in the less sloping, higher landscape positions. Zanesville soils are deep and have a loess cap and a fragipan. They are on the higher, less sloping ridges and side slopes.

Typical pedon of Berks loam, in a wooded area of Gilpin-Berks loams, 25 to 50 percent slopes; 2,200 feet south and 200 feet west of the northeast corner of sec. 28, T. 2 S., R. 6 W.

A—0 to 2 inches; dark grayish brown (10YR 4/2) loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; many fine and medium roots; about 10 percent sandstone fragments less than 0.75 inch long; extremely acid; clear smooth boundary.

Bw1—2 to 5 inches; yellowish brown (10YR 5/4) loam; weak fine and medium subangular blocky structure; friable; common fine and medium roots; about 3 percent sandstone fragments less than 0.75 inch long; extremely acid; clear smooth boundary.

Bw2—5 to 12 inches; yellowish brown (10YR 5/6) channery loam; weak medium subangular blocky structure; friable; common medium roots; about 27 percent sandstone fragments less than 3 inches long; extremely acid; clear wavy boundary.

BC—12 to 18 inches; yellowish brown (10YR 5/4) very channery loam; weak coarse subangular blocky structure; friable; few medium roots; about 47 percent sandstone fragments 3 to 10 inches long; extremely acid; clear wavy boundary.
C—18 to 22 inches; yellowish brown (10YR 5/4) extremely channery loam; massive; friable; about 67 percent sandstone fragments 3 to 10 inches long; extremely acid; clear wavy boundary.
R—22 inches; rippable sandstone bedrock.

The solum is 18 to 30 inches thick. Rippable bedrock is at a depth of 20 to 30 inches.

The A horizon has value of 3 or 4 and chroma of 2 or 3. The E horizon, if it occurs, has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. The A and E horizons are silt loam or loam. The Bw horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. The BC and C horizons have hue of 10YR or 7.5YR and value of 4 or 5. The B and C horizons are loam or the channery, very channery, or extremely channery analogs of loam or silt loam.

Bethesda Series

The Bethesda series consists of deep, well drained, moderately slowly permeable soils on uplands. These soils formed in a regolith in surface-mined areas. Slopes range from 8 to 70 percent.

Bethesda soils are similar to Fairpoint soils and commonly are adjacent to Belknap, Bonnie, Fairpoint, Gilpin, Hosmer, and Zanesville soils. Fairpoint soils are nonacid. Belknap and Bonnie soils have subhorizons that are grayer than those of the Bethesda soils. They are on flood plains. Gilpin, Hosmer, and Zanesville soils have a well developed subsoil. They are on uplands.

Typical pedon of Bethesda shaly silt loam, in a wooded area of Fairpoint-Bethesda complex, 25 to 70 percent slopes; 1,850 feet east and 1,600 feet north of the southwest corner of sec. 17, T. 2 S., R. 7 W.

A—0 to 3 inches; dark grayish brown (2.5Y 4/2) shaly silt loam, light brownish gray (2.5Y 6/2) dry; moderate medium granular structure; friable; common medium and coarse roots; about 30 percent coarse fragments; very strongly acid; clear smooth boundary.
C1—3 to 21 inches; yellowish brown (10YR 5/6) shaly silty clay loam; common medium prominent dark grayish brown (2.5Y 4/2) and few fine distinct brownish yellow (10YR 6/8) mottles; massive; firm; few medium and coarse roots; about 35 percent coarse fragments; very strongly acid; gradual wavy boundary.
C2—21 to 35 inches; yellowish brown (10YR 5/6) very shaly silty clay loam; common medium prominent dark grayish brown (2.5Y 4/2) and common fine distinct brownish yellow (10YR 6/8) mottles; massive; firm; few medium and coarse roots; about 60 percent coarse fragments; very strongly acid; gradual wavy boundary.
C3—35 to 54 inches; yellowish brown (10YR 5/4) extremely shaly silty clay loam; common medium prominent dark gray (N 4/0) and common fine distinct yellowish brown (10YR 5/8) mottles; massive; firm; about 70 percent coarse fragments; very strongly acid; gradual wavy boundary.
C4—54 to 60 inches; yellowish brown (10YR 5/6) extremely shaly silty clay loam; common fine prominent dark gray (N 4/0) and common fine distinct brown (10YR 5/3) mottles; massive; firm; about 75 percent coarse fragments; very strongly acid.

The depth to bedrock is more than 5 feet. Reaction is strongly acid to extremely acid throughout the profile. The content of coarse fragments ranges from 15 to 65 percent in the A horizon and from 25 to 75 percent in the C horizon.

The A horizon has hue of 2.5Y or 10YR and chroma of 1 to 4. It is the shaly or very shaly analogs of silt loam, loam, or silty clay loam. The C horizon has hue of 2.5Y to 7.5YR or is neutral in hue. It has value of 3 to 6 and chroma of 0 to 8. It is the shaly, very shaly, extremely shaly, channery, or very channery analogs of silty clay loam, silt loam, loam, or clay loam.

Birds Series

The Birds series consists of deep, poorly drained, moderately slowly permeable soils on bottom land. These soils formed in silty alluvial sediments. Slopes range from 0 to 2 percent.

Birds soils are similar to Bonnie soils and commonly are adjacent to Beaucoup and Wakeland soils. Bonnie soils are more acid than the Birds soils. Beaucoup soils have a dark surface layer and have more clay in the subsoil than the Birds soils. They are in the slightly lower landscape positions. Wakeland soils have subhorizons that are browner than those of the Birds soils. They are on swells on flood plains.

Typical pedon of Birds silt loam, frequently flooded, in a cultivated field; 225 feet east and 200 feet north of the southwest corner of sec. 25, T. 1 N., R. 9 W.

Ap—0 to 8 inches; grayish brown (10YR 5/2) silt loam, very pale brown (10YR 7/3) dry; moderate medium granular structure; friable; many fine roots; medium acid; abrupt smooth boundary.
Cg1—8 to 16 inches; gray (10YR 6/1) silt loam; many medium distinct yellowish brown (10YR 5/4) mottles; weak medium granular structure; friable; common fine roots; medium acid; clear smooth boundary.
Cg2—16 to 21 inches; gray (10YR 5/1) silt loam; common fine distinct dark yellowish brown (10YR

4/4) mottles; massive; friable; few fine roots; slightly acid; gradual smooth boundary.

Cg3—21 to 40 inches; gray (10YR 5/1) silt loam; common medium distinct light olive brown (2.5Y 5/4) mottles; massive; friable; slightly acid; gradual smooth boundary.

Cg4—40 to 60 inches; gray (10YR 6/1) silt loam that has strata of silty clay loam; many medium prominent yellowish brown (10YR 5/6) mottles; massive; friable; slightly acid.

The Ap horizon has value of 4 to 6 and chroma of 1 or 2. The Cg horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 or 2. It is typically silt loam to a depth of 40 inches and commonly has strata of silty clay loam below that depth. It is medium acid to neutral.

Birds silt loam, occasionally flooded, has higher chroma than is described as the range for the series. This difference, however, does not alter the usefulness or behavior of the soil.

Bloomfield Series

The Bloomfield series consists of deep, somewhat excessively drained, rapidly permeable soils on uplands and terraces. These soils formed in deposits of windblown sand. Slopes range from 6 to 50 percent.

Bloomfield soils commonly are adjacent to Alvin, Ayrshire, Princeton, and Sylvan soils. Alvin soils have a continuous argillic horizon. They are on ridge summits and side slopes. Ayrshire soils have a subsoil that is grayer than that of the Bloomfield soils. They are in the lower positions on the landscape. Princeton soils have more clay throughout than the Bloomfield soils. They are nearly level and are on terraces and upland ridgetops. Sylvan soils have less sand and more silt throughout than the Bloomfield soils. They are on side slopes and the higher ridges.

Typical pedon of Bloomfield sand, in a pastured area of Alvin-Bloomfield complex, 6 to 15 percent slopes; 1,250 feet east and 1,700 feet south of the northwest corner of sec. 7, T. 1 N., R. 7 W.

Ap—0 to 10 inches; dark brown (10YR 4/3) sand, pale brown (10YR 6/3) dry; weak fine granular structure; very friable; many fine roots; slightly acid; abrupt smooth boundary.

E—10 to 28 inches; yellowish brown (10YR 5/4) sand; thin dark yellowish brown (10YR 4/4) bands; weak medium subangular blocky structure; very friable; many fine roots; slightly acid; clear smooth boundary.

E&Bt—28 to 40 inches; yellowish brown (10YR 5/4) sand (E); weak medium subangular blocky structure; very friable; bands of dark brown (7.5YR 4/4) fine sandy loam (Bt); coarse subangular blocky structure in the thicker bands; friable; wavy and discontinuous bands 0.25 inch thick in the upper part and 1 inch thick in the lower part; bands 3 to 5 inches apart; slightly acid; gradual wavy boundary.

Bt&E1—40 to 55 inches; dark brown (7.5YR 4/4) loamy sand (Bt) occurring as nearly continuous bands 1 to 4 inches thick; coarse subangular blocky structure; friable; interbedded with yellowish brown (10YR 5/4) fine sand (E); weak medium subangular blocky structure; very friable; bands 3 inches apart; slightly acid; gradual irregular boundary.

Bt&E2—55 to 80 inches; dark brown (7.5YR 4/4) fine sand (Bt) occurring as irregularly shaped bands; coarse subangular blocky structure; friable; interbedded with yellowish brown (10YR 5/4) sand (E); single grain; loose; neutral; diffuse irregular boundary.

C—80 to 100 inches; light yellowish brown (10YR 6/4) sand; single grain; loose; mildly alkaline.

The thickness of the solum ranges from 48 to 84 inches. In the upper 60 inches, the total thickness of the bands is 15 to 20 inches.

The Ap horizon is dark grayish brown (10YR 4/2) or dark brown (10YR 4/3). The A horizon, if it occurs, has hue of 10YR, value of 3, and chroma of 1 to 3. The Ap and A horizons are sand, fine sand, loamy fine sand, or loamy sand. The E horizon and the E part of the E&Bt and Bt&E horizons have value of 4 or 5 and chroma of 3 or 4. They are sand, fine sand, or loamy fine sand. The thickness of the Bt bands increases with increasing depth. These bands have hue of 5YR, 7.5YR, or 10YR and chroma of 3 or 4. They are fine sand, loamy fine sand, loamy sand, sandy loam, or fine sandy loam. They range from medium acid to neutral. The C horizon has value of 5 or 6 and chroma of 3 or 4. It is slightly acid to mildly alkaline sand or loamy sand.

Bonnie Series

The Bonnie series consists of deep, poorly drained, moderately slowly permeable soils on bottom land. These soils formed in silty alluvial sediments. Slopes range from 0 to 2 percent.

Bonnie soils are similar to Birds soils and commonly are adjacent to Belknap, Peoga, and Steff soils. Birds soils are less acid than the Bonnie soils. Belknap soils have subhorizons that are browner than those of the Bonnie soils. They are on swells on flood plains. Peoga soils have more clay than the Bonnie soils and have a B horizon. They are on terraces. Steff soils have a brownish subsoil. They are on swells next to stream channels.

Typical pedon of Bonnie silt loam, frequently flooded, in a cultivated field; 2,500 feet west and 1,750 feet north of the southeast corner of sec. 2, T. 3 S., R. 8 W.

Ap—0 to 9 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry; weak medium granular structure; friable; common fine roots; few pebbles; strongly acid; abrupt smooth boundary.

Cg1—9 to 23 inches; gray (10YR 5/1) silt loam; common medium prominent yellowish brown (10YR 5/6) and few fine prominent strong brown (7.5YR 5/6) mottles; weak coarse subangular blocky structure; friable; few fine roots; few pebbles; strongly acid; clear smooth boundary.

Cg2—23 to 48 inches; gray (10YR 6/1) silt loam; common medium distinct yellowish brown (10YR 5/4) mottles; friable; massive; few black (10YR 2/1) iron and manganese oxide accumulations; strongly acid; gradual smooth boundary.

Cg3—48 to 60 inches; gray (10YR 6/1) silt loam that has thin strata of silty clay loam; common medium prominent yellowish brown (10YR 5/8) mottles; massive; friable; strongly acid.

The Ap horizon has value of 4 to 6 and chroma of 1 or 2. The Cg horizon has value of 5 to 7 and chroma of 1 or 2. It is typically silt loam to a depth of 40 inches, but it commonly has strata of silty clay loam. It is strongly acid or very strongly acid.

Chetwynd Series

The Chetwynd series consists of deep, well drained, moderately permeable soils on uplands. These soils formed in a thin layer of loess and in the underlying glacial outwash. Slopes range from 25 to 50 percent.

Chetwynd soils commonly are adjacent to Alford, Hickory, Pike, and Sylvan soils. Alford soils formed in more than 60 inches of loess and contain less sand in the solum than the Chetwynd soils. They are in the less sloping areas. Hickory soils are yellower than the Chetwynd soils and contain less sand throughout. They are on side slopes. Pike soils have a loess cap that is thicker than that of the Chetwynd soils. They are in the higher, less sloping landscape positions. Sylvan soils formed in more than 60 inches of loess and have a solum that is thinner than that of the Chetwynd soils. Also, they are less acid. They are in the less sloping areas at the base of side slopes below the Chetwynd soils.

Typical pedon of Chetwynd silt loam, 25 to 50 percent slopes, in a wooded area; 200 feet south and 450 feet west of the northeast corner of sec. 33, T. 1 S., R. 8 W.

A—0 to 3 inches; dark brown (10YR 3/3) silt loam, gray (10YR 5/1) dry; weak fine granular structure; friable; many fine roots; few pebbles; strongly acid; abrupt wavy boundary.

E—3 to 7 inches; yellowish brown (10YR 5/4) silt loam, pale brown (10YR 6/3) dry; weak medium platy structure parting to moderate medium granular; friable; many fine roots; few pebbles; very strongly acid; abrupt wavy boundary.

Bt1—7 to 16 inches; yellowish red (5YR 4/6) sandy clay loam; moderate medium subangular blocky structure; firm; common fine roots; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds; about 4 percent coarse fragments; very strongly acid; clear smooth boundary.

Bt2—16 to 26 inches; yellowish red (5YR 4/6) sandy clay loam; moderate medium subangular blocky structure; firm; common fine roots; thin continuous reddish brown (5YR 4/4) clay films on faces of peds; about 2 percent coarse fragments; strongly acid; clear wavy boundary.

Bt3—26 to 39 inches; yellowish red (5YR 4/6) sandy loam; moderate coarse subangular blocky structure; firm; few fine roots; thin continuous dark reddish brown (5YR 3/4) clay films on faces of peds; about 2 percent coarse fragments; strongly acid; clear wavy boundary.

Bt4—39 to 52 inches; yellowish red (5YR 5/6) loamy sand; weak coarse subangular blocky structure; very friable; few fine roots; thin discontinuous reddish brown (5YR 4/4) clay films on faces of peds; strongly acid; gradual wavy boundary.

C—52 to 60 inches; dark yellowish brown (10YR 4/4) sand that has bands of massive loamy sand; single grain; loose and very friable; strongly acid.

The solum is 50 to more than 80 inches thick. The content of coarse fragments is 0 to 10 percent in the A and B horizons and 0 to 5 percent in the C horizon.

The A horizon has chroma of 2 or 3. It is loam or silt loam. The E horizon has value of 4 or 5 and chroma of 3 or 4. The Bt horizon has hue of 5YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is clay loam, sandy clay loam, or loam in the upper part and sandy loam or loamy sand in the lower part. The C horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is strongly acid or medium acid.

Dubois Series

The Dubois series consists of deep, somewhat poorly drained, very slowly permeable soils on glacial lake plains. These soils formed in loess and in the underlying glacial outwash and lacustrine deposits. Slopes range from 0 to 2 percent.

Dubois soils are similar to Bartle soils and commonly are adjacent to Haubstadt, Otwell, and Peoga soils. Bartle soils have less clay in the subsoil than the Dubois soils, have smaller prisms in the Btx horizon, and do not have a loess cap. Haubstadt and Otwell soils have a subsoil that is browner than that of the Dubois soils. They are on the more sloping ridges and side slopes and on rises. Peoga soils have a subsoil that is grayer than that of the Dubois soils and do not have a fragipan. They are near the center of broad lake plains.

Typical pedon of Dubois silt loam, 0 to 2 percent slopes, in a cultivated field; 1,320 feet north and 1,056 feet west of the southeast corner of sec. 1, T. 1 S., R. 7 W.

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

E—9 to 19 inches; light yellowish brown (10YR 6/4) silt loam; common fine faint light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; friable; few brown (10YR 4/3) iron oxide accumulations; common fine roots; very strongly acid; clear smooth boundary.

Btg—19 to 31 inches; light brownish gray (10YR 6/2) silty clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; common fine roots; thin discontinuous light brownish gray (10YR 6/2) clay films on faces of peds; thin discontinuous light gray (10YR 7/2) silt coatings on faces of peds; extremely acid; clear smooth boundary.

Btx1—31 to 40 inches; light brownish gray (10YR 6/2) silty clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; strong very coarse prismatic structure; very firm; thin discontinuous light brownish gray (10YR 6/2) clay films on faces of peds; thick light gray (10YR 7/2) silt coatings on the tops of prisms and thin silt coatings on the sides of prisms; many black (10YR 2/1) iron and manganese oxide accumulations; extremely acid; gradual smooth boundary.

2Btx2—40 to 55 inches; yellowish brown (10YR 5/4) silt loam that has strata of silty clay loam; many medium distinct light brownish gray (10YR 6/2) mottles; strong very coarse prismatic structure; very firm; thin light gray (10YR 7/2) silt coatings on vertical faces of prisms; many black (10YR 2/1) iron and manganese oxide accumulations; very strongly acid; clear smooth boundary.

2C—55 to 70 inches; yellowish brown (10YR 5/4) silt loam that has strata of silty clay loam; common fine distinct light brownish gray (10YR 6/2) mottles; massive; friable; slightly acid.

The solum ranges from 52 to more than 80 inches in thickness. The depth to the fragipan is 24 to 36 inches.

The Ap horizon has value of 4 or 5 and chroma of 2 or 3. The E and Bt horizons have value of 4 to 6 and chroma of 2 to 4. The Bt, Btx, and 2Btx horizons are silt loam or silty clay loam. They are strongly acid to extremely acid. The Btx, 2Btx, and BC horizons have value of 4 to 6 and chroma of 2 to 6. The 2C horizon is stratified silt loam, silty clay loam, clay loam, loam, or fine sandy loam. It ranges from slightly acid to very strongly acid.

Elkinsville Series

The Elkinsville series consists of deep, well drained, moderately permeable soils on terraces. These soils formed in old alluvium. Slopes range from 0 to 2 percent.

Elkinsville soils commonly are adjacent to Alvin, Henshaw, Peoga, Princeton, and Wakeland soils. Alvin soils have more sand and less silt and clay in the solum than the Elkinsville soils. They are on small rises. Henshaw soils have mottles in the upper part of the subsoil and are underlain by mildly alkaline or moderately alkaline material. They are in the slightly lower landscape positions. Peoga soils have a gray, mottled subsoil. They are in slightly concave areas. Princeton soils have more sand and less silt in the solum than the Elkinsville soils. They are on uplands and terraces. Wakeland soils are grayer than the Elkinsville soils and have less clay in their subhorizons. They are on flood plains.

Typical pedon of Elkinsville silt loam, 0 to 2 percent slopes, in a cultivated field; 400 feet east and 600 feet north of the southwest corner of sec. 21, T. 1 N., R. 8 W.

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

Bt1—10 to 15 inches; dark yellowish brown (10YR 4/4) silty clay loam; weak medium subangular blocky structure; friable; many fine roots; discontinuous dark grayish brown (10YR 4/2) silt coatings on faces of peds and in pores; slightly acid; clear smooth boundary.

Bt2—15 to 26 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium subangular blocky structure; firm; common fine roots; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; discontinuous dark grayish brown (10YR 4/2) silt coatings on faces of peds and in pores; very strongly acid; gradual smooth boundary.

2Bt3—26 to 47 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; firm; common fine roots; thin continuous dark brown (10YR 4/3) clay films on faces of peds; very strongly acid; gradual smooth boundary.

2BC—47 to 56 inches; brown (7.5YR 4/4) sandy loam; moderate coarse subangular blocky structure; firm; few fine roots; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; very strongly acid; gradual smooth boundary.

2C—56 to 60 inches; yellowish brown (10YR 5/4) fine sandy loam; few fine faint pale brown (10YR 6/3) mottles; massive; friable; very strongly acid.

The solum is 48 to 65 inches thick. The Ap horizon has value of 4 and chroma of 3 or 4. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is silt loam or silty clay loam. The 2Bt horizon has colors similar to those of the Bt horizon. It is silty clay loam to sandy loam. The 2C horizon has chroma of 3 or 4. It is silty clay loam, silt loam, fine sandy loam, or sandy loam. It is strongly acid or very strongly acid.

Fairpoint Series

The Fairpoint series consists of deep, well drained, moderately slowly permeable soils on uplands. These soils formed in regolith in surface-mined areas. Slopes range from 1 to 70 percent.

Fairpoint soils are similar to Bethesda soils and are adjacent to Belknap, Bethesda, Bonnie, Gilpin, Hosmer, and Zanesville soils. Bethesda soils are more acid than the Fairpoint soils. Belknap and Bonnie soils have a subsoil that is grayer than that of the Fairpoint soils. They are on flood plains. Gilpin, Hosmer, and Zanesville soils have a well developed subsoil. They are on uplands.

Typical pedon of Fairpoint very shaly silt loam, in a wooded area of Fairpoint-Bethesda complex, 25 to 70 percent slopes; 1,600 feet east and 1,400 feet north of the southwest corner of sec. 17, T. 2 S., R. 7 W.

A—0 to 3 inches; very dark grayish brown (10YR 3/2) very shaly silt loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; many fine and common medium roots; about 55 percent coarse fragments; slightly acid; clear wavy boundary.

C1—3 to 20 inches; mottled dark grayish brown (10YR 4/2), yellowish brown (10YR 5/8), and dark yellowish brown (10YR 4/4) very shaly silty clay loam; massive; friable; common fine and medium roots; about 43 percent coarse fragments; neutral; gradual wavy boundary.

C2—20 to 33 inches; mottled dark grayish brown (10YR 4/2), yellowish brown (10YR 5/8), and dark yellowish brown (10YR 4/4) very shaly silt loam; massive; friable; few medium roots; about 36 percent coarse fragments; neutral; gradual wavy boundary.

C3—33 to 60 inches; mottled dark grayish brown (10YR 4/2), yellowish brown (10YR 5/8), and dark yellowish brown (10YR 4/4) very shaly silt loam; massive; friable; about 40 percent coarse fragments; medium acid.

The depth to bedrock is more than 5 feet. Reaction is medium acid to neutral throughout the profile. The content of coarse fragments ranges from 0 to 60 percent in the A horizon and from 35 to 80 percent in the C horizon. The coarse fragments commonly range from 2 millimeters to 5 inches in diameter.

The A horizon has hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 1 to 6. It is silt loam, loam, silty clay loam, or the shaly or very shaly analogs of these textures. The C horizon has hue of 7.5YR to 5Y, value of 3 to 6, and chroma of 1 to 8. It is the shaly, very shaly, channery, or very channery analogs of silt loam, loam, clay loam, or silty clay loam.

Fairpoint silt loam, reclaimed, 1 to 15 percent slopes, has a thicker layer of soil material over the regolith than is definitive for the series. This difference, however, does not alter the usefulness or behavior of the soil.

Gilpin Series

The Gilpin series consists of moderately deep, well drained, moderately permeable soils in the uplands. These soils formed in material weathered from sandstone, siltstone, and shale. Slopes range from 15 to 50 percent.

Gilpin soils are similar to Berks soils and commonly are adjacent to Berks, Wellston, and Zanesville soils. Berks soils have less clay and a higher content of coarse fragments in the subsoil than the Gilpin soils. Wellston and Zanesville soils are on the higher, less sloping ridges and side slopes. They have a solum that is thicker than that of the Gilpin soils. Also, Wellston soils are more silty, and Zanesville soils have a fragipan.

Typical pedon on Gilpin silt loam, 15 to 30 percent slopes, in a wooded area; 500 feet east and 550 feet north of the southwest corner of sec. 13, T. 1 S., R. 8 W.

A—0 to 1 inch; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; strongly acid; clear smooth boundary.

E—1 to 6 inches; dark brown (10YR 4/3) silt loam, brown (10YR 5/3) dry; weak medium granular structure; friable; very strongly acid; clear smooth boundary.

BE—6 to 10 inches; yellowish brown (10YR 5/4) loam; weak medium subangular blocky structure; friable; thin patchy dark brown (7.5YR 4/4) clay films on faces of peds; strongly acid; gradual wavy boundary.

Bt1—10 to 20 inches; yellowish brown (10YR 5/4) channery clay loam; moderate medium subangular blocky structure; firm; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds; about 20 percent sandstone fragments; very strongly acid; gradual wavy boundary.

Bt2—20 to 30 inches; yellowish brown (10YR 5/4) channery clay loam; moderate coarse subangular blocky structure; firm; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds; about 25 percent sandstone fragments; strongly acid; clear smooth boundary.

BC—30 to 35 inches; yellowish brown (10YR 5/4) very channery loam; weak coarse subangular blocky structure; friable; yellowish brown (10YR 5/6) coatings on faces of peds; about 40 percent sandstone fragments; strongly acid; clear smooth boundary.

R—35 inches; yellowish brown (10YR 5/4), interbedded, fractured sandstone.

The solum is 20 to 36 inches thick. Rippable bedrock is at a depth of 20 to 40 inches.

The A horizon has value of 3 to 5 and chroma of 2 or 3. It is silt loam or loam. The Ap horizon, if it occurs, has hue of 10YR, value of 4 or 5, and chroma of 4. The Bt horizon has hue of 10YR or 7.5YR and chroma of 4 to 8. It is silt loam, clay loam, loam, silty clay loam, or the channery or shaly analogs of these textures. The content of coarse fragments in this horizon ranges from 5 to 40 percent. The C horizon, if it occurs, has hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 2 to 6. It is the shaly, very shaly, channery, or very channery analogs of silt loam, loam, silty clay loam, or clay loam.

Haubstadt Series

The Haubstadt series consists of deep, moderately well drained, slowly permeable soils on glacial lake plains. These soils formed in loess and in the underlying glacial deposits. Slopes range from 1 to 6 percent.

Haubstadt soils are similar to Pekin soils and commonly are adjacent to Dubois, Hosmer, and Otwell soils. Pekin soils have a solum that is thinner than that of the Haubstadt soils. Dubois soils have a subsoil that is grayer than that of the Haubstadt soils. They are on broad flats and at the head of drainageways. Hosmer soils formed in a layer of loess that is thicker than that of the Haubstadt soils. Also, they are deeper to the gray mottles. They are in the higher landscape positions. Otwell soils do not have gray mottles in the upper part of the subsoil. They are on the narrower ridges and steeper side slopes.

Typical pedon of Haubstadt silt loam, 1 to 6 percent slopes, in a cultivated field; 1,950 feet south and 1,900 feet west of the northeast corner of sec. 19, T. 1 S., R. 6 W.

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam, very pale brown (10YR 7/3) dry; weak fine and medium granular structure; friable; common fine roots; slightly acid; abrupt smooth boundary.

Bt1—8 to 12 inches; yellowish brown (10YR 5/6) silt loam; common fine distinct pale brown (10YR 6/3) mottles; weak medium subangular blocky structure; friable; few fine roots; thin patchy yellowish brown (10YR 5/4) clay films on faces of peds; medium acid; clear smooth boundary.

Bt2—12 to 27 inches; yellowish brown (10YR 5/6) silt loam; common fine prominent light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; firm; few fine roots; thin discontinuous yellowish brown (10YR 5/4) clay films on faces of peds; patchy pale brown (10YR 6/3) silt coatings on faces of peds; few strong brown (7.5YR 5/8) iron oxide accumulations; very strongly acid; clear wavy boundary.

Btx—27 to 40 inches; yellowish brown (10YR 5/6) silty clay loam; common fine prominent light brownish gray (10YR 6/2) mottles; moderate very coarse prismatic structure; very firm; brittle; thin patchy yellowish brown (10YR 5/4) clay films on faces of peds; continuous light brownish gray (10YR 6/2) and pale brown (10YR 6/3) silt coatings on faces of prisms; common strong brown (7.5YR 5/8) iron oxide accumulations; extremely acid; gradual wavy boundary.

2Bt1—40 to 55 inches; dark yellowish brown (10YR 4/6) silt loam that has thin strata of silty clay loam; common fine prominent light brownish gray (10YR 6/2) mottles; moderate coarse subangular blocky structure; firm; thin patchy yellowish brown (10YR 5/6) clay films on faces of peds; patchy pale brown (10YR 6/3) silt coatings on faces of peds; very strongly acid; clear wavy boundary.

2Bt2—55 to 80 inches; brownish yellow (10YR 6/6) silt loam that has strata of silty clay loam; few fine distinct light brownish gray (10YR 6/2) mottles; weak coarse subangular blocky structure; firm; thin patchy yellowish brown (10YR 5/6) clay films on faces of peds; patchy pale brown (10YR 6/3) silt coatings on faces of peds; few black (10YR 2/1) iron and manganese oxide accumulations; few pebbles; medium acid.

The Ap horizon ranges from neutral to very strongly acid. The Bt and Btx horizons are silty clay loam or silt loam. The Bt horizon has chroma of 4 to 6. It is medium acid to very strongly acid. The Btx horizon has chroma of 4 to 8. It is strongly acid to extremely acid. The 2Bt horizon has value of 4 to 6 and chroma of 3 to 8. It is stratified silt loam, silty clay loam, clay loam, or loam.

Haymond Series

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

Haymond soils are similar to Nolin soils and commonly are adjacent to Huntsville, Petrolia, and Stonelick soils. Nolin soils contain more clay in the solum than the Haymond soils. Huntsville soils have a surface layer that is thicker and darker than that of the Haymond soils. They are on the slightly higher flood plains. Petrolia soils have a gray, mottled subsoil. They are in depressions that formerly were stream channels. Stonelick soils contain more sand throughout than the Haymond soils. They are in the slightly higher landscape positions.

Typical pedon of Haymond silt loam, frequently flooded, in a cultivated field; 200 feet west and 850 feet south of the northeast corner of sec. 7, T. 1 N., R. 6 W.

Ap—0 to 10 inches; dark yellowish brown (10YR 4/4) silt loam, light yellowish brown (10YR 6/4) dry; weak medium granular structure; friable; few fine roots; neutral; abrupt smooth boundary.

Bw1—10 to 25 inches; yellowish brown (10YR 5/4) silt loam; weak medium and coarse subangular blocky structure; friable; few fine roots; patchy dark yellowish brown (10YR 4/4) coatings on faces of peds; slightly acid; gradual smooth boundary.

Bw2—25 to 36 inches; yellowish brown (10YR 5/4) silt loam; weak medium and coarse subangular blocky structure; friable; few fine roots; thin patchy dark yellowish brown (10YR 4/4) coatings on faces of peds; slightly acid; gradual smooth boundary.

Bw3—36 to 54 inches; yellowish brown (10YR 5/4) silt loam; weak coarse subangular blocky structure; friable; patchy yellowish brown (10YR 5/4) coatings on faces of peds; neutral; gradual smooth boundary.

C—54 to 60 inches; yellowish brown (10YR 5/4) silt loam; massive; friable; neutral.

The solum is 40 to 60 inches thick. The Ap horizon has chroma of 3 or 4. The Bw horizon has value of 4 or 5 and chroma of 3 or 4. The C horizon is fine sandy loam to silt loam. In some pedons it is stratified. It is slightly acid or neutral.

Henshaw Series

The Henshaw series consists of deep, somewhat poorly drained, moderately slowly permeable soils on lake plains and terraces. These soils formed in silty lacustrine sediments. Slopes range from 0 to 3 percent.

Henshaw soils are commonly adjacent to Elkinsville, Markland, McGary, and Princeton soils. Elkinsville soils do not have mottles in the upper part of the subsoil and are sandier and more acid in the substratum than the Henshaw soils. They are in the slightly higher landscape positions. Markland soils are on the steeper side slopes. Their subsoil is browner and has more clay than that of the Henshaw soils. McGary soils are on the broader, less sloping, lower terraces. Their subsoil is grayer and has more clay than that of the Henshaw soils. Princeton soils do not have mottles in the subsoil and are sandier throughout than the Henshaw soils. They are in the slightly higher landscape positions.

Typical pedon of Henshaw silt loam, 0 to 3 percent slopes, in a cultivated field; 1,200 feet southeast of the west corner of donation 10 and then 250 feet northeast of the southwest boundary, T. 1 N., R. 9 W.

Ap—0 to 9 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak medium granular structure; friable; few fine roots; medium acid; abrupt smooth boundary.

BA—9 to 15 inches; yellowish brown (10YR 5/4) silt loam; few fine faint pale brown (10YR 6/3) mottles; weak medium subangular blocky structure; friable; few fine roots; thin patchy brown (10YR 5/3) clay films on faces of peds; slightly acid; clear smooth boundary.

Bt1—15 to 23 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 light yellowish brown (10YR 6/4) and yellowish brown (10YR 5/4) clay films on faces of peds; slightly acid; clear smooth boundary.

Bt2—23 to 35 inches; yellowish brown (10YR 5/6) silty clay loam; few fine distinct pale brown (10YR 6/3) mottles; moderate coarse subangular blocky structure; firm; thin discontinuous yellowish brown (10YR 5/4) clay films on faces of peds; common very dark grayish brown (10YR 3/2) iron and manganese oxide accumulations; medium acid; gradual smooth boundary.

BC—35 to 48 inches; yellowish brown (10YR 5/4) silt loam; common fine distinct light brownish gray (10YR 6/2) and common medium distinct yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure; friable; thin patchy pale brown (10YR 6/3) and light yellowish brown (10YR 6/4) clay films on faces of peds; few very dark brown (10YR 2/2) iron and manganese oxide accumulations; strong effervescence; mildly alkaline; clear smooth boundary.

C—48 to 60 inches; yellowish brown (10YR 5/4) silt loam; common fine distinct light brownish gray (10YR 6/2) and yellowish brown (10YR 5/8) mottles; massive; firm; common light gray (10YR 7/1) calcium carbonate accumulations; strong effervescence; moderately alkaline.

The solum is 40 to 60 inches thick. The depth to carbonates is 30 to 50 inches.

The Ap horizon has chroma of 3 or 4. It is medium acid or slightly acid. The BA horizon has chroma of 4 to 6. It is strongly acid to neutral. The Bt horizon is similar in color and reaction to the BA horizon. It is silt loam or silty clay loam. The C horizon also is silt loam or silty clay loam. It has value and chroma of 4 to 6. It is mildly alkaline or moderately alkaline.

Hickory Series

The Hickory series consists of deep, well drained, moderately permeable soils on uplands. These soils formed in a thin layer of loess and in the underlying glacial drift. Slopes range from 18 to 50 percent.

These soils have more silt and less sand in the subsoil than is definitive for the Hickory series. This difference, however, does not alter the usefulness or behavior of the soils.

Hickory soils are similar to Pike soils and commonly are adjacent to Chetwynd, Otwell, and Sylvan soils. Pike soils have a loess cap that is thicker than that of the Hickory soils and are redder in the lower part of the subsoil. Chetwynd soils are redder and have more sand throughout than the Hickory soils. They are on side slopes. Otwell soils have a fragipan and have a loess cap that is thicker than that of the Hickory soils. They are on the higher ridges and less sloping side slopes. Sylvan soils formed in loess that is 5 or more feet thick. They are on side slopes.

Typical pedon of Hickory silt loam, 18 to 50 percent slopes, in a wooded area; 1,200 feet south and 1,000 feet west of the northeast corner of sec. 2, T. 1 S., R. 9 W.

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

E—2 to 7 inches; yellowish brown (10YR 5/4) silt loam, pale brown (10YR 6/3) dry; weak medium platy structure; friable; many fine roots; very strongly acid; clear wavy boundary.

Bt1—7 to 13 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium subangular blocky structure; friable; common fine roots; thin patchy brown (7.5YR 4/4) clay films on faces of peds; very strongly acid; clear smooth boundary.

Bt2—13 to 23 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium subangular blocky structure; firm; common fine roots; thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; few pebbles; very strongly acid; clear smooth boundary.

2Bt3—23 to 31 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; firm; common fine roots; thin continuous brown (7.5YR 4/4) clay films on faces of peds; few black (10YR 2/1) iron and manganese oxide accumulations; about 1 percent coarse fragments; very strongly acid; gradual smooth boundary.

2Bt4—31 to 42 inches; yellowish brown (10YR 5/6) clay loam; common medium distinct pale brown (10YR 6/3) and few medium distinct dark yellowish brown (10YR 4/4) mottles; moderate medium subangular blocky structure; firm; thin continuous brown (7.5YR 4/4) clay films on faces of peds; common black (10YR 2/1) iron and manganese oxide accumulations; about 1 percent coarse fragments; very strongly acid; gradual wavy boundary.

2Bt5—42 to 50 inches; dark yellowish brown (10YR 4/4) clay loam; many fine distinct light brownish gray (10YR 6/2) mottles; moderate coarse subangular blocky structure; firm; thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; many black (10YR 2/1) iron and manganese oxide accumulations; about 2 percent coarse fragments; strongly acid; clear wavy boundary.

2C—50 to 60 inches; yellowish brown (10YR 5/4) loam that has strata of sandy loam; many medium distinct strong brown (7.5YR 5/6) and few medium distinct light brownish gray (10YR 6/2) mottles; massive; friable; many black (10YR 2/1) iron and manganese oxide accumulations; about 1 percent coarse fragments; medium acid.

The solum is 48 to 72 inches thick. It is very strongly acid to medium acid. The loess is from 13 to 30 inches thick. The content of coarse fragments ranges from 0 to 15 percent in the solum and from 0 to 35 percent in the substratum.

The A horizon has value of 2 to 4 and chroma of 1 to 3. The E horizon has chroma of 3 or 4. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is silt loam or silty clay loam. The 2Bt horizon has colors similar to those of the Bt horizon. It is clay loam, loam, or silty clay loam. The BC horizon, if it occurs, has hue of 10YR, value of 4 or 5, and chroma of 4 to 8. It is clay loam or silty clay loam that has some thin layers of silt loam to silty clay. The C horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 2 to 6. It commonly is stratified sandy loam to clay loam and has minor layers of silt loam to silty clay. It ranges from medium acid to mildly alkaline.

Hosmer Series

The Hosmer series consists of deep, well drained soils on uplands. These soils have a fragipan. They are moderately permeable above the fragipan and very slowly permeable in the fragipan (fig. 12). They formed in loess that is more than 5 feet thick. Slopes range from 0 to 18 percent.

Hosmer soils are similar to Otwell and Zanesville soils and commonly are adjacent to Alford, Haubstadt, Iva, and Pekin soils. Otwell and Zanesville soils formed in a layer of loess that is thinner than that of the Hosmer soils. Otwell soils are stratified in the lower part of the solum. Zanesville soils are shallower over bedrock than the Hosmer soils. Alford soils do not have a fragipan. They generally are on the more narrow ridges and side slopes. Haubstadt soils have gray mottles in the upper part of the subsoil. They formed in a layer of loess that is thinner than that of the Hosmer soils. They are on the lower ridges. Iva soils are at the head of drainageways. They have a mottled subsoil and they do not have a fragipan. Pekin soils have gray mottles in the upper part of the subsoil and formed in a layer of loess that is

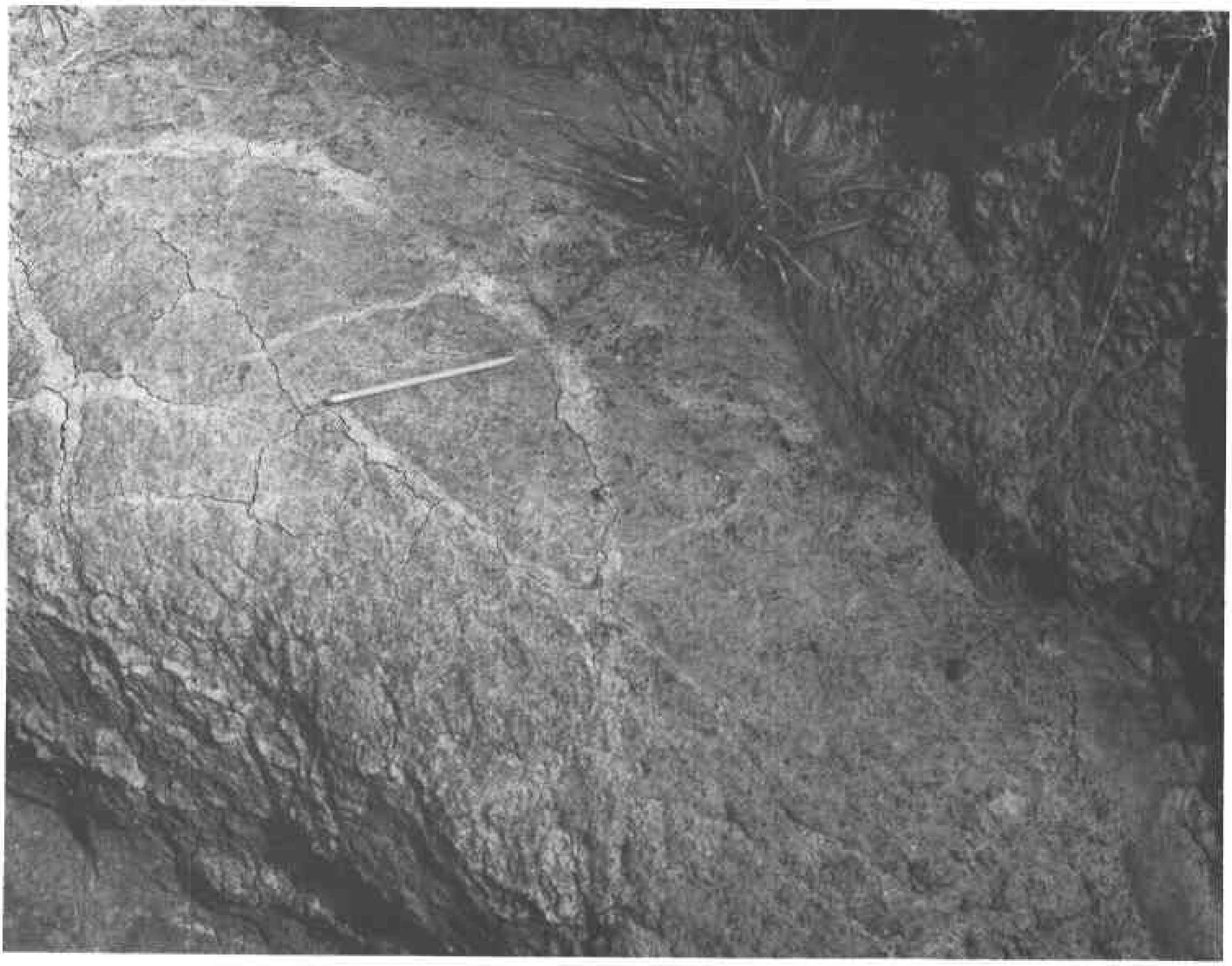


Figure 12.—A fragipan exposed in a gully in an area of Hosmer silt loam, 6 to 12 percent slopes, severely eroded. Silt coatings outline the shape of the prisms in the fragipan.

thinner than that of the Hosmer soils. They are on stream terraces.

Typical pedon of Hosmer silt loam, 2 to 6 percent slopes, eroded, in an idle field; 300 feet east and 650 feet south of the northwest corner of sec. 19, T. 2 S., R. 7 W.

Ap—0 to 8 inches; brown (10YR 5/3) silt loam, pale brown (10YR 6/3) dry; weak medium granular structure; friable; many fine roots; medium acid; abrupt smooth boundary.

Bt1—8 to 13 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium subangular blocky structure; firm; common fine roots; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; strongly acid; clear smooth boundary.

Bt2—13 to 29 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium and coarse subangular blocky structure; firm; common fine roots; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; strongly acid; clear wavy boundary.

B/E—29 to 31 inches; yellowish brown (10YR 5/6) silt loam (B); moderate coarse prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; thin to thick coatings and fillings of light brownish gray (10YR 6/2) material (E); thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; very strongly acid; abrupt wavy boundary.

Btx1—31 to 47 inches; strong brown (7.5YR 5/6) silt loam; moderate very coarse prismatic structure; very firm; brittle; thin continuous brown (7.5YR 4/4) clay films on faces of peds; thick light brownish gray (10YR 6/2) silt coatings on faces of prisms; very strongly acid; gradual wavy boundary.

Btx2—47 to 63 inches; yellowish brown (10YR 5/6) silt loam; moderate very coarse prismatic structure; very firm; brittle; thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; thick light brownish gray (10YR 6/2) silt coatings on faces of prisms; strongly acid; gradual irregular boundary.

BC—63 to 73 inches; yellowish brown (10YR 5/6) silt loam; weak coarse subangular blocky structure; friable; medium acid; clear smooth boundary.

C—73 to 80 inches; yellowish brown (10YR 5/4) silt loam; massive; friable; medium acid.

The solum is 50 to more than 80 inches thick. The depth to the fragipan is 20 to 36 inches.

The Ap horizon has value of 4 or 5 and chroma of 3 or 4. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is silt loam or silty clay loam. It is strongly acid or very strongly acid. The Btx horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 8. It is medium acid to very strongly acid. The C horizon has value of 4 or 5 and chroma of 3 to 6. It is medium acid to very strongly acid.

Huntsville Series

The Huntsville series consists of deep, well drained, moderately permeable soils on broad bottom land. These soils formed in silty alluvial sediments. Slopes range from 0 to 2 percent.

Huntsville soils are similar to Armiesburg soils and commonly are adjacent to Haymond and Vincennes Variant soils. Armiesburg soils have a surface layer that is thinner than that of the Huntsville soils and have less sand in the solum. Haymond soils do not have a dark surface layer. They are on the slightly lower flood plains. Vincennes Variant soils do not have a dark surface layer and have a gray, mottled subsoil. They are on the lower slack water terraces and on flood plains.

Typical pedon of Huntsville silt loam, rarely flooded, in a cultivated field; 2,650 feet south and 2,830 feet east of the northwest corner of sec. 7, T. 1 N., R. 8 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine granular structure; friable; many fine roots; medium acid; abrupt smooth boundary.

A1—8 to 15 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; many fine roots; slightly acid; clear smooth boundary.

A2—15 to 26 inches; very dark brown (10YR 2/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; many fine roots; neutral; clear smooth boundary.

A3—26 to 31 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; weak fine subangular blocky structure; friable; common fine roots; thin black (10YR 2/1) stains on faces of peds; neutral; gradual smooth boundary.

Bw—31 to 42 inches; dark yellowish brown (10YR 4/4) silt loam; weak coarse subangular blocky structure; few fine roots; friable; thin dark brown (10YR 4/3) coatings on faces of peds; neutral; gradual smooth boundary.

C1—42 to 53 inches; yellowish brown (10YR 5/4) silt loam; few fine faint pale brown (10YR 6/3) mottles; massive; friable; neutral; gradual smooth boundary.

C2—53 to 60 inches; yellowish brown (10YR 5/4) silt loam that has strata of fine sandy loam; common fine distinct light brownish gray (10YR 6/2) mottles; massive; friable; neutral.

The solum is 36 to 45 inches thick. The mollic epipedon is 24 to 36 inches thick.

The A horizon has value of 2 or 3 and chroma of 1 to 3. The Bw horizon has value of 3 to 5 and chroma of 3 or 4. The C horizon has value of 4 or 5.

Iona Series

The Iona series consists of deep, moderately well drained, moderately slowly permeable soils on uplands. These soils formed in calcareous loess. Slopes range from 0 to 2 percent.

Iona soils are similar to Muren soils and commonly are adjacent to Reesville and Sylvan soils. Muren soils are more acid in the solum than the Dubois soils and are not calcareous within a depth of 60 inches. Reesville soils have a subsoil that is grayer than that of the Iona soils. They are on broad flats. Sylvan soils do not have gray mottles in the lower part of the subsoil. They are in the more sloping areas.

Typical pedon of Iona silt loam, 0 to 2 percent slopes, in a cultivated field; 2,310 feet north and 50 feet east of the southwest corner of sec. 29, T. 1 N., R. 8 W.

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; weak medium granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

Bt1—10 to 22 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; firm; common fine roots; thin continuous brown (10YR 4/3) clay films on faces of peds; light brownish gray (10YR 6/2) silt coatings in voids and on faces of peds; strongly acid; clear wavy boundary.

Bt2—22 to 31 inches; yellowish brown (10YR 5/4) silty clay loam; common fine faint grayish brown (10YR 5/2) and common fine distinct yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; few fine roots; thin continuous brown (10YR 4/3) clay films on faces of peds; common black (10YR 2/1) iron and manganese oxide accumulations; medium acid; clear wavy boundary.

BC—31 to 46 inches; light yellowish brown (10YR 6/4) silt loam; common medium distinct grayish brown (10YR 5/2) and common medium prominent yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure; friable; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; common black (10YR 2/1) iron and manganese oxide accumulations; neutral; gradual wavy boundary.

C—46 to 60 inches; light yellowish brown (10YR 6/4) silt loam; common coarse faint light brownish gray (10YR 6/2) mottles; massive; friable; strong effervescence; moderately alkaline.

The thickness of the solum is 40 to 50 inches and coincides with the depth to carbonates. The Ap horizon has value of 4 or 5 and chroma of 2 to 4. Some pedons have an E horizon, which is 3 to 6 inches thick. The Bt horizon has value of 4 to 6 and chroma of 3 or 4. It is silt loam or silty clay loam and is strongly acid to slightly acid. The BC horizon is slightly acid to mildly alkaline.

Iva Series

The Iva series consists of deep, somewhat poorly drained, moderately permeable soils on uplands. These soils formed in windblown silty material. Slopes range from 0 to 2 percent.

Iva soils are similar to Reesville soils and commonly are adjacent to Alford, Hosmer, and Muren soils. Reesville soils are less acid than the Iva soils, have a thinner solum, and are calcareous in the lower part. Alford and Hosmer soils are in the higher or more sloping areas. Alford soils have a brown subsoil that is free of mottles. Hosmer soils have a fragipan. Muren soils have a subsoil that is browner than that of the Iva soils. They are in the higher areas.

Typical pedon of Iva silt loam, 0 to 2 percent slopes, in a cultivated field; 2,200 feet east and 2,500 feet south of the northwest corner of sec. 30, T. 1 N., R. 7 W.

Ap—0 to 11 inches; grayish brown (10YR 5/2) silt loam, light brownish gray (10YR 6/2) dry; few fine distinct yellowish brown (10YR 5/6) mottles; weak medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

E—11 to 18 inches; light brownish gray (10YR 6/2) silt loam; few fine prominent yellowish brown (10YR 5/6) mottles; weak medium granular structure; friable; many fine roots; neutral; clear smooth boundary.

Bt1—18 to 28 inches; light brownish gray (10YR 6/2) silty clay loam; many medium prominent yellowish brown (10YR 5/6) 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; thin light gray (10YR 7/2) silt coatings on faces of peds; very strongly acid; clear wavy boundary.

Bt2—28 to 42 inches; yellowish brown (10YR 5/6) silty clay loam; many medium prominent light brownish gray (10YR 6/2) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; thick continuous gray (10YR 5/1) clay films on faces of peds; very strongly acid; gradual wavy boundary.

BC—42 to 54 inches; yellowish brown (10YR 5/6) silt loam; many coarse prominent light brownish gray (10YR 6/2) mottles; weak coarse subangular blocky structure; friable; thin discontinuous gray (10YR 5/1) clay films on faces of peds; few light gray (10YR 7/2) silt coatings on vertical faces of peds; medium acid; clear wavy boundary.

C—54 to 60 inches; gray (10YR 6/1) silt loam; many medium prominent yellowish brown (10YR 5/8) mottles; massive; friable; medium acid.

The solum is 48 to 60 inches thick. The Ap horizon has value of 4 or 5. The E horizon has value of 5 or 6 and chroma of 2 or 3. The Bt and C horizons have value of 5 or 6 and chroma of 2 to 6. The Bt horizon is very strongly acid to medium acid.

Lindside Series

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

Lindside soils are similar to Steff soils and commonly are adjacent to Nolin and Stendal soils. Steff soils are more acid throughout than the Lindside soils. Nolin soils do not have gray mottles. They are in the slightly higher landscape positions. Stendal soils are shallower to gray mottles than the Lindside soils and are more acid. They are in the broader areas on the flood plains.

Typical pedon of Lindside silt loam, frequently flooded, in a cultivated field; 950 feet north and 900 feet east of the southwest corner of sec. 11, T. 1 N., R. 7 W.

Ap—0 to 9 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; common fine roots; mildly alkaline; abrupt smooth boundary.

Bw1—9 to 17 inches; dark brown (10YR 4/3) silt loam; weak medium subangular blocky structure; firm; few fine roots; mildly alkaline; clear smooth boundary.

Bw2—17 to 25 inches; dark brown (10YR 4/3) silty clay loam; common medium distinct grayish brown (10YR 5/2) and common fine distinct yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure; firm; few fine roots; few strong brown (7.5YR 4/6) iron oxide stains; mildly alkaline; clear smooth boundary.

Bw3—25 to 34 inches; brown (10YR 5/3) silty clay loam; common medium faint grayish brown (10YR 5/2) and common medium faint dark brown (10YR 4/3) mottles; weak medium subangular blocky structure; firm; few strong brown (7.5YR 4/6) iron oxide stains; neutral; clear smooth boundary.

Bw4—34 to 43 inches; brown (10YR 5/3) silty clay loam; many coarse faint grayish brown (10YR 5/2) and common medium faint dark brown (10YR 4/3) mottles; weak medium prismatic structure parting to weak coarse subangular blocky; friable; few strong brown (7.5YR 4/6) iron oxide stains; neutral; clear smooth boundary.

BC—43 to 49 inches; brown (10YR 5/3) silty clay loam; common medium distinct dark yellowish brown (10YR 4/4) and common fine faint grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; friable; few strong brown (7.5YR 4/6) iron oxide stains; neutral; gradual smooth boundary.

C—49 to 60 inches; brown (10YR 5/3) silty clay loam; common medium distinct dark yellowish brown (10YR 4/4) and common fine faint grayish brown (10YR 5/2) mottles; massive; friable; few strong brown (7.5YR 4/6) iron oxide stains; neutral.

The solum is 35 to 50 inches thick. It is slightly acid to mildly alkaline.

The Ap horizon has value of 3 or 4 and chroma of 2 or 3. It is silt loam or silty clay loam. The Bw horizon has value of 4 or 5 and chroma of 3 to 6. It is very fine sandy loam, silt loam, or silty clay loam. The C horizon has value of 4 to 6 and chroma of 1 to 4. It generally is silty clay loam or silt loam, but it has thin strata of loam or fine sandy loam in some pedons.

Markland Series

The Markland series consists of deep, well drained, slowly permeable soils on lake plains and terraces. These soils formed in silty and clayey, calcareous lacustrine sediments. Slopes range from 6 to 15 percent.

Markland soils commonly are adjacent to Henshaw and McGary soils. Henshaw soils have gray mottles in the upper part of the subsoil and have less clay in the subsoil than the Markland soils. They are on the higher, less sloping terraces. McGary soils have a subsoil that is grayer than that of the Markland soils. They are nearly level and are on the higher lying lacustrine terraces.

Typical pedon of Markland silty clay loam, 6 to 15 percent slopes, severely eroded, in a cultivated field; 1,300 feet northwest of the south corner of donation 10 and then 225 feet northeast of the southwest boundary, T. 1 N., R. 9 W.

Ap—0 to 6 inches; yellowish brown (10YR 5/4) silty clay loam, light yellowish brown (10YR 6/4) dry; weak fine granular structure; firm; common fine roots; neutral; abrupt smooth boundary.

Bt—6 to 16 inches; yellowish brown (10YR 5/4) silty clay; moderate medium subangular blocky structure; very firm; few fine roots; thin discontinuous brown (10YR 4/3) and dark yellowish brown (10YR 4/4) clay films on faces of peds; patchy pale brown (10YR 6/3) silt coatings on faces of peds; neutral; clear smooth boundary.

BC—16 to 31 inches; yellowish brown (10YR 5/4) silty clay; weak coarse subangular blocky structure; very firm; thin patchy light olive brown (2.5Y 5/4) clay films on faces of peds; discontinuous olive (5Y 5/3) silt coatings on faces of peds; many light gray (10YR 7/2) calcium carbonate accumulations; strong effervescence; moderately alkaline; clear smooth boundary.

C—31 to 60 inches; light olive brown (2.5Y 5/4) silty clay loam that has strata of silt loam and silty clay; common medium faint grayish brown (2.5Y 5/2) mottles; massive; firm; strong effervescence; moderately alkaline.

The solum is 20 to 35 inches thick. The depth to free carbonates is 15 to 20 inches.

The Ap horizon has value of 4 or 5. The Bt horizon has hue of 10YR or 7.5YR and chroma of 4 to 6. It is neutral or mildly alkaline. The BC horizon has colors similar to those of the Bt horizon. It is silty clay or silty clay loam. It is mildly alkaline or moderately alkaline. The C horizon has hue of 2.5Y or 10YR and value of 5 or 6.

McGary Series

The McGary series consists of deep, somewhat poorly drained, slowly permeable soils on lake plains and terraces. These soils formed in clayey and silty, calcareous lacustrine sediments. Slopes range from 0 to 2 percent.

McGary soils commonly are adjacent to Henshaw, Markland, Montgomery, and Reesville soils. Henshaw soils have a subsoil that is browner and less clayey than that of the McGary soils. They are on the more convex, slightly higher terraces. Markland soils have a subsoil that is browner than that of the McGary soils. They are on the more sloping side slopes. Montgomery soils have a dark surface layer and a gray, mottled subsoil. They are in depressions. Reesville soils have less clay throughout than the McGary soils. They are in the slightly higher landscape positions.

Typical pedon of McGary silty clay loam, 0 to 2 percent slopes, in a cultivated field; 1,950 feet north and 1,200 feet east of the southwest corner of sec. 17, T. 1 N., R. 7 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silty clay loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; firm; many fine roots; slightly acid; abrupt smooth boundary.

Bt—8 to 14 inches; olive brown (2.5Y 4/4) silty clay; few fine prominent gray (10YR 6/1) mottles; moderate medium angular blocky structure; firm; common fine roots; thin discontinuous dark grayish brown (10YR 4/2) clay films on faces of peds; slightly acid; clear smooth boundary.

Btg1—14 to 23 inches; grayish brown (2.5Y 5/2) silty clay; common medium faint light olive brown (2.5Y 5/4) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; firm; few fine roots; thin continuous gray (10YR 5/1) clay films on faces of peds; few fine black (10YR 2/1) iron and manganese oxide accumulations; neutral; clear smooth boundary.

Btg2—23 to 38 inches; grayish brown (10YR 5/2) silty clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure parting to moderate coarse angular blocky; firm; thin continuous gray (10YR 5/1) clay films on faces of peds; few medium black (10YR 2/1) iron and manganese oxide accumulations; slight effervescence; moderately alkaline; gradual smooth boundary.

C—38 to 60 inches; light brownish gray (10YR 6/2) silty clay that has strata of silty clay loam and silt loam; many fine prominent yellowish brown (10YR 5/6) mottles; massive; firm; thin discontinuous light gray (10YR 7/2) coatings in old root channels; slight effervescence; moderately alkaline.

The solum is 36 to 50 inches thick. The depth to carbonates is 20 to 40 inches.

The Ap horizon has value of 4 or 5 and chroma of 2 or 3. It is silty clay loam or silt loam. The Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 to 4. The C horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 to 3.

Montgomery Series

The Montgomery series consists of deep, very poorly drained, slowly permeable soils on terraces and lake plains. These soils formed in clayey and silty, calcareous lacustrine sediments. Slopes range from 0 to 2 percent.

Montgomery soils are similar to Beaucoup soils and commonly are adjacent to McGary soils. Beaucoup soils have less clay in the solum than the Montgomery soils. McGary soils do not have a dark surface layer and have a gray and brown, mottled subsoil. They are in the higher landscape positions.

Typical pedon of Montgomery silty clay, in a cultivated field; 925 feet east and 1,500 feet north of the southwest corner of sec. 17, T. 1 N., R. 7 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silty clay, gray (10YR 5/1) dry; moderate medium granular structure; firm; many fine roots; neutral; abrupt smooth boundary.

A—8 to 15 inches; very dark grayish brown (10YR 3/2) silty clay, dark gray (10YR 4/1) dry; moderate fine and medium angular blocky structure; firm; many fine roots; neutral; clear wavy boundary.

Bg1—15 to 22 inches; dark gray (10YR 4/1) silty clay; many medium distinct grayish brown (2.5Y 5/2) mottles; weak coarse prismatic structure parting to moderate medium angular blocky; firm; common fine roots; thin continuous dark gray (10YR 4/1) clay films on faces of peds; neutral; clear smooth boundary.

Bg2—22 to 34 inches; dark gray (10YR 4/1) silty clay; many medium distinct olive brown (2.5Y 4/4) mottles; weak coarse prismatic structure parting to moderate coarse angular blocky; firm; common fine roots; thin continuous gray (10YR 5/1) clay films on faces of peds; neutral; gradual smooth boundary.

BCg—34 to 50 inches; gray (5Y 6/1) silty clay; many medium prominent light olive brown (2.5Y 5/6) mottles; massive; firm; continuous dark gray (10YR 4/1) tubular tongues 1 to 2 inches in diameter and 6 to 12 inches apart; few black (10YR 2/1) iron and manganese oxide accumulations; mildly alkaline; gradual smooth boundary.

Cg—50 to 60 inches; gray (10YR 5/1) silty clay that has thin strata of silty clay loam and silt loam; many medium prominent yellowish brown (10YR 5/6) mottles; massive; firm; few black (10YR 2/1) iron and manganese oxide accumulations; strong effervescence; moderately alkaline.

The solum is 30 to 50 inches thick. The Ap horizon has value of 2 or 3 and chroma of 1 or 2. The Bg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 or 5, and chroma of 1 or 2. It is silty clay loam or silty clay. The Cg horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 or 6, and chroma of 1 or 2.

Muren Series

The Muren series consists of deep, moderately well drained, moderately permeable soils on uplands. These soils formed in windblown silty material. Slopes range from 0 to 2 percent.

These soils have lower base saturation than is definitive for the series. This difference, however, does not alter the usefulness or behavior of the soils.

Muren soils are similar to Iona soils and commonly are adjacent to Alford and Iva soils. Iona soils are less acid in the solum than the Muren soils and are calcareous within a depth of 50 inches. Alford soils do not have mottles within a depth of 30 inches. They are on the more sloping ridges and side slopes. Iva soils have a gray, mottled subsoil. They are on broad flats in the uplands.

Typical pedon of Muren silt loam, 0 to 2 percent slopes, in a cultivated field; 990 feet southwest of the north corner of donation 233 and then 665 feet southeast of the northwest boundary, T. 1 N., R. 9 W.

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam, very pale brown (10YR 7/3) dry; weak medium granular structure; friable; many fine roots; medium acid; abrupt smooth boundary.

BA—8 to 12 inches; yellowish brown (10YR 5/4) silt loam; weak fine subangular blocky structure; friable; common fine roots; medium acid; clear smooth boundary.

Bt1—12 to 21 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct yellowish brown (10YR 5/8) and common fine distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; firm; common fine roots; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; common black (10YR 2/1) iron and manganese oxide accumulations; very strongly acid; clear smooth boundary.

Bt2—21 to 30 inches; yellowish brown (10YR 5/6) silty clay loam; common fine distinct light brownish gray (10YR 6/2) and pale brown (10YR 6/3) mottles; moderate coarse subangular blocky structure; firm; few fine roots; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; common black (10YR 2/1) iron and manganese oxide accumulations; very strongly acid; clear smooth boundary.

BC—30 to 47 inches; yellowish brown (10YR 5/4) silt loam; many fine distinct light brownish gray (10YR 6/2) and few fine distinct yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure; friable; few black (10YR 2/1) iron and manganese oxide accumulations; strongly acid; clear smooth boundary.

C—47 to 60 inches; yellowish brown (10YR 5/6) silt loam; common medium prominent light brownish gray (10YR 6/2) mottles; massive; friable; few black (10YR 2/1) iron and manganese oxide accumulations; slightly acid.

The solum is 40 to 60 inches thick. The Ap horizon has value of 4 or 5. It is strongly acid to slightly acid. The BA horizon, if it occurs, has hue of 10YR, value of 4 or 5, and chroma of 4. The Bt horizon has value and chroma of 4 to 6. It is silt loam or silty clay loam. It is medium acid to very strongly acid. The C horizon has value of 5 or 6 and chroma of 4 to 6. It is medium acid or slightly acid.

Nolin Series

The Nolin series consists of deep, well drained, moderately permeable soils on broad bottom land. These soils formed in silty alluvial sediments. Slopes range from 0 to 2 percent.

Nolin soils are similar to Haymond soils and commonly are adjacent to Armiesburg, Lindside, Petrolia, Stonelick, and Wilhite soils. Haymond soils have less clay in the solum than the Nolin soils. Armiesburg soils have a dark surface layer. They are in the slightly higher landscape positions. Lindside soils are shallower to gray mottles than the Nolin soils. They are in the slightly lower landscape positions. Petrolia soils have a gray, mottled subsoil. They are in the lower old channels. Stonelick soils contain more sand throughout than the Nolin soils. They are in the slightly higher landscape positions. Wilhite soils have a gray, mottled subsoil and have more clay throughout than the Nolin soils. They are in the lower landscape positions.

Typical pedon of Nolin silty clay loam, frequently flooded, in a cultivated field; 660 feet north and 1,650 feet west of the southeast corner of sec. 15, T. 1 N., R. 8 W.

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

Bw1—10 to 21 inches; yellowish brown (10YR 5/4) silt loam; moderate medium subangular blocky structure; firm; many fine roots; very dark brown (10YR 4/3) coatings on faces of peds; neutral; clear smooth boundary.

Bw2—21 to 35 inches; dark yellowish brown (10YR 4/4) silt loam; moderate coarse subangular blocky structure; firm; few fine roots; few dark brown (10YR 4/3) coatings on faces of peds; neutral; clear smooth boundary.

BC—35 to 50 inches; yellowish brown (10YR 5/4) silt loam; weak coarse subangular blocky structure; friable; few fine roots; few dark brown (10YR 4/3) coatings on faces of peds; neutral; gradual smooth boundary.

C—50 to 60 inches; yellowish brown (10YR 5/4) silt loam that has thin strata of fine sandy loam; massive; friable; neutral.

The solum is 40 to 55 inches thick. The Ap and Bw horizons are silty clay loam or silt loam. The Ap horizon has chroma of 2 or 3. The Bw horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. It is slightly acid or neutral. The C horizon has value of 4 or 5 and chroma of 3 or 4. It is silt loam that has thin strata of silty clay loam, fine sandy loam, or loam.

Otwell Series

The Otwell series consists of deep, well drained, very slowly permeable soils on glacial lake plains. These soils formed in loess and in the underlying glacial outwash deposits. Slopes range from 2 to 18 percent.

Otwell soils are similar to Hosmer and Zanesville soils and are commonly adjacent to Dubois, Haubstadt, Hickory, and Pike soils. Hosmer soils formed in a layer of loess that is thicker than that of the Otwell soils and are not stratified in the lower part of the solum. Zanesville soils are shallower over bedrock than the Otwell soils. The lower part of their solum formed in material weathered from sandstone, siltstone, or shale. Dubois soils have a subsoil that is grayer than that of the Otwell soils. They are on the lower flats and at the head of drainageways. Haubstadt soils are shallower to gray mottles than the Otwell soils. They are on the broader ridgetops and the upper end of drainageways. Hickory soils do not have a fragipan and have a layer of loess that is thinner than that of the Otwell soils. They are on the steeper side slopes. Pike soils do not have a fragipan and are redder in the lower part than the Otwell soils. They are on the steeper side slopes.

Typical pedon of Otwell silt loam, 6 to 12 percent slopes, severely eroded, in a cultivated field; 325 feet north and 1,650 feet west of the southeast corner of sec. 28, T. 1 N., R. 7 W.

Ap—0 to 6 inches; yellowish brown (10YR 5/4) silt loam, pale brown (10YR 6/3) dry; weak medium granular structure; friable; many fine roots; strongly acid; abrupt smooth boundary.

Bt—6 to 11 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate coarse subangular blocky structure; firm; common fine roots; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds; very strongly acid; clear wavy boundary.

Btx1—11 to 32 inches; dark yellowish brown (10YR 4/4) silt loam; moderate coarse prismatic structure; very firm; brittle; few flattened roots between prism faces; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of subangular blocky peds; light brownish gray (10YR 6/2) silt coatings on the sides and tops of prisms; common black (10YR 2/1) iron and manganese oxide accumulations and stains; very strongly acid; clear smooth boundary.

2Btx2—32 to 46 inches; dark brown (7.5YR 4/4) silt loam; few fine distinct brown (10YR 5/3) mottles; moderate coarse prismatic structure; very firm; brittle; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of subangular blocky peds; few fine faint light brownish gray (10YR 6/2) silt coatings on faces of prisms; few black (10YR 2/1) iron and manganese oxide accumulations and stains; 20 to 30 percent sand; strongly acid; clear smooth boundary.

2BC—46 to 66 inches; yellowish brown (10YR 5/4) silt loam; few fine faint pale brown (10YR 6/3) mottles; moderate coarse subangular blocky structure; firm; 20 to 30 percent sand; medium acid; clear smooth boundary.

2C—66 to 70 inches; yellowish brown (10YR 5/4) silt loam that has strata of loam; few fine faint dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/6) mottles; massive; firm; few black (10YR 2/1) iron and manganese oxide accumulations and stains; slightly acid.

The solum is 50 to 80 inches thick. The depth to bedrock is more than 80 inches. The loess is 20 to 40 inches thick.

The Ap horizon has value 4 or 5 and chroma of 3 or 4. It is neutral to strongly acid. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is silt loam or silty clay loam. It is strongly acid or very strongly acid. The Btx horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 8. It is silt loam or loam. It is strongly acid or very strongly acid. The 2BC horizon has colors similar to those of the Btx horizon. It is silt loam, silty clay loam, loam, or clay loam. It is strongly acid to slightly acid. The 2C horizon has chroma of 4 to 8. It is stratified silt loam, loam, silty clay loam, sandy loam, or silty clay. It is medium acid to neutral.

Pekin Series

The Pekin series consists of deep, moderately well drained soils on low stream terraces. These soils have a fragipan. They are moderately permeable above the fragipan and very slowly permeable in the fragipan. They formed in a thin layer of loess and in the underlying acid alluvium. Slopes range from 2 to 6 percent.

Pekin soils are similar to Haubstadt soils and commonly are adjacent to Bartle, Belknap, Hosmer, and Steff soils. Haubstadt soils have a solum that is thicker than that of the Pekin soils. Bartle soils have a subsoil that is grayer than that of the Pekin soils. They are nearly level and are on stream terraces. Belknap soils do not have a fragipan and have subhorizons that are grayer than those of the Pekin soils. They are on flood plains. Hosmer soils do not have gray mottles in the upper part of the subsoil. They formed in a layer of loess that is thicker than that of the Pekin soils. They are on uplands. Steff soils do not have a fragipan. They are on flood plains.

Typical pedon of Pekin silt loam, 2 to 6 percent slopes, in a cultivated field; 425 feet west and 75 feet north of the center of sec. 22, T. 2 S., R. 8 W.

Ap—0 to 8 inches; dark yellowish brown (10YR 4/4) silt loam, very pale brown (10YR 7/3) dry; weak fine subangular blocky structure parting to weak medium granular; friable; few fine roots; slightly acid; abrupt smooth boundary.

Bt1—8 to 14 inches; yellowish brown (10YR 5/4) silt loam; few fine faint pale brown (10YR 6/3) mottles; weak fine and medium subangular blocky structure; friable; few fine roots; thin patchy dark yellowish brown (10YR 4/4) clay films on faces of peds; patchy light yellowish brown (10YR 6/4) silt coatings on faces of peds; very strongly acid; clear wavy boundary.

Bt2—14 to 22 inches; yellowish brown (10YR 5/4) silt loam; common fine distinct light brownish gray (10YR 6/2) mottles; moderate medium and coarse subangular blocky structure; firm; few fine roots; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; patchy light yellowish brown (10YR 6/4) silt coatings on faces of peds; few strong brown (7.5YR 5/8) iron oxide accumulations; very strongly acid; clear wavy boundary.

Bt3—22 to 29 inches; yellowish brown (10YR 5/4) silt loam; common fine distinct light brownish gray (10YR 6/2) mottles; moderate medium and coarse subangular blocky structure; firm; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; discontinuous light yellowish brown (10YR 6/4) silt coatings on faces of peds; common strong brown (7.5YR 5/8) and very dark brown (10YR 2/2) iron and manganese oxide accumulations; very strongly acid; clear wavy boundary.

Bx1—29 to 39 inches; yellowish brown (10YR 5/8) silt loam; common fine prominent light brownish gray (10YR 6/2) mottles; moderate very coarse prismatic structure; very firm; brittle; continuous pale brown (10YR 6/3) silt coatings on faces of prisms; common strong brown (7.5YR 5/8) and very dark brown (10YR 2/2) iron and manganese oxide accumulations; very strongly acid; gradual wavy boundary.

Bx2—39 to 56 inches; yellowish brown (10YR 5/8) silt loam; common fine prominent light brownish gray (10YR 6/2) mottles; moderate very coarse prismatic structure; very firm; brittle; continuous pale brown (10YR 6/3) silt coatings on faces of prisms; common strong brown (7.5YR 5/8) and very dark brown (10YR 2/2) iron and manganese oxide accumulations; very strongly acid; gradual wavy boundary.

C—56 to 60 inches; yellowish brown (10YR 5/4) silt loam that has strata of silty clay loam; common fine distinct light brownish gray (10YR 6/2) and pale brown (10YR 6/3) mottles; massive; firm; common very dark brown (10YR 2/2) iron and manganese oxide accumulations; very strongly acid.

The solum is 50 to 60 inches thick. The depth to the fragipan is 27 to 33 inches.

The Ap horizon has chroma of 3 or 4. It is medium acid to neutral. The Bt horizon has chroma of 4 to 6. It is silt loam or silty clay loam. It is strongly acid or very strongly acid. The Bx horizon has chroma of 4 to 8. The C horizon is stratified silt loam, silty clay loam, or loam. It is very strongly acid to neutral.

Peoga Series

The Peoga series consists of deep, poorly drained, slowly permeable soils on lake plains and low terraces. These soils formed in loess and stratified, acid silty material. Slopes range from 0 to 2 percent.

Peoga soils commonly are adjacent to Belknap, Bonnie, Dubois, and Elkinsville soils. Belknap and Bonnie soils are on flood plains. Belknap soils do not have a B horizon and have subhorizons that are browner than those of the Peoga soils. Bonnie soils do not have a B horizon and have less clay than the Peoga soils. Dubois soils have a subsoil that is browner than that of the Peoga soils and have a fragipan. They are nearly level and are on lake plains next to the more sloping ridges and side slopes. Elkinsville soils have a brown subsoil that is free of mottles. They are on the slightly higher terraces.

Typical pedon of Peoga silt loam, in a cultivated field; 750 feet west and 50 feet south of the center of sec. 10, T. 1 S., R. 7 W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, very pale brown (10YR 7/3) dry; weak medium subangular blocky structure parting to weak medium granular; friable; few fine roots; neutral; abrupt smooth boundary.

BE—9 to 18 inches; light brownish gray (10YR 6/2) silt loam; common medium prominent yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure; friable; few fine roots; thin patchy pale brown (10YR 6/3) clay films on faces of peds; strongly acid; clear wavy boundary.

Btg1—18 to 34 inches; light brownish gray (10YR 6/2) silt loam; common medium prominent yellowish brown (10YR 5/8) mottles; moderate coarse prismatic structure; firm; few fine roots; thin discontinuous pale brown (10YR 6/3) and grayish brown (10YR 5/2) clay films on faces of peds; very strongly acid; gradual wavy boundary.

Btg2—34 to 48 inches; light brownish gray (10YR 6/2) silty clay loam; common medium prominent strong brown (7.5YR 5/8) mottles; moderate coarse subangular blocky structure; firm; thin continuous pale brown (10YR 6/3) and grayish brown (10YR 5/2) clay films on faces of peds; very strongly acid; gradual wavy boundary.

Btg3—48 to 59 inches; gray (10YR 6/1) silt loam; common medium prominent strong brown (7.5YR 5/8) mottles; weak coarse subangular blocky structure; firm; thin discontinuous pale brown (10YR 6/3) and grayish brown (10YR 5/2) clay films on faces of peds; common black (10YR 2/1) iron and manganese oxide accumulations; strongly acid; gradual irregular boundary.

2BCg—59 to 70 inches; gray (10YR 6/1) silt loam that has strata of silty clay loam; common medium prominent strong brown (7.5YR 5/8) mottles; weak coarse subangular blocky structure; firm; thin patchy pale brown (10YR 6/3) and grayish brown (10YR 5/2) clay films on faces of peds; common black (10YR 2/1) iron and manganese oxide accumulations; medium acid; gradual irregular boundary.

2Cg—70 to 80 inches; light brownish gray (10YR 6/2) silt loam that has strata of silty clay loam; many medium prominent yellowish brown (10YR 5/8) mottles; massive; firm; slightly acid.

The solum is 54 to 72 inches thick. The Ap horizon has value of 4 or 5 and chroma of 1 or 2. It is medium acid to neutral. The BE horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 or 2. The Btg horizon has value of 5 or 6 and chroma of 1 or 2. The Cg horizon is stratified silt loam, silty clay loam, or clay loam. It is medium acid or slightly acid.

Petrolia Series

The Petrolia series consists of deep, poorly drained, moderately slowly permeable soils in sloughs on flood plains. These soils formed in moderately fine textured alluvium. Slopes range from 0 to 2 percent.

Petrolia soils are similar to Wilhite soils and commonly are adjacent to Armiesburg, Haymond, Nolin, and Stendal soils. Wilhite soils have more clay throughout than the Petrolia soils. Armiesburg soils have a surface layer that is thicker and darker than that of the Petrolia soils. They have a brown subsoil. They are in the higher areas. Haymond and Nolin soils also are in the higher areas. They have brown subhorizons. Also, Haymond soils have less clay throughout than the Petrolia soils. Stendal soils have a subsoil that is browner than that of the Petrolia soils. They are in the slightly higher lying landscape positions.

Typical pedon of Petrolia silty clay loam, frequently flooded, in a cultivated field; 1,475 feet north and 1,625 feet east of the center of sec. 20, T. 1 N., R. 8 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silty clay loam, light brownish gray (10YR 6/2) dry; few fine faint dark grayish brown (2.5Y 4/2) mottles; weak medium granular structure in the upper part and weak medium subangular blocky structure in the lower part; firm; few fine roots; mildly alkaline; abrupt smooth boundary.

Bg1—7 to 16 inches; gray (5Y 5/1) silty clay loam; common medium distinct dark grayish brown (2.5Y 4/2) and light olive brown (2.5Y 5/4) and common medium prominent dark brown (7.5YR 3/4) mottles; weak coarse and medium subangular blocky structure; firm; few fine roots; neutral; clear wavy boundary.

Bg2—16 to 27 inches; gray (N 5/0) silty clay loam; few medium distinct dark grayish brown (2.5Y 4/2) and many medium prominent dark brown (7.5YR 3/4) mottles; weak medium subangular blocky structure; firm; few fine roots; neutral; clear wavy boundary.

Cg1—27 to 39 inches; gray (N 6/0) silty clay loam; common medium prominent strong brown (7.5YR 5/6) mottles; massive; firm; neutral; clear wavy boundary.

Cg2—39 to 60 inches; gray (N 6/0) silty clay loam; common medium prominent yellowish brown (10YR 5/8) mottles; massive; firm; neutral.

The solum is 20 to 36 inches thick. The control section is silty clay loam in which the content of clay is 27 to 35 percent and the content of fine sand and coarser sand is less than 15 percent.

The Ap horizon has value of 4 or 5 and chroma of 1 or 2. The Bg horizon has hue of 10YR, 2.5Y, or 5Y or is neutral in hue. It has value of 5 or 6 and chroma of less than 2. It is slightly acid or neutral. The Cg horizon has hue of 10YR or 2.5Y or is neutral in hue. It has value of 5 or 6 and chroma of less than 2. It is neutral or mildly alkaline. The part of this horizon below a depth of 40 inches is dominantly silty clay loam, but it has strata of silt loam in some pedons.

Pike Series

The Pike series consists of deep, well drained, moderately permeable soils on loess-capped terraces and uplands. These soils formed in loess and glacial drift. Slopes range from 12 to 18 percent.

Pike soils are similar to Hickory soils and commonly are adjacent to Alford, Chetwynd, Otwell, and Wellston soils. Hickory soils have a loess cap that is thinner than that of the Pike soils. Also, the lower part of their subsoil is not so red. Alford soils formed in more than 60 inches of loess. They are less sloping than the Pike soils and generally are higher on the landscape. Chetwynd soils have a loess cap that is thinner than that of the Pike soils. Also, they have more sand in the subsoil. They are on the steeper side slopes. Otwell and Wellston soils are not so red in the lower part as the Pike soils. Also, Otwell soils are less acid, and Wellston soils are shallower over bedrock. Otwell soils have a fragipan.

They are on less sloping side slopes. Wellston soils are at the base of the side slopes.

Typical pedon of Pike silt loam, 12 to 18 percent slopes, severely eroded, in an idle field; 1,950 feet east and 450 feet south of the northwest corner of sec. 34, T. 1 S., R. 8 W.

Ap—0 to 6 inches; yellowish brown (10YR 5/4) silt loam, very pale brown (10YR 7/4) dry; weak medium subangular blocky structure parting to moderate fine granular; friable; many fine roots; strongly acid; abrupt smooth boundary.

Bt1—6 to 19 inches; brown (7.5YR 4/4) silty clay loam; moderate medium and fine subangular blocky structure; firm; common fine roots; thin discontinuous dark brown (7.5YR 3/4) clay films on faces of peds; medium acid; clear smooth boundary.

Bt2—19 to 28 inches; brown (7.5YR 5/4) silty clay loam; moderate medium subangular blocky structure; firm; few fine roots; thin discontinuous dark brown (7.5YR 3/4) clay films on faces of peds; medium acid; gradual smooth boundary.

Bt3—28 to 44 inches; brown (7.5YR 5/4) silt loam; weak coarse subangular blocky structure; friable; thin patchy dark brown (7.5YR 4/4) clay films on faces of peds; strongly acid; gradual smooth boundary.

2Btb1—44 to 50 inches; brown (7.5YR 4/4) silt loam; weak coarse subangular blocky structure; friable; thin patchy yellowish brown (10YR 5/4) clay films on faces of peds; a higher percentage of sand than in the horizons above; strongly acid; clear wavy boundary.

2Btb2—50 to 60 inches; brown (7.5YR 4/4) loam; weak coarse subangular blocky structure; friable; thin patchy yellowish brown (10YR 5/4) clay films on faces of peds; strongly acid; gradual wavy boundary.

2BCb—60 to 80 inches; reddish brown (5YR 4/4) sandy loam that has strata of sandy clay loam; weak coarse subangular blocky structure; friable; strongly acid.

The solum is more than 80 inches thick. The Ap horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is neutral to strongly acid. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is medium acid to very strongly acid. The 2Btb horizon has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 4 to 6. It is silt loam, silty clay loam, loam, or clay loam. It is strongly acid or very strongly acid. The 2BCb horizon is similar in color and reaction to the 2Btb horizon. It is sandy clay loam, sandy loam, or gravelly loam.

Princeton Series

The Princeton series consists of deep, well drained soils on uplands and terraces. These soils are moderately permeable in the upper part and moderately rapidly permeable in the lower part. They formed in thick deposits of eolian fine sand and silt. Slopes range from 0 to 2 percent.

These soils have lower base saturation than is definitive for the Princeton series. This difference, however, does not alter the usefulness or behavior of the soils.

Princeton soils commonly are adjacent to Alvin, Ayrshire, Bloomfield, Elkinsville, and Henshaw soils. Alvin and Bloomfield soils are on the more sloping dunes. Alvin soils contain more sand and less clay in the subsoil than the Princeton soils. Bloomfield soils have a banded argillic horizon. Ayrshire soils have a subsoil that is grayer than that of the Princeton soils. They are in the lower landscape positions. Elkinsville soils contain less sand and more silt throughout than the Princeton soils. Also, they are on terraces that generally are farther from the source of eolian material. Henshaw soils have a mottled subsoil and have more silt and clay throughout than the Princeton soils. They are in the slightly lower landscape positions.

Typical pedon of Princeton fine sandy loam, 0 to 2 percent slopes, in a cultivated field; 1,650 feet south and 60 feet east of the center of sec. 21, T. 1 N., R. 8 W.

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

BA—8 to 17 inches; brown (7.5YR 5/4) fine sandy loam; weak medium subangular blocky structure; very friable; few fine roots; medium acid; clear wavy boundary.

Bt1—17 to 26 inches; strong brown (7.5YR 5/6) loam; moderate medium subangular blocky structure; firm; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; medium acid; clear wavy boundary.

Bt2—26 to 35 inches; strong brown (7.5YR 5/6) sandy clay loam; moderate coarse and medium subangular blocky structure; firm; thin continuous strong brown (7.5YR 4/6) clay films on faces of peds; medium acid; clear wavy boundary.

Bt3—35 to 45 inches; strong brown (7.5YR 5/6) sandy clay loam; moderate medium subangular blocky structure; friable; thin discontinuous strong brown (7.5YR 4/6) clay films on faces of peds; strongly acid; clear wavy boundary.

BC—45 to 56 inches; strong brown (7.5YR 5/6) sandy loam; weak medium subangular blocky structure; very friable; thin discontinuous strong brown (7.5YR 4/6) clay films on faces of peds; strongly acid; gradual wavy boundary.

C—56 to 60 inches; strong brown (7.5YR 5/6) loamy sand that has bands of strong brown (7.5YR 4/6) loamy fine sand; massive; loose; strongly acid.

The solum is 50 to 70 inches thick. The Ap horizon has chroma of 3 or 4. It is fine sandy loam, sandy loam, or loam. The BA horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is fine sandy loam, sandy loam, or loam. The Bt, BC, and C horizons have hue of 10YR or 7.5YR and value and chroma of 4 to 6. The Bt horizon is sandy clay loam, sandy loam, or loam. The BC horizon is fine sandy loam, sandy loam, or loamy fine sand. The C horizon has bands of fine sand, loamy fine sand, or fine sandy loam.

Reesville Series

The Reesville series consists of deep, somewhat poorly drained, moderately slowly permeable soils on uplands and terraces. These soils formed in windblown silty material. Slopes range from 0 to 2 percent.

Reesville soils are similar to Iva soils and commonly are adjacent to Iona, McGary, and Sylvan soils. Iva soils have a subsoil that is more acid than that of the Reesville soils and are not calcareous within a depth of 60 inches. Iona and Sylvan soils do not have mottles in the upper part of the subsoil. They are on the more sloping ridges and side slopes. McGary soils have more clay throughout than the Reesville soils. They are on the slightly lower lake plains.

Typical pedon of Reesville silt loam, 0 to 2 percent slopes, in a cultivated field; 265 feet northeast of the south corner of donation 146 and then 925 feet northwest of the southeast boundary, T. 1 N., R. 9 W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, light gray (10YR 7/2) dry; weak medium granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

E—9 to 12 inches; grayish brown (10YR 5/2) silt loam; common fine faint brown (10YR 5/3) mottles; weak thick platy structure parting to weak fine subangular blocky; firm; few black (10YR 2/1) iron and manganese oxide accumulations; many fine roots; neutral; clear smooth boundary.

Bt1—12 to 21 inches; yellowish brown (10YR 5/4) silty clay loam; common fine distinct dark grayish brown (10YR 4/2) and common fine faint yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; common fine roots; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; neutral; gradual smooth boundary.

Bt2—21 to 32 inches; light olive brown (2.5Y 5/4) silty clay loam; few fine prominent yellowish brown (10YR 5/8) and few fine distinct light brownish gray (10YR 6/2) mottles; weak medium 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; neutral; clear smooth boundary.

Bt3—32 to 39 inches; light olive brown (2.5Y 5/4) silt loam; common fine prominent yellowish brown (10YR 5/8) and common fine distinct grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; friable; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; neutral; gradual smooth boundary.

C—39 to 60 inches; light olive brown (2.5Y 5/4) silt loam; many medium faint grayish brown (2.5Y 5/2) and few fine distinct yellowish brown (10YR 5/6) mottles; massive; friable; few black (10YR 2/1) iron and manganese oxide accumulations; strong effervescence; mildly alkaline.

The solum is 30 to 60 inches thick. The Ap horizon has value of 4 or 5. The E horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 4. The Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 or 4. It is mottled. On faces of peds, it has coatings with value of 4 or more and chroma of 2 or less. It is neutral to medium acid. The C horizon has matrix colors similar to those of the Bt horizon.

Steff Series

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

Steff soils are similar to Lindside soils and commonly are adjacent to Bartle, Belknap, Bonnie, and Pekin soils. Lindside soils are less acid than the Steff soils. Bartle soils have a subsoil that is grayer than that of the Steff soils. They are on stream terraces. Belknap soils have gray mottles directly below the Ap horizon. They are in the more nearly level and concave areas on the flood plains. Bonnie soils have gray, mottled subhorizons. They are in swales on the flood plains. Pekin soils have a fragipan. They are on stream terraces.

Typical pedon of Steff silt loam, rarely flooded, in a cultivated field; 2,350 feet north and 950 feet west of the southeast corner of sec. 26, T. 2 S., R. 7 W.

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam, very pale brown (10YR 7/3) dry; moderate medium granular structure; friable; common fine roots; about 3 percent sandstone fragments; medium acid; abrupt smooth boundary.

Bw1—8 to 14 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium subangular blocky structure; friable; few fine roots; about 2 percent sandstone fragments; slightly acid; clear smooth boundary.

Bw2—14 to 24 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct grayish brown (2.5Y 5/2) mottles; moderate medium subangular blocky structure; friable; few fine roots; few yellowish red

(5YR 5/8) concretions; about 2 percent sandstone fragments; strongly acid; clear smooth boundary.

Bw3—24 to 38 inches; yellowish brown (10YR 5/4) silt loam; many coarse distinct grayish brown (2.5Y 5/2) mottles; moderate medium subangular blocky structure; friable; few fine roots; few yellowish red (5YR 5/8) concretions; about 2 percent sandstone fragments; strongly acid; clear smooth boundary.

Cg1—38 to 50 inches; grayish brown (2.5Y 5/2) silt loam; many medium distinct dark yellowish brown (10YR 4/4) mottles; massive; friable; common yellowish red (5YR 5/8) concretions; about 7 percent sandstone fragments; strongly acid; clear smooth boundary.

Cg2—50 to 60 inches; grayish brown (2.5Y 5/2) channery silt loam; common medium distinct dark yellowish brown (10YR 4/4) mottles; massive; friable; common yellowish red (5YR 5/8) concretions; about 18 percent sandstone fragments; strongly acid.

The solum is 30 to 50 inches thick. Unless limed, the soils are strongly acid or very strongly acid throughout. If limed, the Ap horizon is neutral to medium acid. The content of coarse fragments ranges from 0 to 5 percent in the solum and from 0 to 35 percent in the substratum.

The Bw horizon has chroma of 4 to 6 and value of 2 to 4. The C horizon has hue of 10YR or 2.5Y, chroma of 4 to 6, and value of 2 to 4. It is silt loam, loam, or the channery analogs of these textures.

Stendal Series

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

Stendal soils commonly are adjacent to Armiesburg, Lindside, Petrolia, and Vincennes Variant soils. Armiesburg soils have a dark surface layer. They are in the higher areas on the flood plains. Lindside soils have no gray mottles in the upper part of the solum and are less acid than the Stendal soils. They are in the more sloping areas on the flood plains. Petrolia and Vincennes Variant soils have a subsoil that is grayer than that of the Stendal soils. Also, Vincennes Variant soils have more sand throughout. Petrolia soils are in the lower channels, and Vincennes Variant soils are in the slightly lower landscape positions.

Typical pedon of Stendal silt loam, frequently flooded, in a cultivated field; 10 feet north and 1,600 feet west of the southeast corner of sec. 17, T. 1 N., R. 6 W.

Ap—0 to 9 inches; dark brown (10YR 4/3) silt loam, very pale brown (10YR 7/3) dry; moderate medium granular structure; friable; many fine roots; medium acid; abrupt smooth boundary.

Bw—9 to 18 inches; pale brown (10YR 6/3) silty clay loam; many medium distinct grayish brown (10YR 5/2) and many medium prominent yellowish brown (10YR 5/8) mottles; weak medium subangular blocky structure; firm; common fine roots; strongly acid; clear smooth boundary.

Bg1—18 to 28 inches; grayish brown (10YR 5/2) silty clay loam; many medium distinct pale brown (10YR 6/3) and common medium prominent yellowish brown (10YR 5/8) mottles; weak medium subangular blocky structure; firm; few fine roots; very strongly acid; clear smooth boundary.

Bg2—28 to 37 inches; grayish brown (10YR 5/2) silty clay loam; common medium distinct pale brown (10YR 6/3) and common medium prominent yellowish brown (10YR 5/8) mottles; weak coarse subangular blocky structure; firm; very strongly acid; clear smooth boundary.

Cg1—37 to 45 inches; grayish brown (10YR 5/2) silty clay loam; common medium distinct pale brown (10YR 6/3) and common medium prominent yellowish brown (10YR 5/8) mottles; massive; firm; strongly acid; clear smooth boundary.

Cg2—45 to 60 inches; gray (10YR 5/1) silty clay loam; common medium distinct pale brown (10YR 6/3) and common medium prominent yellowish brown (10YR 5/8) mottles; massive; firm; strongly acid.

The solum is 20 to 40 inches thick. The Ap horizon has chroma of 2 or 3. It is silt loam or silty clay loam. It is strongly acid to slightly acid. The Bw horizon has hue of 10YR or 2.5Y and value of 4 to 6. The Bg and Cg horizons have hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. The Cg horizon is silty clay loam or silt loam.

Stonelick Series

The Stonelick series consists of deep, well drained, moderately rapidly permeable soils on flood plains. These soils formed in sandy and loamy alluvium. Slopes range from 0 to 2 percent.

These soils have less calcium carbonate than is definitive for the Stonelick series and are more acid. These differences, however, do not alter the usefulness or behavior of the soils.

Stonelick soils commonly are adjacent to Haymond and Nolin soils in the slightly lower areas, generally farther from the river. Haymond soils contain more silt and less sand throughout than the Stonelick soils. Nolin soils contain more clay and silt and less sand throughout than the Stonelick soils.

Typical pedon of Stonelick fine sandy loam, frequently flooded, in a hayfield; 1,450 feet west and 200 feet south of the northeast corner of sec. 21, T. 1 N., R. 8 W.

Ap—0 to 11 inches; dark brown (10YR 4/3) fine sandy loam, brown (10YR 5/3) dry; weak coarse subangular blocky structure parting to weak fine granular; very friable; common fine roots; medium acid; abrupt smooth boundary.

Bw1—11 to 23 inches; yellowish brown (10YR 5/4) loamy sand; weak coarse and medium subangular blocky structure; very friable; common fine roots; medium acid; clear smooth boundary.

Bw2—23 to 37 inches; yellowish brown (10YR 5/4) fine sandy loam; moderate coarse and medium subangular blocky structure; very friable; few fine and medium roots; slightly acid; gradual smooth boundary.

C—37 to 60 inches; yellowish brown (10YR 5/4) loamy fine sand that has strata of fine sandy loam and fine sand; massive; very friable; neutral.

The solum is 30 to 50 inches thick. It is medium acid to mildly alkaline.

The Ap horizon is loamy sand, fine sandy loam, sandy loam, or loamy fine sand. The Bw horizon has value of 4 or 5 and chroma of 3 or 4. It is fine sandy loam, loam, sandy loam, loamy fine sand, or loamy sand. The C horizon has colors similar to those of the Bw horizon. It is stratified fine sandy loam, loam, or loamy fine sand. It is neutral to moderately alkaline.

Sylvan Series

The Sylvan series consists of deep, well drained, moderately permeable soils on uplands and terraces. These soils formed in calcareous loess. Slopes range from 2 to 50 percent.

Sylvan soils are similar to Alford soils and commonly are adjacent to Bloomfield, Chetwynd, Hickory, Iona, and Reesville soils. Alford soils have a solum that is thicker than that of the Sylvan soils. They formed in leached loess. Bloomfield, Chetwynd, and Hickory soils are on side slopes. Bloomfield soils have more sand throughout than the Sylvan soils. Chetwynd and Hickory soils formed in loess and glacial drift. Iona soils have mottles in the lower part of the subsoil. They are on the higher ridges. Reesville soils are grayer than the Sylvan soils. They are on broad flats.

Typical pedon of Sylvan silt loam, 2 to 6 percent slopes, eroded, in a cultivated field; 50 feet west and 100 feet north of the southeast corner of sec. 30, T. 1 N., R. 8 W.

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

Bt1—8 to 17 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium subangular blocky structure; firm; common fine roots; thin continuous brown (7.5YR 4/4) clay films on faces of peds; medium acid; clear smooth boundary.

Bt2—17 to 30 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium and coarse subangular blocky structure; firm; common fine roots; thin continuous brown (7.5YR 4/4) clay films on faces of peds; medium acid; gradual wavy boundary.

BC—30 to 39 inches; yellowish brown (10YR 5/4) silt loam; weak coarse prismatic structure; friable; few fine roots; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; slightly acid; clear wavy boundary.

C—39 to 60 inches; light brownish gray (10YR 6/2) silt loam; many medium distinct brownish yellow (10YR 6/6) mottles; massive; friable; strong effervescence; moderately alkaline.

The solum is 30 to 40 inches thick. It is medium acid to neutral.

The Ap horizon has chroma of 2 or 3. The Bt horizon has value of 4 or 5 and chroma of 4 to 6. The C horizon has value of 5 or 6 and chroma of 2 to 4.

Vincennes Variant

The Vincennes Variant consists of deep, poorly drained, slowly permeable soils on slack water terraces and on flood plains. These soils formed in acid old alluvium. Slopes range from 0 to 2 percent.

Vincennes Variant soils commonly are adjacent to Armiesburg, Huntsville, Stendal, and Wilhite soils. Armiesburg soils have a dark surface layer and a brown subsoil. They are in the higher landscape positions. Huntsville soils have a surface layer that is thicker and darker than that of the Vincennes Variant soils and have a brown subsoil. They are in the higher landscape positions. Stendal soils have a subsoil that is browner than that of the Vincennes Variant soils and have less sand throughout. They are in the slightly higher landscape positions. Wilhite soils have more clay throughout than the Vincennes Variant soils. They are in the slightly lower landscape positions.

Typical pedon of Vincennes Variant clay loam, occasionally flooded, in a cultivated field; 2,310 feet east and 360 feet north of the southwest corner of sec. 17, T. 1 N., R. 8 W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) clay loam, light brownish gray (10YR 6/2) dry; weak medium granular structure; friable; many fine roots; medium acid; abrupt smooth boundary.

Bg1—9 to 19 inches; dark gray (10YR 4/1) clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; few thin dark gray (10YR 4/1) organic coatings in root channels; common fine roots; few fine black (10YR 2/1) iron and manganese oxide accumulations; strongly acid; clear smooth boundary.

Bg2—19 to 30 inches; gray (10YR 5/1) clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few fine black (10YR 2/1) iron and manganese oxide accumulations; fine roots; strongly acid; gradual smooth boundary.

Bg3—30 to 41 inches; gray (10YR 5/1) clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; firm; common fine black (10YR 2/1) iron and manganese oxide accumulations; medium acid; clear wavy boundary.

BCg—41 to 51 inches; gray (10YR 5/1) clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; weak very coarse subangular blocky structure; firm; many fine black (10YR 2/1) iron and manganese oxide accumulations; medium acid; gradual smooth boundary.

Cg—51 to 60 inches; gray (10YR 5/1) and yellowish brown (10YR 5/8) sandy loam that has thin strata of clay loam; massive; firm; medium acid.

The solum is 42 to 60 inches thick. The Ap horizon has value of 4 or 5 and chroma of 1 or 2. It is clay loam or loam. The Bg horizon has value of 4 to 6 and chroma of 1 or 2. It is clay loam or sandy clay loam. The C horizon has hue of 10YR to 5Y, value of 5 or 6, and chroma of 1 to 4. It is stratified clay loam to fine sand. It is medium acid to neutral.

Wakeland Series

The Wakeland series consists of deep, somewhat poorly drained, moderately permeable soils on bottom land. These soils formed in silty alluvial sediments. Slopes range from 0 to 2 percent.

Wakeland soils are similar to Belknap soils and commonly are adjacent to Beaucoup, Birds, and Elkinsville soils. Belknap soils are more acid than Wakeland soils. Beaucoup soils have a surface layer that is darker than that of the Belknap soils and a subsoil that is grayer. Also, they have more clay throughout. They are in the slightly lower landscape positions. Birds soils are grayer than the Wakeland soils and have more clay in their subhorizons. They are in the lower landscape positions. Elkinsville soils have a brown subsoil that has more clay than that of the Wakeland soils. Also, they are more acid. They are on terraces.

Typical pedon of Wakeland silt loam, frequently flooded, in a cultivated field; 260 feet north and 2,150 feet west of the southeast corner of sec. 34, T. 1 N., R. 9 W.

Ap—0 to 8 inches; brown (10YR 5/3) silt loam, very pale brown (10YR 7/3) dry; common fine faint grayish brown (10YR 5/2) mottles; moderate medium granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

C—8 to 16 inches; brown (10YR 5/3) silt loam; common medium faint grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; friable; common fine roots; neutral; clear smooth boundary.

Cg1—16 to 25 inches; grayish brown (10YR 5/2) silt loam; common medium distinct yellowish brown (10YR 5/4) mottles; massive; friable; few fine roots; slightly acid; clear smooth boundary.

Cg2—25 to 40 inches; brown (10YR 5/3) silt loam; many coarse faint grayish brown (10YR 5/2) mottles; massive; friable; slightly acid; clear smooth boundary.

Cg3—40 to 46 inches; grayish brown (10YR 5/2) silt loam; common fine distinct yellowish brown (10YR 5/6) mottles; massive; friable; few pebbles; slightly acid; clear smooth boundary.

Cg4—46 to 60 inches; grayish brown (10YR 5/2) silt loam that has strata of loam; many medium distinct dark yellowish brown (10YR 4/4) mottles; massive; friable; few pebbles; slightly acid.

The control section is medium acid to neutral. It averages less than 18 percent clay and less than 15 percent fine sand or coarser sand.

The Ap horizon has value of 4 or 5 and chroma of 2 or 3. The part of the C horizon between depths of 10 and 30 inches has value of 4 to 6 and chroma of 1 to 3. The part between depths of 30 and 60 inches has value of 5 or 6 and chroma of 1 to 4. Strata of fine sand to loam are below a depth of 40 inches.

Wellston Series

The Wellston series consists of deep, well drained, moderately permeable soils on uplands. These soils formed in a thin layer of loess and in the underlying material weathered from sandstone, siltstone, or shale. Slopes range from 15 to 30 percent.

These soils have a lower base saturation than is definitive for the Wellston series. This difference, however, does not alter the usefulness or behavior of the soils.

Wellston soils commonly are adjacent to Berks, Gilpin, Hosmer, Pike, and Zanesville soils. Berks and Gilpin soils are moderately deep. They are on the lower, more sloping side slopes. The subsoil of Berks soils has a lower content of clay and silt and a higher content of sand and coarse fragments than that of the Wellston soils. Gilpin soils have a solum that is thinner than that of the Wellston soils and contain less silt and more sand in the subsoil. Hosmer and Zanesville soils have a fragipan. They are on the higher ridges and side slopes.

Pike soils are deeper over bedrock than the Wellston soils and are redder in the lower part of the subsoil. They are on the higher side slopes.

Typical pedon of Wellston silt loam, 15 to 30 percent slopes, in a wooded area; 2,485 feet south and 850 feet west of the northeast corner of sec. 10, T. 1 S., R. 8 W.

A—0 to 3 inches; very dark grayish brown (10YR 3/2) silt loam, light brownish gray (10YR 6/2) dry; weak medium granular structure; friable; many fine roots; very strongly acid; abrupt smooth boundary.

E—3 to 8 inches; brown (10YR 5/3) silt loam, very pale brown (10YR 7/3) dry; weak thick platy structure parting to weak medium subangular blocky; friable; many fine and medium roots; very strongly acid; clear smooth boundary.

BE—8 to 11 inches; brown (7.5YR 5/4) silt loam; weak fine subangular blocky structure; friable; common fine and medium roots; thin patchy dark brown (7.5YR 4/4) clay films on faces of peds; very strongly acid; clear smooth boundary.

Bt1—11 to 19 inches; strong brown (7.5YR 5/6) silt loam; moderate medium subangular blocky structure; firm; common medium roots; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; very strongly acid; clear smooth boundary.

Bt2—19 to 28 inches; strong brown (7.5YR 4/6) silt loam; moderate coarse subangular blocky structure; firm; common medium roots; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; very strongly acid; gradual smooth boundary.

2Bt3—28 to 39 inches; strong brown (7.5YR 5/6) loam; moderate coarse subangular blocky structure; firm; few medium and fine roots; thin discontinuous reddish brown (5YR 4/4) clay films on faces of peds; few sandstone fragments; very strongly acid; gradual smooth boundary.

2BC—39 to 49 inches; strong brown (7.5YR 5/6) fine sandy loam; weak coarse subangular blocky structure; friable; few fine roots; about 5 percent sandstone fragments; very strongly acid; clear smooth boundary.

2C—49 to 60 inches; yellowish brown (10YR 5/6) fine sandy loam; common medium distinct brown (10YR 5/3) mottles; massive; friable; about 5 percent sandstone fragments; very strongly acid; abrupt wavy boundary.

2R—60 inches; sandstone bedrock.

The solum is 32 to 50 inches thick. The depth to bedrock ranges from 40 to 72 inches. Unless limed, the soils are very strongly acid to medium acid throughout. The content of coarse fragments ranges from 0 to 5 percent in the A horizon, from 0 to 10 percent in the BE and Bt horizons, from 5 to 35 percent in the 2Bt and 2BC horizons, and from 5 to 80 percent in the 2C horizon.

The A horizon has value of 3 or 4. The E horizon has value of 4 to 6 and chroma of 3 or 4. The BE horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 8. It is silt loam or silty clay loam. The 2Bt horizon has colors similar to those of the Bt horizon. It is loam, channery silt loam, or channery silty clay loam. The 2BC horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is fine sandy loam, loam, channery silt loam, or channery silty clay loam. The 2C horizon has hue of 7.5YR, 10YR, or 2.5Y and chroma of 4 to 6. It is fine sandy loam, loam, silt loam, or the shaly, very shaly, channery, or very channery analogs of these textures.

Wilhite Series

The Wilhite series consists of deep, very poorly drained, very slowly permeable soils on flood plains and slack water terraces. These soils formed in alluvial sediments. Slopes range from 0 to 2 percent.

Wilhite soils are similar to Petrolia soils and commonly are adjacent to Armiesburg, Nolin, and Vincennes Variant soils. Petrolia soils have less clay throughout than the Wilhite soils. Armiesburg soils have a dark surface layer and brown subhorizons. They are in the higher landscape positions. Nolin soils have a brown subsoil and have less clay throughout than the Wilhite soils. They are in the higher landscape positions. Vincennes Variant soils are slightly higher on the landscape than the Wilhite soils. Also, their subsoil has less clay and more sand.

Typical pedon of Wilhite silty clay loam, frequently flooded, in a cultivated field; 1,380 feet south and 1,400 feet east of the northwest corner of sec. 19, T. 1 N., R. 8 W.

Ap—0 to 9 inches; dark gray (10YR 4/1) silty clay loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; firm; common fine roots; neutral; abrupt smooth boundary.

BA—9 to 17 inches; dark gray (10YR 4/1) silty clay loam; few fine faint brown (10YR 4/3) mottles; moderate medium subangular blocky structure; firm; common fine roots; medium acid; clear smooth boundary.

Bg1—17 to 26 inches; gray (10YR 5/1) silty clay; common medium distinct yellowish brown (10YR 5/4) mottles; weak medium prismatic structure parting to moderate coarse angular blocky; very firm; few fine roots; strongly acid; clear smooth boundary.

Bg2—26 to 38 inches; gray (10YR 5/1) silty clay; many medium distinct dark yellowish brown (10YR 4/4) mottles; weak medium prismatic structure parting to moderate coarse angular blocky; very firm; few fine roots; discontinuous dark gray (10YR 4/1) coatings on faces of peds; strongly acid; clear smooth boundary.

BCg—38 to 47 inches; dark gray (10YR 4/1) silty clay; many medium prominent yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; very firm; gray (N 5/0) coatings on faces of peds; strongly acid; gradual smooth boundary.

Cg—47 to 60 inches; mottled gray (10YR 6/1) and grayish brown (2.5Y 5/2) silty clay; massive; very firm; medium acid.

The solum is 30 to 50 inches thick. The Ap and Bg horizons are silty clay loam or silty clay. The Ap horizon has chroma of 1 or 2. The Bg horizon has value of 4 or 5 and chroma of 1 or less. The Cg horizon is silty clay or clay. It is slightly acid or medium acid.

Zanesville Series

The Zanesville series consists of deep, moderately well drained soils on ridges and side slopes in the uplands. These soils have a fragipan. They are moderately permeable above the fragipan and slowly permeable in the fragipan. They formed in 2 to 4 feet of loess and in the underlying material weathered from acid sandstone, siltstone, and shale. Slopes range from 2 to 18 percent.

Zanesville soils are similar to Hosmer and Otwell soils and commonly are adjacent to Berks, Gilpin, and Wellston soils. Hosmer soils formed in more than 5 feet of loess. Otwell soils are deeper over bedrock than the Zanesville soils. The lower part of their solum formed in stratified glacial deposits. Berks and Gilpin soils are shallower over bedrock than the Zanesville soils and have a higher content of coarse fragments in the subsoil. Berks, Gilpin, and Wellston soils do not have a fragipan. They are on the steeper side slopes.

Typical pedon of Zanesville silt loam, 6 to 12 percent slopes, severely eroded, in a cultivated field; 400 feet east and 1,580 feet north of the southwest corner of sec. 11, T. 1 S., R. 8 W.

Ap—0 to 7 inches; yellowish brown (10YR 5/4) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; many fine roots; strongly acid; abrupt smooth boundary.

Bt1—7 to 15 inches; strong brown (7.5YR 5/6) silt loam; moderate medium subangular blocky structure; firm; common fine roots; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; few pale brown (10YR 6/3) silt coatings; strongly acid; clear smooth boundary.

Bt2—15 to 21 inches; yellowish brown (10YR 5/6) silty clay loam; moderate coarse subangular blocky structure; firm; few fine roots; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds; few light yellowish brown (10YR 6/4) silt coatings; strongly acid; abrupt irregular boundary.

Btx—21 to 42 inches; yellowish brown (10YR 5/4) silt loam; strong very coarse prismatic structure; very firm; brittle; few flattened roots between prisms; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; light brownish gray (10YR 6/2) silt coatings on faces of prisms; few black (10YR 2/1) iron and manganese oxide accumulations; very strongly acid; gradual wavy boundary.

2Bx—42 to 50 inches; dark brown (7.5YR 4/4) and yellowish brown (10YR 5/4) silt loam; strong very coarse prismatic structure; very firm; brittle; strongly acid; gradual smooth boundary.

2C—50 to 65 inches; dark brown (7.5YR 4/4) and yellowish brown (10YR 5/4) silt loam; massive; friable; about 10 percent small sandstone fragments; strongly acid.

The solum is 35 to 70 inches thick. The loess cap is 24 to 48 inches thick. The depth to the fragipan is 20 to 32 inches. The depth to rippable bedrock ranges from 40 to 80 inches. Unless limed, the soils are very stongly acid or strongly acid throughout.

The Ap horizon has value of 4 or 5 and chroma of 2 to 4. The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. The Btx and 2Bx horizons have colors similar to those of the Bt horizon. The 2Bx horizon is silt loam or loam. The C horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. It is silty clay loam to fine sandy loam. The content of sandstone, siltstone, or shale fragments in this horizon is 5 to 35 percent.

Formation of the Soils

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

Factors of Soil Formation

Soil forms through processes that act on deposited or accumulated geologic material. The characteristics of the soil at any given point are determined by the physical and mineralogical composition of the parent material; the climate under which the soil material has accumulated and existed since accumulation; the plant and animal life on and in the soil; the relief, or lay of the land; and the length of time that the forces of soil formation have acted on the soil material.

Climate and plant and animal life, chiefly plants, are active factors of soil formation. They act on the parent material that has accumulated through the weathering of rocks and slowly change it into a natural body that has genetically related horizons. The effects of climate and plant and animal life are conditioned by relief. The parent material affects the kind of soil profile that forms and, in extreme cases, determines it almost entirely. Finally, time is needed for changing the parent material into a soil. Some time is always required for the differentiation of soil horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effects of any one factor unless conditions are specified for the other four.

Parent Material

Parent material is the unconsolidated mass in which a soil forms. It determines the limits of the chemical and mineralogical composition of the soil. The parent material in Pike County consists of alluvial, lacustrine, glacial, and windblown deposits; material weathered from sandstone, siltstone, shale, or limestone; and overburden from surface mining.

The oldest parent material in the county is bedrock residuum. This bedrock consists of sedimentary rocks of ancient ocean beds. These rocks have been exposed to the soil-forming processes for perhaps a million years (*3*). Gilpin, Berks, Wellston, and Zanesville soils formed mainly in material weathered from these rocks (fig. 13).

The bedrock in Pike County is of the Pennsylvanian Period, which ended more than 200 million years ago. This bedrock is mostly shale and sandstone and minor amounts of siltstone, coal, limestone, clayey chert, and sedimentary iron ore. Most of the commercial beds of coal in Indiana are in this bedrock (*6*).

Thousands of years ago, the Illinoian glacier covered roughly the northern third of Pike County. It cut down the hills, filled in the valleys, ground up the bedrock, and formed a moderately rolling till plain. Mainly because of this glacial action, the soils and relief in the northern third of the county differ from those in the southern part.

The ice sheet resulted in the blocking of the preglacial White River and its four tributaries flowing northwesterly from the present Patoka drainage basin. This blocking and disarrangement of streams and the consequent ponding of their waters resulted in the formation of the present lake plain in the Otwell and Cato areas through the deposition of silts, sands, and pebbles (*8*). Otwell, Haubstadt, Dubois, and Peoga soils formed in these lake deposits and in the windblown silts deposited in these areas after the glacial meltwater receded.

The present course of Patoka River is westerly because the former tributaries of the White River broke through divides and connected with the other branches of the preglacial Patoka River. One of these divides is on the eastern edge of Pike County, in an area where the river enters from Dubois County. In this area the Patoka River flows in a deeply entrenched valley about one-eighth of a mile wide, which broadens to a width of 1.25 miles where this stream is joined by Cup Creek (*8*).

As the ice sheet melted, the runoff deposited alluvium, which filled in many of the valleys. Subsequent glacial meltwater cut a channel into this valley fill. Later, this channel was partially filled with alluvium from the uplands. The areas of valley fill that remain are higher than the overflow bottoms that were formed by the upland runoff. Thus, many are referred to as second bottoms. Elkinsville, Pekin, and Bartle soils formed in Illinoian fluvial deposits.

Because Pike County was at the margin of the glacier, the material deposited by the ice sheet varies. Areas of loose glacial till and pockets of sand interfinger into glacial outwash and lacustrine deposits.

The Wisconsinan ice sheet was the most recent glacier to cover parts of Indiana. It did not reach Pike County, but the meltwater from this ice sheet flowed through the county. The gravel and sand generally were deposited upstream before the meltwater reached Pike

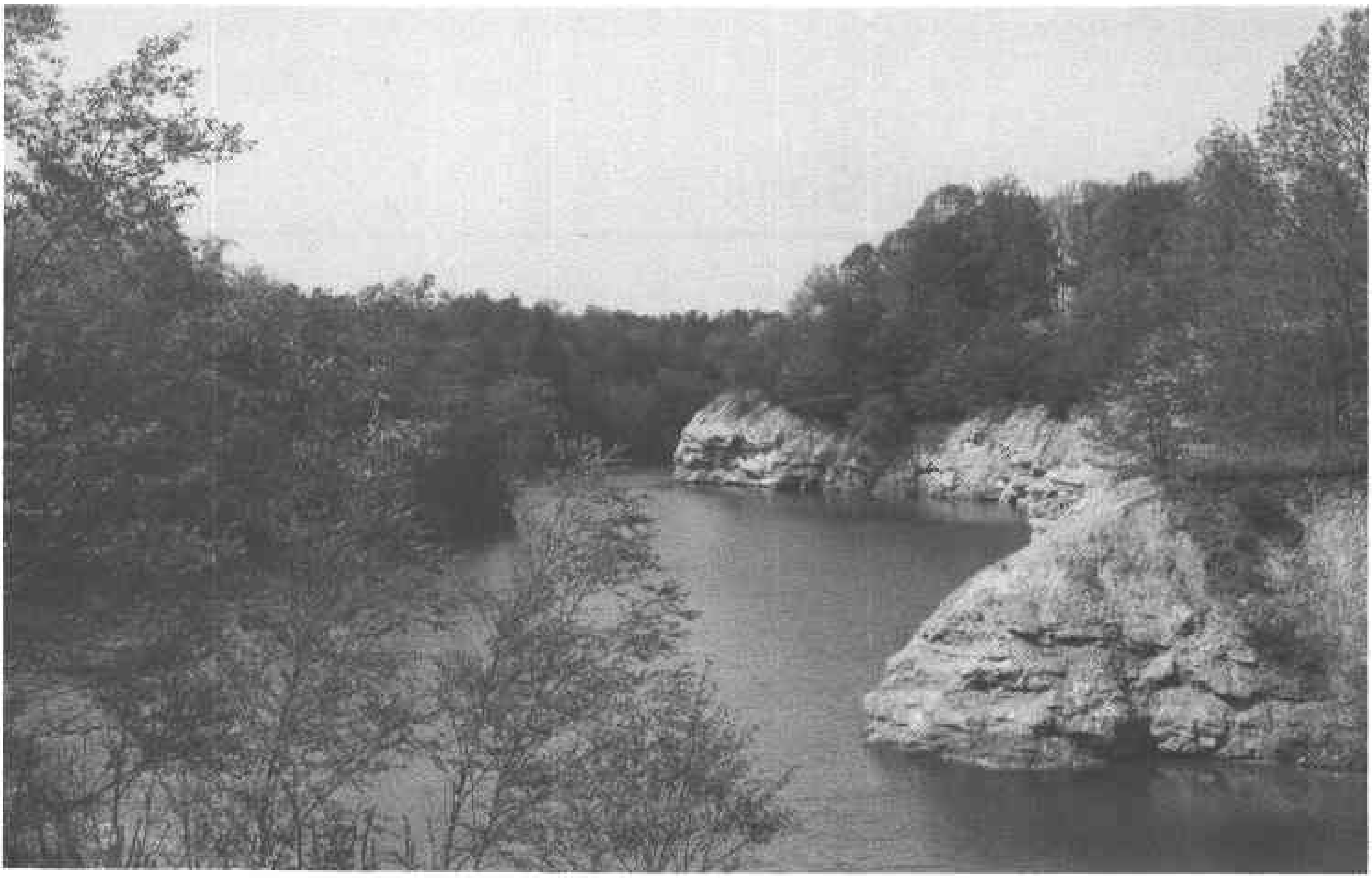


Figure 13.—The bedrock underlying Zanesville soils exposed on a highwall along a strip pit.

County. The finer sand, silt, and clay still remained in suspension, however, and commonly were deposited in the river valleys in the county (*3*).

The ice sheets melted over a period of many years. Because of seasonal variations, the glacial sluiceways were alternately dry and at flood stage. During the dry periods, strong prevailing winds from the northwest swept material off the bars and deposited it in the areas southeast of the valleys. Sands were moved a short distance, but silts, which were swept high into the air, were carried many miles.

The sandy deposits are on the river bluffs along the White River. They were laid down about the time of the Wisconsinan Glaciation. Alvin, Bloomfield, Princeton, and Ayrshire soils formed in these sandy deposits.

Windblown silty deposits, or loess, were laid down after the Illinoian glacial period. They are thickest in the northwestern part of the county and thinnest in the southeastern corner. Alford, Muren, Iva, Sylvan, Iona, Reesville, and Hosmer soils formed in areas where the loess is 60 or more inches thick. Many of the other soils in the county have a loess cap, generally less than 4 feet thick.

Nearly all of the glacial till plain was covered by a thick layer of loess. Hickory and Chetwynd are the only soils in this area that formed in glacial drift. They are on moderately steep to very steep hillsides where the layer of loess is thin.

The sand, silt, and clay deposited by meltwater from the Wisconsinan glacier commonly accumulated and blocked the mouths of tributary valleys. Fine grained sediments were laid down in the still water of these blocked tributaries (*13*). Markland, McGary, Montgomery, and Henshaw soils formed in these Wisconsinan lake sediments.

About one-fourth of the soils in Pike County formed in recent alluvium, which has been deposited since the latest glacial period. These sediments were washed largely from the upland areas of the drainage basins and deposited by floodwater of present streams. They vary in texture, depending on the speed of water from which the alluvium was deposited. The moderately coarse textured

Stonelick soils formed in alluvium deposited near the convergence of the East and West Forks of the White River. In this area, the water was rather swift and the duration of flooding very brief. The fine textured Montgomery and Wilhite soils formed in alluvium deposited in sloughs and depressions. These areas are distant from stream channels and are in the lowest position on the flood plains. Fine textured sediments settle out in the sluggish floodwater that backs up into these areas and remains there for long periods. The rest of the soils in the county that are subject to flooding are medium textured or moderately fine textured.

Fairpoint and Bethesda soils formed in the mine spoil that has been recently exposed by surface mining. The mine spoil consists of highly variable, partially weathered soil and rock material. Fragments of shale, siltstone, sandstone, and coal make up about half of the volume of the spoil. Natural soil structure is destroyed by mining activities. After the soil-forming processes act on the mine spoil for a considerable period, a new soil will form. This soil will differ from the original soil because the parent material and other factors are not the same.

Plant and Animal Life

Plants have been the principal organisms influencing the soils in Pike County. Bacteria, fungi, and earthworms, however, have also been important. The chief contribution of plant and animal life to soil formation is the addition of organic matter and nitrogen to the soil. The kind of organic material on and in the soil depends on the kinds of plants that grew on the soil in the past. In some areas the remains of these plants accumulated on the surface, decayed, and eventually became organic matter. The roots of the plants provided channels for the downward movement of water through the soil and added moisture and plant nutrients from the lower part of the soil to the upper part. Bacteria helped to break down the organic matter into plant nutrients.

The native vegetation in Pike County was mainly hardwood trees. Differences in natural soil drainage and minor variations in the parent material have affected the composition of the forest species. Well drained upland soils, such as Alford, Gilpin, and Wellston soils, were covered mainly by yellow-poplar, oak, beech, hickory, elm, maple, and ash. Wet soils, such as Bonnie, Peoga, and Wilhite soils, were covered primarily by sweetgum, hackberry, sycamore, cottonwood, and birch. Only a small amount of organic matter derived from trees was incorporated into the soils as they formed. On a few wet soils, a cover of swamp grasses, sedges, sphagnum, and other mosses contributed greatly to the accumulation of organic matter. Examples are Montgomery and Beaucoup soils. The soils that formed under forest vegetation generally contain less organic matter than the soils that formed under swamp vegetation.

Climate

Climate helps to determine the kind of plant and animal life on and in the soil, the amount of water available for the weathering of minerals and the transporting of soil material, and the rate of chemical reactions in the soil. The climate in Pike County is cool and humid. It is presumably similar to the climate under which the soils formed. The soils in this county differ from those that formed under a dry, warm climate and from those that formed under a hot, moist climate. Although its effect is modified locally by runoff, vegetation, and the proximity to the White and Patoka Rivers, climate is uniform throughout the county. Because of this uniformity, differences among the soils cannot be explained on the basis of differences in climate alone.

Climatic forces weather rocks into the parent material in which soils form. Combined with the actions of plants and animals, climate accelerates soil formation. It affects the intake and outgo of plant nutrients. Plants draw nutrients from the lower part of the soil through the roots. As the plants die, the plant nutrients are returned to the upper part of the soil. In Pike County the climate is such that more nutrients, such as calcium and magnesium, are leached from the soils than are replaced. Because of strong leaching, most of the soils are acid and low in fertility.

More information about the climate is available under the heading "General Nature of the County."

Relief

Relief has markedly affected the soils in Pike County through its effect on natural drainage, runoff, erosion, plant cover, and soil temperature. Slopes range from nearly level to very steep. Runoff is most rapid and geologic erosion most extensive on the steeper slopes. In low areas, water is temporarily ponded and soil material is deposited.

The soils in the county range from somewhat excessively drained on side slopes to very poorly drained in depressions. Through its affect on aeration in the soil, drainage determines the color of the soil. Water and air move freely through well drained soils but slowly through very poorly drained soils. The very poorly drained soils also warm up more slowly than the well drained soils. In Alvin and other well drained soils, the iron compounds that give most soils their color are brightly colored and oxidized. Wilhite and other very poorly drained, poorly aerated soils are dull gray and mottled. The position of a soil on the landscape largely determines the natural drainage class.

Time

Usually, a long time is needed for the processes of soil formation to form distinct horizons in the parent material. Differences in the length of time that the parent material has been in place are commonly reflected in the degree of profile development. Some soils form rapidly; others form slowly.

The soils in Pike County range from young to mature. Many of the soils formed in windblown silty material and in shale, siltstone, and sandstone residuum. These materials have been exposed to the soil-forming factors long enough for distinct horizons to form. Some soils, however, have not been in place long enough for the development of distinct horizons. Wakeland and other soils that formed in recent alluvial material are examples. The steep and very steep Berks soils, which formed in areas where geologic erosion is nearly as rapid as soil formation, also are relatively young.

Hickory soils have well developed horizons and are considered mature. They show the effects of time on leaching of lime in the profile. They are leached to a depth of more than 80 inches. In contrast, McGary soils, which were submerged under glacial lake water and thus were protected from leaching, are calcareous at a depth of 20 to 40 inches.

Processes of Soil Formation

Several processes have been involved in the formation of the soils in Pike County. These processes are the accumulation of organic matter; the dissolution, transfer, and removal of calcium carbonates and bases; and the liberation and translocation of silicate clay minerals. In most soils more than one of these processes have helped to differentiate horizons.

Some organic matter has accumulated in the surface layer of all the soils in the county. The organic matter content of some soils is low, but that of others is high. Generally, the soils that have the most organic matter, such as Huntsville and Beaucoup soils, have a thick, black surface layer.

Carbonates and bases have been leached from the upper horizons of nearly all the soils in the county. Leaching probably preceded the translocation of silicate clay minerals. Most of the carbonates and some of the bases have been leached from the A and B horizons of well drained soils. Even in the wettest soils, some leaching is indicated by the absence of carbonates and by an acid reaction. Leaching of wet soils is slow because of a high water table or the slow movement of water through the profile.

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Glossary

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium or on steep rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bottom land. The normal flood plain of a stream, subject to flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Cation. 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.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

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.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fine textured soil. Sandy clay, silty clay, and clay.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

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.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

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.

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.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor filter (in tables). Because of rapid permeability the soil may not adequately filter effluent from a waste disposal system.

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.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the 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.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slippage (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into 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.

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).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface drainage system. Removal of excess ground water through buried drains installed within the soil profile. The drains collect water and convey it to a gravity or pump outlet.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from about 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons. It includes all subdivisions of these horizons.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

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.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

(Recorded in the period 1951-78 at Princeton, Indiana)

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days*	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January----	39.6	22.0	30.8	67	-8	61	2.86	1.30	4.18	6	3.0
February---	45.2	25.9	35.5	70	-1	92	2.68	1.28	3.89	5	2.9
March------	54.4	33.9	44.2	79	11	240	4.56	2.35	6.48	8	1.5
April------	67.9	45.0	56.5	85	25	495	4.44	2.32	6.29	8	.2
May--------	76.9	54.0	65.5	92	33	791	4.78	2.97	6.40	8	.0
June-------	85.8	62.7	74.2	98	45	1,026	4.23	2.09	6.08	7	.0
July-------	88.5	66.1	77.3	97	49	1,156	3.92	2.04	5.55	6	.0
August-----	87.1	63.7	75.4	97	48	1,097	3.17	1.40	4.68	5	.0
September--	81.8	57.1	69.4	95	37	882	3.11	1.20	4.71	5	.0
October----	70.7	45.6	58.2	89	26	564	2.67	1.16	3.95	5	.0
November---	55.3	35.8	45.6	78	12	196	3.44	1.61	5.00	6	.8
December---	43.4	26.9	35.1	68	-2	81	3.76	1.78	5.46	7	.7
Yearly:											
Average--	66.4	44.9	55.6	---	---	---	---	---	---	---	---
Extreme--	---	---	---	99	-12	---	---	---	---	---	---
Total----	---	---	---	---	---	6,681	43.62	37.47	49.54	76	9.1

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40 degrees F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

(Recorded in the period 1951-78 at Princeton, Indiana)

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	Apr. 5	Apr. 20	Apr. 30
2 years in 10 later than--	Apr. 1	Apr. 14	Apr. 26
5 years in 10 later than--	Mar. 24	Apr. 4	Apr. 16
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 26	Oct. 19	Oct. 5
2 years in 10 earlier than--	Oct. 31	Oct. 23	Oct. 10
5 years in 10 earlier than--	Nov. 10	Nov. 1	Oct. 21

TABLE 3.--GROWING SEASON

(Recorded in the period 1951-78 at Princeton, Indiana)

Probability	Daily minimum temperature during growing season		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	213	189	165
8 years in 10	219	197	172
5 years in 10	230	211	186
2 years in 10	242	224	200
1 year in 10	248	232	208

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
AdA	Alford silt loam, 0 to 2 percent slopes	420	0.2
AdB2	Alford silt loam, 2 to 6 percent slopes, eroded	5,900	2.7
AdC2	Alford silt loam, 6 to 12 percent slopes, eroded	4,550	2.1
AnB	Alvin fine sandy loam, 2 to 6 percent slopes	1,650	0.8
AoC	Alvin-Bloomfield complex, 6 to 15 percent slopes	1,950	0.9
Ar	Armiesburg silty clay loam, occasionally flooded	2,050	0.9
Ay	Ayrshire fine sandy loam, loamy substratum	365	0.2
Ba	Bartle silt loam	210	0.1
Bb	Beaucoup silty clay loam, frequently flooded	400	0.2
Bf	Belknap silt loam, rarely flooded	3,100	1.4
Bg	Belknap silt loam, frequently flooded	15,900	7.3
Bh	Birds silt loam, occasionally flooded	360	0.2
Bk	Birds silt loam, frequently flooded	1,400	0.6
BlF	Bloomfield loamy fine sand, 25 to 50 percent slopes	485	0.2
Bo	Bonnie silt loam, frequently flooded	6,300	2.9
Bp	Bonnie silt loam, ponded	1,400	0.6
ClF	Chetwynd silt loam, 25 to 50 percent slopes	245	0.1
DbA	Dubois silt loam, 0 to 2 percent slopes	2,800	1.3
Du	Dumps, mine	1,550	0.7
EkA	Elkinsville silt loam, 0 to 2 percent slopes	640	0.3
FaB	Fairpoint silt loam, reclaimed, 1 to 15 percent slopes	4,950	2.3
FbC	Fairpoint-Bethesda complex, 8 to 15 percent slopes	9,400	4.3
FbG	Fairpoint-Bethesda complex, 25 to 70 percent slopes	22,250	10.2
GnE	Gilpin silt loam, 15 to 30 percent slopes	11,500	5.3
GnE3	Gilpin silt loam, 15 to 25 percent slopes, severely eroded	2,600	1.2
GoF	Gilpin-Berks loams, 25 to 50 percent slopes	1,600	0.7
HbB	Haubstadt silt loam, 1 to 6 percent slopes	5,600	2.6
Hd	Haymond silt loam, frequently flooded	2,050	0.9
HeA	Henshaw silt loam, 0 to 3 percent slopes	360	0.2
HkF	Hickory silt loam, 18 to 50 percent slopes	2,100	1.0
HoA	Hosmer silt loam, 0 to 2 percent slopes	450	0.2
HoB2	Hosmer silt loam, 2 to 6 percent slopes, eroded	18,800	8.6
HoC3	Hosmer silt loam, 6 to 12 percent slopes, severely eroded	7,100	3.3
HoD3	Hosmer silt loam, 12 to 18 percent slopes, severely eroded	1,250	0.6
Hu	Huntsville silt loam, rarely flooded	400	0.2
IoA	Iona silt loam, 0 to 2 percent slopes	930	0.4
IvA	Iva silt loam, 0 to 2 percent slopes	1,100	0.5
Ln	Lindside silt loam, frequently flooded	1,100	0.5
MbC3	Markland silty clay loam, 6 to 15 percent slopes, severely eroded	235	0.1
MgA	McGary silty clay loam, 0 to 2 percent slopes	520	0.2
Mt	Montgomery silty clay	200	0.1
MuA	Muren silt loam, 0 to 2 percent slopes	710	0.3
No	Nolin silty clay loam, frequently flooded	3,000	1.4
OtB2	Otwell silt loam, 2 to 6 percent slopes, eroded	220	0.1
OtC3	Otwell silt loam, 6 to 12 percent slopes, severely eroded	5,300	2.4
OtD3	Otwell silt loam, 12 to 18 percent slopes, severely eroded	2,700	1.2
PcB	Pekin silt loam, 2 to 6 percent slopes	1,050	0.5
Pe	Peoga silt loam	1,550	0.7
Ph	Petrolia silty clay loam, frequently flooded	950	0.4
Pm	Petrolia silty clay loam, frequently flooded, very long duration	750	0.3
PpD3	Pike silt loam, 12 to 18 percent slopes, severely eroded	2,950	1.4
PrA	Princeton fine sandy loam, 0 to 2 percent slopes	560	0.3
ReA	Reesville silt loam, 0 to 2 percent slopes	600	0.3
Se	Steff silt loam, rarely flooded	1,050	0.5
Sf	Steff silt loam, frequently flooded	2,950	1.4
So	Stendal silt loam, frequently flooded	1,600	0.7
Sw	Stonelick fine sandy loam, frequently flooded	305	0.1
SyB2	Sylvan silt loam, 2 to 6 percent slopes, eroded	1,400	0.6
SyC3	Sylvan silt loam, 6 to 12 percent slopes, severely eroded	760	0.3
SyF	Sylvan silt loam, 25 to 50 percent slopes	390	0.2
Vn	Vincennes Variant clay loam, occasionally flooded	1,500	0.7
Wa	Wakeland silt loam, frequently flooded	6,400	2.9
WeE	Wellston silt loam, 15 to 30 percent slopes	3,150	1.4
Wh	Wilhite silty clay loam, frequently flooded	1,200	0.5
ZaB	Zanesville silt loam, 2 to 6 percent slopes	5,500	2.5

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
ZaC3	Zanesville silt loam, 6 to 12 percent slopes, severely eroded	13,100	6.0
ZaD3	Zanesville silt loam, 12 to 18 percent slopes, severely eroded	8,800	4.0
	Water greater than 40 acres	342	0.2
	Water less than 40 acres	3,450	1.6
	Total	218,407	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
AdA	Alford silt loam, 0 to 2 percent slopes
AdB2	Alford silt loam, 2 to 6 percent slopes, eroded
AnB	Alvin fine sandy loam, 2 to 6 percent slopes
Ar	Armiesburg silty clay loam, occasionally flooded
Ay	Ayrshire fine sandy loam, loamy substratum (where drained)
Ba	Bartle silt loam (where drained)
Bb	Beaucoup silty clay loam, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
Bf	Belknap silt loam, rarely flooded (where drained)
Bg	Belknap silt loam, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
Bh	Birds silt loam, occasionally flooded (where drained)
Bk	Birds silt loam, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
Bo	Bonnie silt loam, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
DbA	Dubois silt loam, 0 to 2 percent slopes (where drained)
EkA	Elkinsville silt loam, 0 to 2 percent slopes
HbB	Haubstadt silt loam, 1 to 6 percent slopes
Hd	Haymond silt loam, frequently flooded (where protected from flooding or not frequently flooded during the growing season)
HeA	Henshaw silt loam, 0 to 3 percent slopes
HoA	Hosmer silt loam, 0 to 2 percent slopes
HoB2	Hosmer silt loam, 2 to 6 percent slopes, eroded
Hu	Huntsville silt loam, rarely flooded
IoA	Iona silt loam, 0 to 2 percent slopes
IvA	Iva silt loam, 0 to 2 percent slopes (where drained)
Ln	Lindside silt loam, frequently flooded (where protected from flooding or not frequently flooded during the growing season)
MgA	McGary silty clay loam, 0 to 2 percent slopes (where drained)
Mt	Montgomery silty clay (where drained)
MuA	Muren silt loam, 0 to 2 percent slopes
No	Nolin silty clay loam, frequently flooded (where protected from flooding or not frequently flooded during the growing season)
OtB2	Otwell silt loam, 2 to 6 percent slopes, eroded
PcB	Pekin silt loam, 2 to 6 percent slopes
Pe	Peoga silt loam (where drained)
Ph	Petrolia silty clay loam, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
PrA	Princeton fine sandy loam, 0 to 2 percent slopes
ReA	Reesville silt loam, 0 to 2 percent slopes (where drained)
Se	Steff silt loam, rarely flooded
Sf	Steff silt loam, frequently flooded (where protected from flooding or not frequently flooded during the growing season)
So	Stendal silt loam, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
Sw	Stonelick fine sandy loam, frequently flooded (where protected from flooding or not frequently flooded during the growing season)
SyB2	Sylvan silt loam, 2 to 6 percent slopes, eroded
Vn	Vincennes Variant clay loam, occasionally flooded (where drained)
Wa	Wakeland silt loam, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
ZaB	Zanesville silt loam, 2 to 6 percent slopes

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	Red clover-orchardgrass hay	Tall fescue
		Bu	Bu	Bu	Tons	AUM*
AdA------------------- Alford	I	125	44	50	4.1	8.2
AdB2------------------ Alford	IIe	115	40	46	3.8	7.6
AdC2------------------ Alford	IIIe	110	38	44	3.6	7.2
AnB------------------- Alvin	IIe	80	28	32	3.3	6.6
AoC------------------- Alvin-Bloomfield	IIIe	70	24	---	3.0	6.0
Ar-------------------- Armiesburg	IIw	110	42	47	3.8	8.8
Ay-------------------- Ayrshire	IIw	105	37	42	3.5	7.0
Ba-------------------- Bartle	IIw	110	38	50	3.6	7.2
Bb-------------------- Beaucoup	IIw	130	41	---	4.2	8.4
Bf-------------------- Belknap	IIw	105	36	42	3.5	7.0
Bg-------------------- Belknap	IIw	100	35	40	3.4	6.8
Bh-------------------- Birds	IIw	120	42	---	4.0	8.0
Bk-------------------- Birds	IIIw	115	40	---	3.8	7.6
BlF------------------- Bloomfield	VIe	---	---	---	---	3.2
Bo-------------------- Bonnie	IIIw	105	36	---	3.5	7.0
Bp-------------------- Bonnie	Vw	---	---	---	---	---
ClF------------------- Chetwynd	VIIe	---	---	---	---	3.2
DbA------------------- Dubois	IIw	110	38	---	3.6	7.2
Du**. Dumps						

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Winter wheat	Red clover-orchardgrass hay	Tall fescue
		Bu	Bu	Bu	Tons	AUM*
EkA----------------------- Elkinsville	I	120	42	48	4.0	8.0
FaB----------------------- Fairpoint	IVs	---	---	25	2.5	5.0
FbC----------------------- Fairpoint-Bethesda	VIs	---	---	---	---	3.5
FbG----------------------- Fairpoint-Bethesda	VIIe	---	---	---	---	---
GnE----------------------- Gilpin	VIe	---	---	---	---	4.0
GnE3---------------------- Gilpin	VIIe	---	---	---	---	3.0
GoF----------------------- Gilpin-Berks	VIIe	---	---	---	---	---
HbB----------------------- Haubstadt	IIe	110	35	40	4.0	8.0
Hd------------------------ Haymond	IIw	120	42	---	3.7	8.0
HeA----------------------- Henshaw	IIw	120	42	42	4.5	9.0
HkF----------------------- Hickory	VIIe	---	---	---	2.4	4.8
HoA----------------------- Hosmer	IIs	105	37	47	3.4	6.8
HoB2---------------------- Hosmer	IIe	95	33	43	3.1	6.2
HoC3---------------------- Hosmer	IVe	75	26	34	2.5	5.0
HoD3---------------------- Hosmer	VIe	---	---	27	2.0	4.0
Hu------------------------ Huntsville	I	140	48	56	4.8	9.6
IoA----------------------- Iona	I	125	44	50	4.1	8.2
IvA----------------------- Iva	IIw	135	47	54	4.4	8.8
Ln------------------------ Lindside	IIw	120	42	---	3.5	7.0
MbC3---------------------- Markland	VIe	---	---	---	2.0	4.0

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Winter wheat	Red clover-orchardgrass hay	Tall fescue
		Bu	Bu	Bu	Tons	AUM*
MgA------------------- McGary	IIIw	100	35	45	2.3	4.6
Mt-------------------- Montgomery	IIIw	115	40	52	3.8	7.6
MuA------------------- Muren	I	125	44	50	4.1	8.2
No-------------------- Nolin	IIIw	125	43	---	3.7	8.0
OtB2------------------ Otwell	IIe	95	33	43	3.1	6.2
OtC3------------------ Otwell	IVe	75	26	34	2.5	5.0
OtD3------------------ Otwell	VIe	---	---	27	2.0	4.0
PcB------------------- Pekin	IIe	105	37	47	3.4	6.8
Pe-------------------- Peoga	IIIw	125	44	50	4.1	8.2
Ph-------------------- Petrolia	IIIw	110	35	40	3.7	7.4
Pm-------------------- Petrolia	IVw	80	30	---	---	5.2
PpD3------------------ Pike	VIe	---	---	---	---	4.6
PrA------------------- Princeton	I	100	35	45	3.3	6.6
ReA------------------- Reesville	IIw	130	45	52	4.5	9.0
Se-------------------- Steff	I	120	42	---	4.5	9.0
Sf-------------------- Steff	IIw	105	36	---	4.3	8.6
So-------------------- Stendal	IIw	110	38	40	3.7	7.4
Sw-------------------- Stonelick	IIIw	80	28	---	3.5	7.0
SyB2------------------ Sylvan	IIe	120	42	48	4.5	9.0
SyC3------------------ Sylvan	IVe	105	36	42	4.2	8.4
SyF------------------- Sylvan	VIIe	---	---	---	---	3.4

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Winter wheat	Red clover-orchardgrass hay	Tall fescue
		Bu	Bu	Bu	Tons	AUM*
Vn----------------------- Vincennes Variant	IIw	100	35	---	3.5	7.0
Wa----------------------- Wakeland	IIw	115	40	---	4.0	8.8
WeE---------------------- Wellston	VIe	---	---	---	---	5.6
Wh----------------------- Wilhite	IVw	85	30	---	2.8	5.6
ZaB---------------------- Zanesville	IIe	105	37	---	3.5	7.0
ZaC3--------------------- Zanesville	IVe	65	23	---	3.0	6.0
ZaD3--------------------- Zanesville	VIe	---	---	---	2.5	5.0

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--CAPABILITY CLASSES AND SUBCLASSES

(Miscellaneous areas are excluded. Absence of an entry indicates no acreage)

Class	Total acreage	Major management concerns (Subclass)			
		Erosion (e)	Wetness (w)	Soil problem (s)	Climate (c)
		Acres	Acres	Acres	Acres
I	4,710	---	---	---	---
II	86,415	40,120	45,845	450	---
III	16,965	5,740	11,225	---	---
IV	33,920	27,020	1,950	4,950	---
V	1,400	---	1,400	---	---
VI	39,985	30,585	---	9,400	---
VII	29,670	29,185	---	485	---
VIII	---	---	---	---	---

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY

(Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available)

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Trees to plant
AdA, AdB2, AdC2: Alford	5A	Slight	Slight	Slight	Slight	White oak	90	Eastern white pine, red pine, black walnut, yellow-poplar, white ash, white oak.
						Yellow-poplar	98	
						Sweetgum	76	
AnB: Alvin	4A	Slight	Slight	Slight	Slight	White oak	80	Green ash, black walnut, yellow-poplar, white oak, eastern white pine, American sycamore, sugar maple.
						Northern red oak	80	
						Black walnut	---	
						Yellow-poplar	90	
AoC*:								
Alvin	4A	Slight	Slight	Slight	Slight	White oak	80	Green ash, black walnut, yellow-poplar, white oak, eastern white pine, American sycamore, sugar maple.
						Northern red oak	80	
						Black walnut	---	
						Yellow-poplar	90	
Bloomfield	4S	Slight	Slight	Moderate	Slight	Black oak	70	Eastern white pine, red pine, black oak, jack pine.
						White oak	---	
						Scarlet oak	---	
						Shagbark hickory	---	
Ar: Armiesburg	8A	Slight	Slight	Slight	Slight	Yellow-poplar	100	Eastern white pine, black walnut, yellow-poplar, green ash, northern red oak.
						White oak	90	
						Black walnut	70	
Ay: Ayrshire	5A	Slight	Slight	Slight	Slight	White oak	85	Green ash, yellow-poplar, pin oak, sweetgum, American sycamore, eastern cottonwood, white ash, eastern white pine, white oak, red maple.
						Pin oak	100	
						Yellow-poplar	100	
						Sweetgum	100	
Ba: Bartle	4A	Slight	Slight	Slight	Slight	White oak	75	Eastern white pine, green ash, red maple, yellow-poplar, American sycamore, eastern cottonwood.
						Pin oak	85	
						Yellow-poplar	85	
						Sweetgum	80	
Bb: Beaucoup	5W	Slight	Severe	Moderate	Moderate	Pin oak	90	Eastern cottonwood, red maple, American sycamore, sweetgum, pin oak, green ash.
						Eastern cottonwood	100	
						Sweetgum	---	
						Cherrybark oak	---	
						American sycamore	---	
Bf, Bg: Belknap	6A	Slight	Slight	Slight	Slight	Yellow-poplar	90	Eastern cottonwood, red maple, American sycamore, sweetgum, green ash, yellow-poplar, pin oak.
						Eastern cottonwood	100	
						American sycamore	---	
						Sweetgum	---	
						Pin oak	90	

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
Bh, Bk: Birds	5W	Slight	Severe	Moderate	Moderate	Pin oak Eastern cottowoood Sweetgum Cherrybark oak American sycamore	90 100 --- --- ---	Eastern cottonwood, red maple, American sycamore, green ash, baldcypress, pin oak, sweetgum.
BlF: Bloomfield	4R	Moderate	Moderate	Moderate	Slight	Black oak White oak Scarlet oak Shagbark hickory	70 --- --- ---	Eastern white pine, red pine, black oak, jack pine.
Bo, Bp: Bonnie	5W	Slight	Severe	Severe	Severe	Pin oak Eastern cottonwood Sweetgum Cherrybark oak American sycamore	90 100 --- --- ---	Eastern cottonwood, red maple, American sycamore, sweetgum, baldcypress, pin oak.
ClF: Chetwynd	7R	Severe	Severe	Slight	Slight	Yellow-poplar Northern red oak	99 88	Eastern white pine, yellow-poplar, red pine, northern red oak, white oak, black cherry.
DbA: Dubois	3A	Slight	Slight	Slight	Slight	White oak Pin oak Yellow-poplar Sweetgum Northern red oak	65 --- --- --- ---	Eastern white pine, white ash, black oak, red maple, yellow-poplar.
EkA: Elkinsville	5A	Slight	Slight	Slight	Slight	White oak Yellow-poplar Sweetgum	90 98 76	Eastern white pine, red pine, white ash, yellow-poplar, black walnut, white oak.
FaB: Fairpoint	---	---	---	---	---	---	---	Eastern white pine, American sycamore, yellow-poplar, red pine, white spruce, eastern cottonwood, blue spruce.
FbC*, FbG*:								
Fairpoint	---	---	---	---	---	---	---	Eastern white pine, American sycamore, yellow-poplar, red pine, white spruce, blue spruce, eastern cottonwood.
Bethesda	---	---	---	---	---	---	---	Eastern white pine, red pine, Austrian pine, jack pine, Virginia pine.
GnE, GnE3: Gilpin	4R	Moderate	Moderate	Slight	Slight	Northern red oak Yellow-poplar	80 95	Red pine, Virginia pine, eastern white pine, black cherry, yellow-poplar, northern red oak.

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Trees to plant
GoF*:								
Gilpin	4R	Severe	Severe	Slight	Slight	Northern red oak Yellow-poplar	80 95	Red pine, Virginia pine, eastern white pine, black cherry, yellow-poplar, northern red oak.
Berks	4F	Moderate	Severe	Moderate	Slight	Northern red oak Black oak Virginia pine	70 70 70	Virginia pine, eastern white pine, black oak, yellow-poplar, red pine.
HbB Haubstadt	4D	Slight	Slight	Slight	Moderate	Northern red oak White oak White ash Slippery elm American beech Sugar maple American sycamore	80 --- --- --- --- --- ---	Eastern white pine, red pine, Virginia pine, white ash, yellow-poplar, black oak.
Hd Haymond	8A	Slight	Slight	Slight	Slight	Yellow-poplar White oak Black walnut	100 90 70	Eastern white pine, black walnut, yellow-poplar, white oak, northern red oak.
HeA Henshaw	5W	Slight	Moderate	Slight	Severe	Pin oak Yellow-poplar Sweetgum	95 95 95	Green ash, sweetgum, eastern cottonwood, yellow-poplar, pin oak.
HkF Hickory	5R	Moderate	Moderate	Slight	Slight	White oak Northern red oak Black oak Green ash Bitternut hickory Yellow-poplar	85 85 --- --- --- 95	Eastern white pine, red pine, yellow-poplar, sugar maple, white oak, black cherry.
HoA, HoB2, HoC3 Hosmer	4A	Slight	Slight	Slight	Moderate	White oak Yellow-poplar Virginia pine Sugar maple	75 90 75 75	Eastern white pine, shortleaf pine, red pine, yellow-poplar, white ash.
HoD3 Hosmer	4R	Moderate	Moderate	Slight	Moderate	White oak Yellow-poplar Virginia pine Sugar maple	75 90 75 75	Eastern white pine, shortleaf pine, red pine, yellow-poplar, white ash.
Hu Huntsville	7A	Slight	Slight	Slight	Slight	Yellow-poplar Eastern cottonwood American sycamore Cherrybark oak Sweetgum Green ash	98 110 --- --- --- ---	Eastern cottonwood, black walnut, American sycamore, yellow-poplar, white oak, green ash.
IoA Iona	5A	Slight	Slight	Slight	Slight	White oak Yellow-poplar Sweetgum	90 98 76	Eastern white pine, red pine, black walnut, yellow-poplar, white ash.

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
IvA Iva	4W	Slight	Moderate	Slight	Slight	White oak Pin oak Yellow-poplar Sweetgum	75 85 85 80	Eastern white pine, pin oak, green ash, red maple, yellow-poplar, American sycamore.
Ln Lindside	5A	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar Black walnut White ash White oak Red maple	86 95 --- 85 85 ---	Eastern cottonwood, yellow-poplar, black walnut, northern red oak, white ash, white oak, American sycamore.
MbC3 Markland	4C	Slight	Slight	Severe	Severe	White oak Northern red oak	75 78	Eastern cottonwood, red maple, yellow-poplar, green ash.
MgA McGary	4W	Slight	Moderate	Severe	Severe	White oak Pin oak Yellow-poplar Sweetgum	70 85 85 80	Eastern cottonwood, pin oak, green ash, red maple, yellow-poplar, American sycamore.
Mt Montgomery	5W	Slight	Severe	Severe	Severe	Pin oak White oak Sweetgum	88 75 90	Eastern cottonwood, baldcypress, pin oak, red maple, green ash, sweetgum.
MuA Muren	5A	Slight	Slight	Slight	Slight	White oak Yellow-poplar Sweetgum	90 98 76	Eastern white pine, red pine, black walnut, black cherry, yellow-poplar, white ash, white oak.
No Nolin	8W	Slight	Moderate	Slight	Slight	Sweetgum Cherrybark oak Eastern cottonwood River birch Black willow American sycamore	92 97 --- --- --- ---	Sweetgum, American sycamore, green ash, pin oak, yellow-poplar, eastern cottonwood.
OtB2, OtC3 Otwell	3D	Slight	Slight	Moderate	Moderate	White oak Yellow-poplar Sugar maple	65 --- ---	Eastern white pine, red pine, yellow-poplar, white ash.
OtD3 Otwell	3R	Moderate	Moderate	Moderate	Moderate	White oak Yellow-poplar Sugar maple	65 --- ---	Eastern white pine, red pine, yellow-poplar, white ash.
PcB Pekin	4A	Slight	Slight	Slight	Slight	White oak Yellow-poplar Virginia pine Sugar maple	70 85 75 75	Eastern white pine, shortleaf pine, red pine, yellow-poplar, white ash.
Pe Peoga	5W	Slight	Severe	Severe	Moderate	Pin oak White oak Sweetgum	90 75 90	Eastern white pine, baldcypress, pin oak, red maple, green ash, sweetgum.

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
Ph, Pm: Petrolia	5W	Slight	Moderate	Moderate	Slight	Pin oak	90	Eastern cottonwood, red maple, American sycamore, baldcypress, pin oak.
						Eastern cottonwood	100	
						Sweetgum	---	
						Cherrybark oak	---	
						American sycamore	---	
PpD3: Pike	5A	Slight	Slight	Slight	Slight	White oak	90	Eastern white pine, red pine, black walnut, black cherry, yellow-poplar, white ash, white oak.
						Yellow-poplar	98	
						Sweetgum	76	
PrA: Princeton	5A	Slight	Slight	Slight	Slight	White oak	90	Eastern white pine, red pine, black walnut, yellow-poplar, white ash, black cherry.
						Yellow-poplar	98	
						Sweetgum	76	
ReA: Reesville	4W	Slight	Moderate	Slight	Slight	Northern red oak	76	Red maple, silver maple, pin oak, sweetgum, red pine, swamp white oak, baldcypress, green ash, eastern cottonwood, American sycamore.
						Yellow-poplar	86	
						Sugar maple	90	
						Green ash	---	
						Swamp white oak	---	
						Black cherry	---	
						Red maple	---	
						Pin oak	---	
						Eastern cottonwood	---	
Se, Sf: Steff	4A	Slight	Slight	Slight	Slight	Northern red oak	80	Yellow-poplar, eastern white pine, red pine, sweetgum, black walnut, green ash.
						Yellow-poplar	95	
So: Stendal	5W	Slight	Moderate	Slight	Slight	Pin oak	90	Eastern white pine, baldcypress, American sycamore, red maple, green ash.
						Sweetgum	85	
						Yellow-poplar	90	
						Virginia pine	90	
Sw: Stonelick	4A	Slight	Slight	Slight	Slight	Northern red oak	80	Eastern white pine, black walnut, yellow-poplar, white ash, red pine, white oak.
						White oak	---	
						Black walnut	---	
						Black cherry	---	
						Sugar maple	---	
						White ash	---	
						Yellow-poplar	---	
SyB2, SyC3: Sylvan	6A	Slight	Slight	Slight	Slight	Yellow-poplar	90	White oak, black walnut, northern red oak, green ash, eastern white pine, red pine, sugar maple.
						White oak	80	
						Northern red oak	80	
						Black walnut	---	
SyF: Sylvan	6R	Severe	Severe	Severe	Slight	Yellow-poplar	90	White oak, black cherry, northern red oak, green ash, eastern white pine, red pine, sugar maple.
						White oak	80	
						Northern red oak	80	
						Black walnut	---	

See footnote at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity		Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	
Vn: Vincennes Variant	5W	Slight	Severe	Severe	Moderate	Pin oak White oak Sweetgum	86 75 90	Eastern white pine, baldcypress, pin oak, red maple, green ash, sweetgum.
Wa: Wakeland	5A	Slight	Slight	Slight	Slight	Pin oak Sweetgum Yellow-poplar Virginia pine	90 88 90 85	Eastern white pine, American sycamore, red maple, white ash, eastern cottonwood.
WeE: Wellston	4R	Moderate	Moderate	Slight	Slight	Northern red oak Yellow-poplar Virginia pine White oak Black walnut Black cherry Sugar maple White ash	71 90 70 --- --- --- --- ---	Eastern white pine, black walnut, yellow-poplar, white oak, northern red oak, white spruce, white ash, Fraser fir, red pine, green ash, black cherry, American sycamore.
Wh: Wilhite	5W	Slight	Severe	Severe	Severe	Pin oak White oak Sweetgum	86 75 90	Eastern white pine, American sycamore, sweetgum, red maple, green ash, pin oak.
ZaB: Zanesville	4A	Slight	Slight	Slight	Slight	Northern red oak Virginia pine	68 70	Virginia pine, eastern white pine, red pine, yellow-poplar.
ZaC3: Zanesville	3D	Slight	Slight	Moderate	Slight	Northern red oak Virginia pine	60 70	Virginia pine, red pine, eastern white pine.
ZaD3: Zanesville	3D	Moderate	Moderate	Moderate	Slight	Northern red oak Virginia pine	60 70	Virginia pine, red pine, eastern white pine.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

(The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil)

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
AdA, AdB2, AdC2--- Alford	---	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.
AnB--------------- Alvin	---	Amur privet, Washington hawthorn, Amur honeysuckle, American cranberrybush, Tatarian honeysuckle.	Austrian pine, northern white-cedar, osageorange, eastern redcedar.	Eastern white pine, red pine, Norway spruce.	---
AoC*:					
Alvin------------	---	Amur privet, Washington hawthorn, Amur honeysuckle, American cranberrybush, Tatarian honeysuckle.	Austrian pine, northern white-cedar, osageorange, eastern redcedar.	Eastern white pine, red pine, Norway spruce.	---
Bloomfield--------	Siberian peashrub	Radiant crabapple, eastern redcedar, autumn-olive, Washington hawthorn, Amur honeysuckle, lilac, Tatarian honeysuckle.	Austrian pine, jack pine, red pine.	Eastern white pine	---
Ar---------------- Armiesburg	---	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.
Ay---------------- Ayrshire	---	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.
Ba---------------- Bartle	---	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, Amur honeysuckle, Tatarian honeysuckle, American cranberrybush.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Bb Beaucoup	---	Silky dogwood, Amur privet, American cranberrybush, Amur honeysuckle.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
Bf, Bg Belknap	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Pin oak, eastern white pine.
Bh, Bk Birds	---	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Washington hawthorn, white fir, blue spruce, northern white-cedar, Austrian pine, Norway spruce.	Eastern white pine	Pin oak.
BlF Bloomfield	Siberian peashrub	Radiant crabapple, eastern redcedar, autumn-olive, Washington hawthorn, Amur honeysuckle, lilac, Tatarian honeysuckle.	Austrian pine, jack pine, red pine.	Eastern white pine	---
Bo, Bp Bonnie	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	White fir, blue spruce, Washington hawthorn, northern white-cedar, Austrian pine, Norway spruce.	Eastern white pine	Pin oak.
ClF Chetwynd	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Pin oak, eastern white pine.
DbA Dubois	---	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, Amur honeysuckle, Tatarian honeysuckle, American cranberrybush.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
Du*. Dumps					

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
EkA------------- Elkinsville	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Pin oak, eastern white pine.
FaB. Fairpoint					
FbC*, FbG*: Fairpoint.					
Bethesda.					
GnE, GnE3--------- 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.	---	---
GoF*: 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.	---	---
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.	---	---
HbB-------------- Haubstadt	---	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, Amur honeysuckle, Tatarian honeysuckle, American cranberrybush.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
Hd--------------- Haymond	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
HeA. Henshaw	---	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.
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.
HoA, HoB2, HoC3, HoD3. Hosmer	---	Eastern redcedar, arrowwood, Washington hawthorn, Tatarian honeysuckle, Amur privet, American cranberrybush, Amur honeysuckle.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
Hu. Huntsville	---	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.
IoA. Iona	---	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.
IvA. Iva	---	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.
Ln. Lindside	---	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.
MbC3. Markland	---	Arrowwood, Washington hawthorn, eastern redcedar, Amur honeysuckle, American cranberrybush, Tatarian honeysuckle, Amur privet.	Austrian pine, green ash, osageorange, white spruce.	Eastern white pine.	---

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
MgA: McGary	---	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, Amur honeysuckle, Tatarian honeysuckle, American cranberrybush.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
Mt: Montgomery	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Northern white-cedar, Norway spruce, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
MuA: Muren	---	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.
No: Nolin	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn, Austrian pine.	Norway spruce	Eastern white pine, pin oak.
OtB2, OtC3, OtD3: Otwell	---	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, Amur honeysuckle, Tatarian honeysuckle, American cranberrybush.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
PcB: Pekin	---	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, Amur honeysuckle, Tatarian honeysuckle, American cranberrybush.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
Pe: Peoga	---	Amur honeysuckle, silky dogwood, Amur privet, American cranberrybush.	Northern white-cedar, Norway spruce, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Ph, Pm------------ Petrolia	---	Silky dogwood, Amur privet, American cranberrybush, Amur honeysuckle.	White fir, blue spruce, Washington hawthorn, Norway spruce, Austrian pine, northern white-cedar.	Eastern white pine	Pin oak.
PpD3-------------- Pike	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, northern white-cedar, blue spruce, white fir.	Austrian pine, Norway spruce.	Pin oak, eastern white pine.
PrA--------------- Princeton	---	Washington hawthorn, Amur honeysuckle, American cranberrybush, Amur privet, Tatarian honeysuckle.	Eastern redcedar, Austrian pine, osageorange, northern white-cedar.	Eastern white pine, Norway spruce, red pine.	---
ReA--------------- Reesville	---	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.
Se, 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.
So---------------- 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.
Sw---------------- Stonelick	---	Tatarian honeysuckle, Siberian peashrub.	Green ash, eastern redcedar, osageorange, northern white-cedar, nannyberry viburnum, white spruce, Washington hawthorn.	Black willow------	---
SyB2, SyC3, SyF--- Sylvan	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Vn: Vincennes Variant	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
Wa: Wakeland	---	Amur honeysuckle, silky dogwood, Amur privet, American cranberrybush, silky dogwood.	Northern white-cedar, Austrian pine, white fir, blue spruce, Washington hawthorn.	---	Eastern white pine, pin oak.
WeE: Wellston	---	Amur honeysuckle, Amur privet, American cranberrybush, silky dogwood.	White fir, northern white-cedar, blue spruce, Washington hawthorn.	Norway spruce, Austrian pine.	Pin oak, eastern white pine.
Wh: Wilhite	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
ZaB, ZaC3, ZaD3: Zanesville	---	American cranberrybush, Amur honeysuckle, Tatarian honeysuckle, Amur privet, arrowwood, Washington hawthorn, eastern redcedar.	Hackberry, osageorange, Austrian pine.	Pin oak, eastern white pine.	---

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--RECREATIONAL DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
AdA------------------ Alford	Slight---------	Slight---------	Slight---------	Slight---------	Slight.
AdB2----------------- Alford	Slight---------	Slight---------	Moderate: slope.	Slight---------	Slight.
AdC2----------------- Alford	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
AnB------------------ Alvin	Slight---------	Slight---------	Moderate: slope.	Slight---------	Slight.
AoC*:					
Alvin----------------	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight---------	Moderate: slope.
Bloomfield-----------	Severe: too sandy.	Severe: too sandy.	Severe: slope, too sandy.	Severe: too sandy.	Moderate: droughty, slope.
Ar------------------- Armiesburg	Severe: flooding.	Slight---------	Moderate: flooding.	Slight---------	Moderate: flooding.
Ay------------------- Ayrshire	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Ba------------------- Bartle	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
Bb------------------- Beaucoup	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding, flooding.	Severe: ponding.	Severe: ponding, flooding.
Bf------------------- Belknap	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Bg------------------- Belknap	Severe: flooding, wetness.	Moderate: flooding, wetness.	Severe: wetness, flooding.	Moderate: wetness, flooding.	Severe: flooding.
Bh------------------- Birds	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Bk------------------- Birds	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding, flooding.	Severe: ponding.	Severe: ponding, flooding.
BlF------------------ Bloomfield	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Bo, Bp--------------- Bonnie	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding, flooding.	Severe: ponding.	Severe: ponding, flooding.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
ClF------------------ Chetwynd	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
DbA------------------ Dubois	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
Du*. Dumps					
EkA------------------ Elkinsville	Slight----------	Slight----------	Slight----------	Slight----------	Slight.
FaB------------------ Fairpoint	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: droughty.
FbC*:					
Fairpoint-----------	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Severe: erodes easily.	Severe: small stones, droughty.
Bethesda------------	Moderate: slope, small stones, percs slowly.	Moderate: slope, small stones, percs slowly.	Severe: slope, small stones.	Slight----------	Severe: droughty.
FbG*:					
Fairpoint-----------	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, erodes easily.	Severe: small stones, droughty, slope.
Bethesda------------	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: droughty, slope.
GnE------------------ Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
GnE3----------------- Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
GoF*:					
Gilpin--------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Berks---------------	Severe: slope.	Severe: small stones.	Severe: slope.	Severe: slope.	Severe: slope.
HbB------------------ Haubstadt	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
Hd------------------- Haymond	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
HeA------------------ Henshaw	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
HkF: Hickory	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily, slope.	Severe: slope.
HoA, HoB2: Hosmer	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Severe: erodes easily.	Slight.
HoC3: Hosmer	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Moderate: slope.
HoD3: Hosmer	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Severe: slope.
Hu: Huntsville	Severe: flooding.	Slight	Slight	Slight	Slight.
IoA: Iona	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness.	Slight.
IvA: Iva	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Ln: Lindside	Severe: flooding.	Moderate: flooding, wetness.	Severe: flooding.	Moderate: wetness, flooding.	Severe: flooding.
MbC3: Markland	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
MgA: McGary	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
Mt: Montgomery	Severe: ponding, too clayey.	Severe: ponding, too clayey.	Severe: too clayey, ponding.	Severe: ponding, too clayey.	Severe: ponding, too clayey.
MuA: Muren	Slight	Slight	Slight	Slight	Slight.
No: Nolin	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
OtB2: Otwell	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Slight	Slight.
OtC3: Otwell	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Moderate: slope.
OtD3: Otwell	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Severe: slope.
PcB: Pekin	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Slight	Slight.
Pe: Peoga	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Ph, Pm: Petrolia	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding, flooding.	Severe: ponding.	Severe: ponding, flooding.
PpD3: Pike	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
PrA: Princeton	Slight	Slight	Slight	Slight	Slight.
ReA: Reesville	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Se: Steff	Severe: flooding.	Moderate: wetness.	Moderate: wetness.	Severe: erodes easily.	Moderate: wetness.
Sf: Steff	Severe: flooding.	Moderate: flooding, wetness.	Severe: flooding.	Severe: erodes easily.	Severe: flooding.
So: Stendal	Severe: flooding, wetness.	Moderate: flooding, wetness.	Severe: wetness, flooding.	Moderate: flooding, wetness.	Severe: flooding.
Sw: Stonelick	Severe: flooding.	Moderate: flooding, small stones.	Severe: small stones, flooding.	Moderate: flooding.	Severe: flooding.
SyB2: Sylvan	Slight	Slight	Moderate: slope.	Slight	Slight.
SyC3: Sylvan	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
SyF: Sylvan	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Vn: Vincennes Variant	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
Wa: Wakeland	Severe: flooding, wetness.	Moderate: flooding, wetness.	Severe: wetness, flooding.	Moderate: flooding, wetness.	Severe: flooding.
WeE: Wellston	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Wh: Wilhite	Severe: flooding, ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, flooding.	Severe: ponding.	Severe: ponding, flooding.
ZaB: Zanesville	Moderate: percs slowly, wetness.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: erodes easily.	Slight.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
ZaC3------------------ Zanesville	Moderate: slope, percs slowly, wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
ZaD3------------------ Zanesville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--WILDLIFE HABITAT

(See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
AdA, AdB2: Alford	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
AdC2: Alford	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
AnB: Alvin	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
AoC*:										
Alvin	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Bloomfield	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Ar: Armiesburg	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Ay: Ayrshire	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Ba: Bartle	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Bb: Beaucoup	Good	Good	Good	Fair	Fair	Good	Good	Good	Good	Good.
Bf, Bg: Belknap	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Bh, Bk: Birds	Good	Fair	Good	Good	Fair	Good	Good	Good	Good	Good.
BlF: Bloomfield	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Bo, Bp: Bonnie	Poor	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
ClF: Chetwynd	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
DbA: Dubois	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Du*. Dumps										
EkA: Elkinsville	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
FaB: Fairpoint	Fair	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
FbC*, FbG*:										
Fairpoint	Very poor.	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.
Bethesda	Very poor.	Very poor.	Poor	Poor	Poor	Very poor.	Very poor.	Very poor.	Poor	Very poor.
GnE Gilpin	Very poor.	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
GnE3 Gilpin	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
GoF*:										
Gilpin	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Berks	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
HbB Haubstadt	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Hd Haymond	Fair	Fair	Fair	Good	Good	Poor	Poor	Fair	Good	Poor.
HeA Henshaw	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
HkF Hickory	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
HoA, HoB2 Hosmer	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
HoC3 Hosmer	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
HoD3 Hosmer	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Hu Huntsville	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
IoA Iona	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
IvA Iva	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Ln Lindside	Fair	Fair	Fair	Good	Good	Poor	Poor	Fair	Good	Poor.
MbC3 Markland	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
MgA McGary	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements: Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Potential as habitat for--: Openland wildlife	Woodland wildlife	Wetland wildlife
Mt----------------- Montgomery	Fair	Poor	Poor	Good	Poor	Good	Good	Poor	Fair	Good.
MuA---------------- Muren	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
No----------------- Nolin	Fair	Fair	Fair	Good	Good	Poor	Very poor.	Fair	Fair	Very poor.
OtB2--------------- Otwell	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
OtC3--------------- Otwell	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
OtD3--------------- Otwell	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
PcB---------------- Pekin	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Pe----------------- Peoga	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Ph, Pm------------- Petrolia	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
PpD3--------------- Pike	Poor	Poor	Fair	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
PrA---------------- Princeton	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
ReA---------------- Reesville	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Se, Sf------------- Steff	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
So----------------- Stendal	Fair	Good	Fair	Good	Good	Good	Fair	Fair	Good	Fair.
Sw----------------- Stonelick	Fair	Fair	Fair	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
SyB2, SyC3--------- Sylvan	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
SyF---------------- Sylvan	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Vn----------------- Vincennes Variant	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Wa----------------- Wakeland	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
WeE---------------- Wellston	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba-ceous plants	Hardwood trees	Conif-erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Wh----------------- Wilhite	Poor	Poor	Poor	Fair	Poor	Good	Good	Poor	Poor	Good.
ZaB---------------- Zanesville	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
ZaC3--------------- Zanesville	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
ZaD3--------------- Zanesville	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--BUILDING SITE DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
AdA: Alford	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
AdB2: Alford	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
AdC2: Alford	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
AnB: Alvin	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
AoC*:						
Alvin	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
Bloomfield	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
Ar: Armiesburg	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding, frost action.	Moderate: flooding.
Ay: Ayrshire	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
Ba: Bartle	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
Bb: Beaucoup	Severe: ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: low strength, ponding, flooding.	Severe: ponding, flooding.
Bf: Belknap	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: frost action.	Moderate: wetness.
Bg: Belknap	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Severe: flooding.
Bh: Birds	Severe: ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: low strength, ponding, flooding.	Severe: ponding.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Bk----------------- Birds	Severe: ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: low strength, ponding, flooding.	Severe: ponding, flooding.
BlF---------------- Bloomfield	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Bo, Bp------------- Bonnie	Severe: ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: low strength, ponding, flooding.	Severe: ponding, flooding.
ClF---------------- Chetwynd	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
DbA---------------- Dubois	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Du*. Dumps						
EkA---------------- Elkinsville	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
FaB---------------- Fairpoint	Moderate: large stones.	Moderate: shrink-swell, large stones.	Moderate: shrink-swell, large stones.	Moderate: shrink-swell, slope, large stones.	Moderate: frost action, shrink-swell, large stones.	Moderate: droughty.
FbC*:						
Fairpoint---------	Moderate: large stones, slope.	Moderate: shrink-swell, slope, large stones.	Moderate: slope, shrink-swell, large stones.	Severe: slope.	Moderate: slope, frost action, shrink-swell.	Severe: small stones, droughty.
Bethesda----------	Moderate: dense layer, large stones, slope.	Moderate: slope, large stones.	Moderate: slope, large stones.	Severe: slope.	Moderate: slope, frost action, large stones.	Severe: droughty.
FbG*:						
Fairpoint---------	Severe: slope, slippage.	Severe: slope, slippage.	Severe: slope, slippage.	Severe: slope, slippage.	Severe: slope, slippage.	Severe: small stones, droughty, slope.
Bethesda----------	Severe: slope, slippage.	Severe: slope, slippage.	Severe: slope, slippage.	Severe: slope, slippage.	Severe: slope, slippage.	Severe: droughty, slope.
GnE, GnE3---------- Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
GoF*:						
Gilpin------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
GoF*:						
Berks	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
HbB Haubstadt	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength.	Moderate: wetness.
Hd Haymond	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding, frost action.	Severe: flooding.
HeA Henshaw	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength.	Moderate: wetness.
HkF Hickory	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
HoA Hosmer	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness.	Moderate: shrink-swell.	Severe: frost action.	Slight.
HoB2 Hosmer	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness.	Moderate: shrink-swell, slope.	Severe: frost action.	Slight.
HoC3 Hosmer	Moderate: wetness, slope.	Moderate: shrink-swell, slope.	Moderate: wetness, slope.	Severe: slope.	Severe: frost action.	Moderate: slope.
HoD3 Hosmer	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, frost action.	Severe: slope.
Hu Huntsville	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, frost action.	Slight.
IoA Iona	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Slight.
IvA Iva	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Ln Lindside	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding, frost action.	Severe: flooding.
MbC3 Markland	Moderate: too clayey, wetness, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: slope.
MgA McGary	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: low strength, shrink-swell.	Moderate: wetness.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Mt----------------- Montgomery	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: low strength, ponding, shrink-swell.	Severe: ponding, too clayey.
MuA---------------- Muren	Moderate: wetness.	Moderate: shrink-swell, wetness.	Severe: wetness.	Moderate: shrink-swell, wetness.	Severe: low strength, frost action.	Slight.
No----------------- Nolin	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Severe: flooding.
OtB2--------------- Otwell	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
OtC3--------------- Otwell	Moderate: too clayey, wetness, slope.	Moderate: shrink-swell, slope.	Moderate: wetness, slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
OtD3--------------- Otwell	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
PcB---------------- Pekin	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness, slope.	Severe: low strength, frost action.	Slight.
Pe----------------- Peoga	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness, frost action.	Severe: wetness.
Ph, Pm------------- Petrolia	Severe: ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: low strength, ponding, flooding.	Severe: ponding, flooding.
PpD3--------------- Pike	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
PrA---------------- Princeton	Severe: cutbanks cave.	Slight---------	Slight---------	Slight---------	Moderate: frost action.	Slight.
ReA---------------- Reesville	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Se----------------- Steff	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: low strength, frost action.	Moderate: wetness.
Sf----------------- Steff	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: low strength, flooding, frost action.	Severe: flooding.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
So------------------ Stendal	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Severe: flooding.
Sw------------------ Stonelick	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
SyB2---------------- Sylvan	Slight----------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
SyC3---------------- Sylvan	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
SyF----------------- Sylvan	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
Vn------------------ Vincennes Variant	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding, frost action.	Severe: wetness.
Wa------------------ Wakeland	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Severe: flooding.
WeE----------------- Wellston	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, frost action.	Severe: slope.
Wh------------------ Wilhite	Severe: ponding.	Severe: flooding, ponding.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding.	Severe: low strength, ponding, flooding.	Severe: ponding, flooding.
ZaB----------------- Zanesville	Moderate: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: slope, wetness.	Severe: low strength.	Slight.
ZaC3---------------- Zanesville	Moderate: slope, wetness.	Moderate: slope, wetness.	Severe: wetness.	Severe: slope.	Severe: low strength.	Moderate: slope.
ZaD3---------------- Zanesville	Severe: slope.	Severe: slope.	Severe: slope, wetness.	Severe: slope.	Severe: low strength, slope.	Severe: slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--SANITARY FACILITIES

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
AdA: Alford	Slight	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
AdB2: Alford	Slight	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
AdC2: Alford	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
AnB: Alvin	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: thin layer.
AoC*:					
Alvin	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Fair: slope, thin layer.
Bloomfield	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Ar: Armiesburg	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Poor: hard to pack.
Ay: Ayrshire	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Ba: Bartle	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Severe: wetness.	Poor: wetness.
Bb: Beaucoup	Severe: flooding, ponding, percs slowly.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Poor: ponding.
Bf: Belknap	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Bg: Belknap	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
Bh, Bk: Birds	Severe: flooding, ponding, percs slowly.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Poor: ponding.
BlF: Bloomfield	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor: seepage, too sandy, slope.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Bo, Bp: Bonnie	Severe: flooding, ponding, percs slowly.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Poor: ponding.
ClF: Chetwynd	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope, seepage.	Poor: slope.
DbA: Dubois	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Severe: wetness.	Poor: wetness.
Du*. Dumps					
EkA: Elkinsville	Slight	Moderate: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
FaB: Fairpoint	Severe: percs slowly.	Severe: slope.	Moderate: too clayey, large stones, slope.	Moderate: slope.	Poor: small stones.
FbC*:					
Fairpoint	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey, large stones.	Moderate: slope.	Poor: small stones.
Bethesda	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey, large stones.	Moderate: slope.	Poor: small stones.
FbG*:					
Fairpoint	Severe: percs slowly, slope, slippage.	Severe: slope, slippage.	Severe: slope, slippage.	Severe: slope, slippage.	Poor: small stones, slope.
Bethesda	Severe: percs slowly, slope, slippage.	Severe: slope.	Severe: slope, slippage.	Severe: slope.	Poor: small stones, slope.
GnE, GnE3: Gilpin	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Poor: slope, depth to rock, thin layer.
GoF*:					
Gilpin	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Poor: slope, depth to rock, thin layer.
Berks	Severe: slope, depth to rock.	Severe: slope, seepage, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage, depth to rock.	Poor: slope, small stones, depth to rock.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
HbB----------------- Haubstadt	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Moderate: wetness.	Fair: too clayey, wetness.
Hd------------------ Haymond	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Good.
HeA----------------- Henshaw	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
HkF----------------- Hickory	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
HoA----------------- Hosmer	Severe: wetness, percs slowly.	Slight-----------	Moderate: wetness, too clayey.	Moderate: wetness.	Fair: too clayey, wetness.
HoB2---------------- Hosmer	Severe: wetness, percs slowly.	Moderate: slope.	Moderate: wetness, too clayey.	Moderate: wetness.	Fair: too clayey, wetness.
HoC3---------------- Hosmer	Severe: wetness, percs slowly.	Severe: slope.	Moderate: wetness, slope, too clayey.	Moderate: wetness, slope.	Fair: too clayey, slope, wetness.
HoD3---------------- Hosmer	Severe: wetness, percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Hu------------------ Huntsville	Moderate: flooding, percs slowly.	Moderate: seepage.	Moderate: flooding.	Moderate: flooding.	Good.
IoA----------------- Iona	Severe: wetness, percs slowly.	Severe: wetness.	Moderate: wetness, too clayey.	Moderate: wetness.	Fair: too clayey, wetness.
IvA----------------- Iva	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Ln------------------ Lindside	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey, wetness.
MbC3---------------- Markland	Severe: wetness, percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
MgA----------------- McGary	Severe: wetness, percs slowly.	Slight-----------	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Mt------------------ Montgomery	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
MuA: Muren	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
No: Nolin	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey.
OtB2: Otwell	Severe: wetness, percs slowly.	Moderate: slope.	Moderate: wetness, too clayey.	Slight	Fair: too clayey, thin layer.
OtC3: Otwell	Severe: wetness, percs slowly.	Severe: slope.	Moderate: wetness, slope, too clayey.	Moderate: slope.	Fair: too clayey, slope, thin layer.
OtD3: Otwell	Severe: wetness, percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
PcB: Pekin	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
Pe: Peoga	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Ph, Pm: Petrolia	Severe: flooding, ponding, percs slowly.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Poor: ponding.
PpD3: Pike	Severe: slope.	Severe: slope.	Severe: seepage, slope.	Severe: slope.	Poor: slope.
PrA: Princeton	Slight	Severe: seepage.	Severe: seepage.	Slight	Good.
ReA: Reesville	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Se: Steff	Severe: wetness.	Severe: flooding, wetness, seepage.	Severe: wetness, seepage.	Severe: wetness, seepage.	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.
So: Stendal	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Sw: Stonelick	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding, seepage.	Poor: seepage.
SyB2: Sylvan	Slight	Moderate: seepage, slope.	Slight	Slight	Good.
SyC3: Sylvan	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
SyF: Sylvan	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Vn: Vincennes Variant	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
Wa: Wakeland	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
WeE: Wellston	Severe: slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.
Wh: Wilhite	Severe: flooding, ponding, percs slowly.	Severe: flooding, ponding.	Severe: flooding, ponding, too clayey.	Severe: flooding, ponding.	Poor: too clayey, ponding.
ZaB: Zanesville	Severe: percs slowly, wetness.	Severe: wetness.	Moderate: wetness, too clayey.	Moderate: wetness.	Fair: too clayey.
ZaC3: Zanesville	Severe: percs slowly, wetness.	Severe: slope, wetness.	Moderate: wetness, too clayey.	Moderate: slope, wetnesss.	Fair: slope, too clayey.
ZaD3: Zanesville	Severe: slope, percs slowly, wetness.	Severe: slope, wetness.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--CONSTRUCTION MATERIALS

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
AdA, AdB2 Alford	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
AdC2 Alford	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
AnB Alvin	Good	Probable	Improbable: too sandy.	Good.
AoC*:				
Alvin	Good	Probable	Improbable: too sandy.	Fair: slope.
Bloomfield	Good	Probable	Improbable: too sandy.	Fair: too sandy, slope.
Ar Armiesburg	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Ay Ayrshire	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Ba Bartle	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Bb Beaucoup	Poor: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Bf, Bg Belknap	Fair: thin layer, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Bh, Bk Birds	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
BlF Bloomfield	Poor: slope.	Probable	Improbable: too sandy.	Poor: slope.
Bo, Bp Bonnie	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
ClF Chetwynd	Poor: slope.	Probable	Improbable: too sandy.	Poor: slope.
DbA Dubois	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Du*. Dumps				
EkA Elkinsville	Good	Improbable: excess fines.	Improbable: excess fines.	Good.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
FaB: Fairpoint	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
FbC*:				
Fairpoint	Fair: large stones, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Bethesda	Fair: large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
FbG*:				
Fairpoint	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Bethesda	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
GnE: Gilpin	Poor: thin layer, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
GnE3: Gilpin	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
GoF*:				
Gilpin	Poor: thin layer, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
Berks	Poor: slope, depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
HbB: Haubstadt	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Hd: Haymond	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
HeA: Henshaw	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
HkF: Hickory	Fair: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
HoA, HoB2: Hosmer	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
HoC3: Hosmer	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
HoD3: Hosmer	Fair: low strength, wetness, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Hu: Huntsville	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
IoA: Iona	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
IvA: Iva	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
Ln: Lindside	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
MbC3: Markland	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
MgA: McGary	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Mt: Montgomery	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
MuA: Muren	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
No: Nolin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
OtB2: Otwell	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
OtC3: Otwell	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
OtD3: Otwell	Fair: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
PcB: Pekin	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Pe: Peoga	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Ph, Pm: Petrolia	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
PpD3: Pike	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
PrA: Princeton	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
ReA: Reesville	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Se, Sf: Steff	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
So: Stendal	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Sw: Stonelick	Good	Probable	Improbable: too sandy.	Poor: small stones.
SyB2: Sylvan	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
SyC3: Sylvan	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
SyF: Sylvan	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Vn: Vincennes Variant	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Wa: Wakeland	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
WeE: Wellston	Fair: thin layer, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Wh: Wilhite	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
ZaB, ZaC3: Zanesville	Severe: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
ZaD3: Zanesville	Severe: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--WATER MANAGEMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
AdA: Alford	Moderate: seepage.	Moderate: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
AdB2: Alford	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
AdC2: Alford	Severe: slope.	Moderate: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
AnB: Alvin	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing, slope.	Soil blowing	Favorable.
AoC*:						
Alvin	Severe: seepage, slope.	Severe: piping.	Deep to water	Soil blowing, slope.	Slope, soil blowing.	Slope.
Bloomfield	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty, rooting depth.
Ar: Armiesburg	Moderate: seepage.	Moderate: hard to pack.	Deep to water	Flooding	Favorable	Favorable.
Ay: Ayrshire	Moderate: seepage.	Severe: piping, wetness.	Frost action	Wetness, soil blowing.	Wetness, soil blowing.	Wetness.
Ba: Bartle	Moderate: seepage.	Moderate: piping, wetness.	Percs slowly, frost action.	Wetness, percs slowly, rooting depth.	Erodes easily, wetness, rooting depth.	Wetness, erodes easily, rooting depth.
Bb: Beaucoup	Slight	Severe: ponding.	Ponding, flooding, frost action.	Ponding, flooding.	Ponding	Wetness.
Bf: Belknap	Moderate: seepage.	Severe: piping, wetness.	Frost action	Wetness, erodes easily.	Erodes easily, wetness.	Wetness, erodes easily.
Bg: Belknap	Moderate: seepage.	Severe: piping, wetness.	Flooding, frost action.	Wetness, erodes easily.	Erodes easily, wetness.	Wetness, erodes easily.
Bh, Bk: Birds	Slight	Severe: ponding.	Ponding, flooding, frost action.	Ponding, erodes easily, flooding.	Erodes easily, ponding.	Wetness, erodes easily.
BlF: Bloomfield	Severe: seepage, slope.	Severe: seepage, piping.	Deep to water	Droughty, fast intake, soil blowing.	Slope, too sandy, soil blowing.	Slope, droughty, rooting depth.
Bo, Bp: Bonnie	Slight	Severe: ponding.	Ponding, flooding, frost action.	Ponding, erodes easily, flooding.	Erodes easily, ponding.	Wetness, erodes easily.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Features affecting-- Drainage	Features affecting-- Irrigation	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
ClF: Chetwynd	Severe: slope.	Moderate: thin layer, piping.	Deep to water	Slope	Slope	Slope.
DbA: Dubois	Slight	Severe: piping, wetness.	Percs slowly, frost action.	Wetness, percs slowly, rooting depth.	Erodes easily, wetness, rooting depth.	Wetness, erodes easily, rooting depth.
Du*. Dumps						
EkA: Elkinsville	Moderate: seepage.	Moderate: thin layer, piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
FaB: Fairpoint	Moderate: slope.	Severe: piping.	Deep to water	Droughty, rooting depth, slope.	Large stones, erodes easily.	Large stones, erodes easily.
FbC*:						
Fairpoint	Severe: slope.	Severe: piping.	Deep to water	Large stones, droughty, rooting depth.	Slope, large stones, erodes easily.	Large stones, slope, erodes easily.
Bethesda	Severe: slope.	Severe: seepage, piping.	Deep to water	Large stones, droughty, rooting depth.	Slope, large stones.	Large stones, slope, droughty.
FbG*:						
Fairpoint	Severe: slope, slippage.	Severe: piping.	Deep to water	Large stones, droughty, rooting depth.	Slope, large stones, erodes easily.	Large stones, slope, erodes easily.
Bethesda	Severe: slope, slippage.	Severe: seepage, piping.	Deep to water	Large stones, droughty, rooting depth.	Slope, large stones, slippage.	Large stones, slope, droughty.
GnE, GnE3: Gilpin	Severe: slope.	Severe: thin layer.	Deep to water	Slope, depth to rock.	Slope, depth to rock, large stones.	Slope, depth to rock, large stones.
GoF*:						
Gilpin	Severe: slope.	Severe: thin layer.	Deep to water	Slope, depth to rock.	Slope, depth to rock, large stones.	Slope, depth to rock, large stones.
Berks	Severe: seepage, slope.	Severe: seepage.	Deep to water	Slope, droughty, depth to rock.	Slope, depth to rock.	Slope, droughty, depth to rock.
HbB: Haubstadt	Moderate: seepage, slope.	Moderate: thin layer, piping, wetness.	Percs slowly, slope.	Wetness, percs slowly, rooting depth.	Erodes easily, wetness.	Erodes easily, rooting depth.
Hd: Haymond	Moderate: seepage.	Severe: piping.	Deep to water	Flooding	Erodes easily	Erodes easily.
HeA: Henshaw	Slight	Severe: piping, wetness.	Favorable	Wetness, erodes easily.	Erodes easily, wetness.	Wetness, erodes easily.
HkF: Hickory	Severe: slope.	Moderate: thin layer.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
HoA----------------- Hosmer	Moderate: seepage.	Severe: piping.	Percs slowly, frost action.	Wetness, percs slowly, rooting depth.	Erodes easily, wetness.	Erodes easily, rooting depth.
HoB2---------------- Hosmer	Moderate: seepage, slope.	Severe: piping.	Percs slowly, frost action, slope.	Wetness, percs slowly, rooting depth.	Erodes easily, wetness.	Erodes easily, rooting depth.
HoC3, HoD3---------- Hosmer	Severe: slope.	Severe: piping.	Percs slowly, frost action, slope.	Wetness, percs slowly, rooting depth.	Slope, erodes easily, wetness.	Slope, erodes easily, rooting depth.
Hu------------------ Huntsville	Moderate: seepage.	Moderate: thin layer, piping.	Deep to water	Favorable------	Favorable------	Favorable.
IoA----------------- Iona	Moderate: seepage.	Moderate: thin layer, wetness.	Frost action---	Wetness, erodes easily.	Erodes easily, wetness.	Erodes easily.
IvA----------------- Iva	Moderate: seepage.	Severe: thin layer, wetness.	Frost action---	Wetness, erodes easily.	Erodes easily, wetness.	Wetness, erodes easily.
Ln------------------ Lindside	Moderate: seepage.	Severe: piping.	Flooding, frost action.	Flooding, wetness, erodes easily.	Wetness, erodes easily.	Erodes easily.
MbC3---------------- Markland	Severe: slope.	Moderate: hard to pack.	Deep to water	Percs slowly, slope, erodes easily.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
MgA----------------- McGary	Slight---------	Severe: wetness.	Percs slowly---	Wetness, percs slowly, rooting depth.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, rooting depth.
Mt------------------ Montgomery	Slight---------	Severe: hard to pack, ponding.	Ponding, percs slowly.	Ponding, slow intake, percs slowly.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
MuA----------------- Muren	Moderate: seepage.	Moderate: thin layer, piping, wetness.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
No------------------ Nolin	Severe: seepage.	Severe: piping.	Deep to water	Erodes easily, flooding.	Erodes easily	Erodes easily.
OtB2---------------- Otwell	Moderate: slope.	Moderate: thin layer.	Deep to water	Percs slowly, rooting depth, slope.	Erodes easily, rooting depth.	Erodes easily, rooting depth.
OtC3, OtD3---------- Otwell	Severe: slope.	Moderate: thin layer.	Deep to water	Percs slowly, rooting depth, slope.	Slope, erodes easily, rooting depth.	Slope, erodes easily, rooting depth.
PcB----------------- Pekin	Moderate: seepage, slope.	Severe: piping.	Percs slowly, frost action, slope.	Wetness, percs slowly, rooting depth.	Erodes easily, wetness.	Erodes easily, rooting depth.
Pe------------------ Peoga	Slight---------	Severe: wetness.	Percs slowly, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
Ph, Pm: Petrolia	Slight	Severe: ponding.	Ponding, percs slowly, flooding.	Ponding, percs slowly, flooding.	Ponding, percs slowly.	Wetness, percs slowly.
PpD3: Pike	Severe: slope.	Moderate: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
PrA: Princeton	Moderate: seepage.	Moderate: thin layer, piping.	Deep to water	Soil blowing	Soil blowing	Favorable.
ReA: Reesville	Moderate: seepage.	Severe: piping.	Frost action	Wetness, erodes easily.	Erodes easily, wetness.	Wetness, erodes easily.
Se: Steff	Moderate: seepage.	Severe: piping, wetness.	Frost action	Wetness, erodes easily.	Erodes easily, wetness.	Erodes easily.
Sf: Steff	Moderate: seepage.	Severe: piping, wetness.	Flooding, frost action.	Wetness, erodes easily.	Erodes easily, wetness.	Erodes easily.
So: Stendal	Moderate: seepage.	Severe: piping, wetness.	Flooding, frost action.	Wetness, erodes easily, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
Sw: Stonelick	Severe: seepage.	Severe: seepage, piping.	Deep to water	Droughty, flooding.	Too sandy, soil blowing.	Droughty.
SyB2: Sylvan	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
SyC3, SyF: Sylvan	Severe: slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
Vn: Vincennes Variant	Moderate: seepage.	Severe: wetness.	Percs slowly, flooding, frost action.	Wetness, percs slowly, flooding.	Wetness, percs slowly.	Wetness, percs slowly.
Wa: Wakeland	Moderate: seepage.	Severe: piping, wetness.	Flooding, frost action.	Wetness, erodes easily, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
WeE: Wellston	Severe: slope.	Severe: piping.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
Wh: Wilhite	Slight	Severe: ponding.	Ponding, percs slowly, flooding.	Ponding, percs slowly.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
ZaB: Zanesville	Moderate: seepage.	Severe: piping.	Percs slowly, slope.	Percs slowly, wetness, rooting depth.	Erodes easily, wetness, rooting depth.	Erodes easily, rooting depth.
ZaC3, ZaD3: Zanesville	Moderate: seepage.	Severe: piping.	Percs slowly, slope.	Percs slowly, wetness, rooting depth.	Slope, erodes easily, wetness.	Slope, erodes easily, rooting depth.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--ENGINEERING INDEX PROPERTIES

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
AdA, AdB2, AdC2-- Alford	0-7	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	20-30	5-15
	7-73	Silty clay loam, silt loam.	CL	A-6, A-4	0	100	100	90-100	80-100	25-35	8-15
	73-80	Silt loam, silt	ML, CL-ML, CL	A-4	0	100	100	90-100	70-100	<25	NP-10
AnB-------------- Alvin	0-10	Fine sandy loam	SM, ML	A-4, A-2	0	100	100	80-95	30-60	<25	NP-4
	10-42	Fine sandy loam, sandy loam, loamy fine sand.	SM, SC, CL, ML	A-2, A-4, A-6	0	100	100	70-100	20-80	15-38	NP-13
	42-65	Stratified sandy loam to fine sand.	SM, SP, SP-SM	A-2, A-3	0-5	95-100	90-100	70-95	4-35	<20	NP-4
AoC*:											
Alvin-----------	0-8	Fine sandy loam	SM, ML	A-4, A-2	0	100	100	80-95	30-60	<25	NP-4
	8-62	Fine sandy loam, sandy loam, sandy clay loam.	SM, SC, CL, ML	A-2, A-4, A-6	0	100	100	70-100	20-80	15-38	NP-13
	62-80	Stratified sandy loam to fine sand.	SM, SP, SP-SM	A-2, A-3	0-5	95-100	90-100	70-95	4-35	<20	NP-4
Bloomfield------	0-28	Sand-------------	SM, SP, SP-SM	A-2-4, A-3	0	100	100	65-90	4-35	---	NP
	28-80	Fine sand, loamy fine sand, sand.	SP, SM, SP-SM	A-2-4, A-3	0	100	100	70-90	4-35	---	NP
	80-99	Fine sand, loamy fine sand, sand.	SM, SP, SP-SM	A-2-4, A-3	0	100	100	65-90	4-35	<20	NP-3
Ar--------------- Armiesburg	0-14	Silty clay loam	CL, CH	A-6, A-7	0	100	100	95-100	85-95	35-55	20-35
	14-60	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	95-100	85-95	35-55	20-35
Ay--------------- Ayrshire	0-13	Fine sandy loam	ML, CL-ML, SM, SM-SC	A-4	0	100	100	70-85	40-55	<20	NP-6
	13-60	Sandy loam, loam, sandy clay loam.	CL-ML, CL, SM-SC, SC	A-4, A-6	0	100	100	60-90	35-70	20-35	6-15
Ba--------------- Bartle	0-7	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	85-100	65-90	20-35	5-15
	7-27	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
	27-39	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	90-100	70-95	30-45	10-25
	39-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	70-95	30-45	10-25
Bb--------------- Beaucoup	0-10	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	85-100	30-45	15-25
	10-42	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	85-100	30-45	15-30
	42-60	Stratified very fine sandy loam to silty clay loam.	CL, CL-ML	A-6, A-7, A-4	0	100	100	90-100	65-95	25-45	5-25
Bf, Bg----------- Belknap	0-10	Silt loam--------	ML, CL, CL-ML	A-4	0	100	95-100	90-100	80-100	20-30	2-8
	10-60	Silt loam--------	ML, CL-ML, CL	A-4, A-6	0	100	95-100	90-100	80-100	20-35	NP-12

See footnote at end of table.

TABLE 16.--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	
Bh, Bk----------- Birds	0-8	Silt loam--------	CL	A-4, A-6	0	100	95-100	90-100	80-100	24-34	8-15
	8-60	Silt loam--------	CL	A-4, A-6	0	100	95-100	90-100	80-100	24-34	8-15
BlF-------------- Bloomfield	0-20	Loamy fine sand, loamy sand.	SM, SP, SP-SM	A-2-4, A-3	0	100	100	70-90	4-35	---	NP
	20-48	Fine sand, loamy sand, sand.	SP, SM, SP-SM	A-2-4, A-3	0	100	100	70-90	4-35	---	NP
	48-60	Fine sand, loamy sand, sand.	SM, SP, SP-SM	A-2-4, A-3	0	100	100	65-90	4-35	<20	NP-3
Bo--------------- Bonnie	0-9	Silt loam--------	CL	A-4, A-6	0	100	100	95-100	90-100	27-34	8-12
	9-48	Silt loam--------	CL	A-4, A-6	0	100	100	95-100	90-100	27-34	8-12
	48-60	Silt loam, silty clay loam.	CL	A-4, A-6	0	100	100	90-100	80-100	25-39	8-15
Bp--------------- Bonnie	0-6	Silt loam--------	CL	A-4, A-6	0	100	100	95-100	90-100	27-34	8-12
	6-16	Silt loam--------	CL	A-4, A-6	0	100	100	95-100	90-100	27-34	8-12
	16-60	Silt loam, silty clay loam.	CL	A-4, A-6	0	100	100	90-100	80-100	25-39	8-15
ClF-------------- Chetwynd	0-7	Silt loam--------	CL-ML, CL	A-4, A-6	0	90-100	85-100	75-95	60-95	22-33	4-12
	7-39	Clay loam, sandy clay loam, sandy loam.	SC, CL	A-4, A-6	0	90-100	85-100	70-95	40-75	20-35	8-18
	39-60	Stratified sand to sandy loam.	SW-SM, SM, SP-SM	A-2, A-1, A-3, A-4	0	75-95	65-95	35-65	6-38	---	NP
DbA-------------- Dubois	0-19	Silt loam--------	CL-ML, ML, CL	A-4	0	100	100	90-100	70-95	<25	3-8
	19-31	Silt loam, silty clay loam.	CL	A-4, A-6	0	100	100	90-100	80-95	25-35	8-15
	31-55	Silty clay loam, clay loam, silt loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	65-95	20-35	5-15
	55-70	Clay loam, loam, silt loam.	CL, CL-ML	A-6, A-4	0	100	95-100	85-100	65-95	20-40	5-15
Du*. Dumps											
EkA-------------- Elkinsville	0-10	Silt loam--------	CL-ML, ML	A-4	0	100	100	90-100	70-90	<25	NP-7
	10-26	Silty clay loam, silt loam.	CL	A-6, A-4	0	100	100	85-100	65-90	20-35	7-15
	26-56	Loam, sandy loam, clay loam.	CL, CL-ML, SC, SM-SC	A-4, A-6	0	100	90-100	75-100	45-80	20-35	5-15
	56-60	Silty clay loam, fine sandy loam, loam.	CL, CL-ML, SC, SM-SC	A-4, A-6	0	100	90-100	60-100	40-80	20-35	5-15
FaB-------------- Fairpoint	0-20	Silt loam--------	CL, CL-ML	A-4, A-6	0-5	90-100	80-100	70-100	50-90	20-40	4-18
	20-60	Gravelly clay loam, very shaly silty clay loam.	GC, CL, CL-ML, SC	A-4, A-6, A-7, A-2	15-30	55-75	25-65	20-65	15-60	25-50	4-24
FbC*: Fairpoint--------	0-3	Shaly silt loam	CL, CL-ML, SC, GC	A-4, A-6, A-2	5-15	55-90	45-85	40-85	30-75	20-40	4-18
	3-60	Gravelly clay loam, shaly silty clay loam.	GC, CL, CL-ML, SC	A-4, A-6, A-7, A-2	15-30	55-75	25-65	20-65	15-60	25-50	4-24

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
FbC*:											
Bethesda--------	0-3	Very shaly silty clay loam.	ML, GM, GM-GC, CL-ML	A-4, A-6	0-15	65-90	55-80	50-80	35-75	25-40	4-14
	3-60	Very shaly silty clay loam, very gravelly silty clay loam.	GM, GC, ML, CL	A-4, A-6, A-7, A-2	10-30	40-80	25-65	20-65	18-60	24-50	3-23
FbG*:											
Fairpoint-------	0-3	Very shaly silty clay loam.	CL, CL-ML, SC, GC	A-4, A-6, A-2	5-15	55-90	45-85	40-85	30-75	20-40	4-18
	3-60	Shaly silt loam, very shaly silty clay loam.	GC, CL, CL-ML, SC	A-4, A-6, A-7, A-2	15-30	55-75	25-65	20-65	15-60	25-50	4-24
Bethesda--------	0-3	Shaly silt loam	ML, GM, GM-GC, CL-ML	A-4, A-6	0-15	65-90	55-80	50-80	35-75	25-40	4-14
	3-60	Shaly silty clay loam, very shaly silty clay loam.	GM, GC, ML, CL	A-4, A-6, A-7, A-2	10-30	40-80	25-65	20-65	18-60	24-50	3-23
GnE, GnE3-------- Gilpin	0-6	Silt loam--------	CL, CL-ML	A-4, A-6	0-5	80-95	75-90	70-85	65-80	20-40	4-15
	6-30	Channery clay loam, loam, silty clay loam.	GC, SC, CL, CL-ML	A-2, A-4, A-6	0-30	50-95	45-90	35-85	30-80	20-40	4-15
	30-35	Channery loam, very channery silt loam, very shaly silty clay loam.	GC, GM-GC	A-1, A-2, A-4, A-6	0-35	25-55	20-50	15-45	15-40	20-40	4-15
	35	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
GoF*:											
Gilpin----------	0-2	Loam-------------	CL, CL-ML	A-4, A-6	0-5	80-95	75-90	70-85	65-80	20-40	4-15
	2-29	Channery loam, shaly silty clay loam, channery 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
	29-37	Channery loam, very channery silt loam, very shaly silty clay loam.	GC, GM-GC	A-1, A-2, A-4, A-6	0-35	25-55	20-50	15-45	15-40	20-40	4-15
	37	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Berks-----------	0-2	Loam-------------	CL, ML, CL-ML	A-4	0-10	80-100	75-100	65-85	50-75	25-36	5-10
	2-18	Channery loam, 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
	18-22	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
	22	Weathered bedrock	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 16.--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	
HbB-------------- Haubstadt	0-8	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	100	90-100	80-100	25-40	4-14
	8-27	Silt loam, silty clay loam.	CL, ML	A-6, A-4, A-7	0	100	100	90-100	80-100	25-45	9-19
	27-40	Loam, silt loam, clay loam.	CL	A-4, A-6, A-7	0	80-100	75-95	65-90	50-85	25-45	9-19
	40-80	Clay loam, loam, gravelly silty clay loam.	CL-ML, CL, GC, SC	A-6, A-4	0	65-90	55-90	50-85	40-75	20-40	4-20
Hd--------------- Haymond	0-10	Silt loam--------	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
	10-54	Silt loam--------	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
	54-60	Fine sandy loam, silt loam, loam.	ML, SM	A-4	0	95-100	90-100	80-100	35-90	27-36	4-10
HeA-------------- Henshaw	0-9	Silt loam--------	ML, CL, CL-ML	A-4	0	95-100	95-100	90-100	80-100	20-35	3-10
	9-48	Silty clay loam, silt loam.	CL	A-6, A-4	0	95-100	95-100	95-100	85-100	30-40	8-18
	48-60	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	95-100	90-100	85-100	75-100	25-40	5-15
HkF-------------- Hickory	0-23	Silt loam--------	CL	A-6, A-4	0-5	95-100	90-100	90-100	75-95	20-35	8-15
	23-50	Clay loam, silty clay loam.	CL	A-6, A-7	0-5	95-100	90-100	80-95	65-80	30-50	15-30
	50-60	Clay loam, sandy loam, loam.	CL-ML, CL	A-4, A-6	0-5	85-100	80-95	80-95	60-80	20-40	5-20
HoA, HoB2-------- Hosmer	0-8	Silt loam--------	ML, CL-ML, CL	A-4	0	100	100	90-100	70-90	<25	3-10
	8-31	Silt loam, silty clay loam.	CL, CL-ML, ML	A-4, A-6	0	100	100	90-100	70-95	25-35	5-15
	31-80	Silt loam, silty clay loam.	CL, CL-ML, ML	A-4, A-6	0	100	100	90-100	70-95	20-30	5-15
HoC3, HoD3------- Hosmer	0-6	Silt loam--------	ML, CL-ML, CL	A-4	0	100	100	90-100	70-90	<25	3-10
	6-32	Silt loam, silty clay loam.	CL, CL-ML, ML	A-4, A-6	0	100	100	90-100	70-95	25-35	5-15
	32-80	Silt loam, silty clay loam.	CL, CL-ML, ML	A-4, A-6	0	100	100	90-100	70-95	20-30	5-15
Hu--------------- Huntsville	0-31	Silt loam--------	CL	A-6	0	100	95-100	90-100	85-100	25-40	10-20
	31-53	Silt loam--------	CL	A-6	0	100	95-100	90-100	85-100	20-35	10-20
	53-60	Silt loam, loam, very fine sandy loam.	CL-ML, CL, SM-SC, SC	A-4, A-6, A-2	0	95-100	90-100	85-95	30-85	20-35	5-20
IoA-------------- Iona	0-10	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-35	5-15
	10-46	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	80-100	35-50	15-30
	46-60	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	20-35	5-15
IvA-------------- Iva	0-18	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-35	5-15
	18-42	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	80-100	35-50	15-30
	42-60	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
Ln--------------- Lindside	0-9	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	95-100	80-100	55-90	20-35	2-15
	9-60	Silty clay loam, silt loam, very fine sandy loam.	CL, ML, CL-ML	A-4, A-6	0	100	95-100	90-100	70-95	25-40	4-18

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
MbC3------------- Markland	0-6	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	30-45	10-20
	6-31	Silty clay, clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	90-95	45-60	19-32
	31-60	Stratified clay to silty clay loam.	CL, CH, ML, MH	A-7	0	100	100	90-100	75-95	40-55	15-25
MgA-------------- McGary	0-8	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	70-95	30-45	15-25
	8-38	Silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	90-100	45-60	25-35
	38-60	Stratified silty clay loam to clay.	CL, CH	A-6, A-7	0	95-100	95-100	95-100	85-100	35-55	20-35
Mt--------------- Montgomery	0-15	Silty clay--------	CH, CL	A-7	0	100	100	95-100	85-100	45-60	25-35
	15-50	Silty clay loam, silty clay.	CH	A-7	0	100	100	95-100	90-100	50-65	30-42
	50-60	Stratified clay to silty clay loam.	CL, CH	A-7	0	100	100	90-100	85-100	40-55	20-32
MuA-------------- Muren	0-12	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	20-30	5-15
	12-47	Silty clay loam, silt loam.	CL	A-6, A-4	0	100	100	90-100	80-100	25-35	8-15
	47-60	Silt loam, silt	CL, CL-ML, ML	A-4	0	100	100	90-100	70-90	<25	NP-10
No--------------- Nolin	0-10	Silty clay loam	ML, CL, CL-ML	A-4, A-6	0	100	95-100	90-100	80-100	25-40	5-18
	10-50	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	100	95-100	85-100	75-100	25-46	5-23
	50-60	Loam, silt loam, gravelly loam.	ML, CL, CL-ML, GM	A-4, A-6	0-10	50-100	50-100	40-95	35-95	<30	NP-15
OtB2------------- Otwell	0-6	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-95	25-35	5-15
	6-27	Silty clay loam, silt loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-95	25-40	5-20
	27-39	Silty clay loam, loam, silt loam.	CL	A-6, A-7	0	95-100	95-100	85-100	65-90	35-50	20-30
	39-90	Stratified silt loam to silty clay.	CL	A-6, A-7	0	95-100	90-100	85-100	80-95	35-50	15-25
OtC3, OtD3-------- Otwell	0-6	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-95	25-35	5-15
	6-11	Silty clay loam, silt loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-95	25-40	5-20
	11-46	Silty clay loam, loam, silt loam.	CL	A-6, A-7	0	95-100	95-100	85-100	65-90	35-50	20-30
	46-70	Stratified silt loam to silty clay.	CL	A-6, A-7	0	95-100	90-100	85-100	80-95	35-50	15-25
PcB-------------- Pekin	0-8	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	85-100	65-100	20-30	5-15
	8-29	Silt loam, silty clay loam.	CL	A-6	0	100	100	90-100	70-100	25-40	10-20
	29-56	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	88-98	65-90	25-35	5-15
	56-60	Stratified fine sandy loam to silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	80-95	50-85	20-40	5-15

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Pe---------------- Peoga	0-18	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-40	5-15
	18-59	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	85-100	35-50	20-30
	59-80	Stratified silty clay loam to silt loam.	CL, ML	A-6, A-7	0	100	100	90-100	70-95	35-50	10-25
Ph---------------- Petrolia	0-7	Silty clay loam	CL	A-6, A-7	0	100	95-100	90-100	80-100	30-45	12-20
	7-27	Silty clay loam	ML, CL	A-6, A-7	0	100	95-100	90-100	80-100	35-50	10-25
	27-60	Silty clay loam, silt loam.	CL	A-4, A-6, A-7	0	100	95-100	80-100	60-100	20-45	8-20
Pm---------------- Petrolia	0-8	Silty clay loam	CL	A-6, A-7	0	100	95-100	90-100	80-100	30-45	12-20
	8-60	Silty clay loam	ML, CL	A-6, A-7	0	100	95-100	90-100	80-100	35-50	10-25
PpD3-------------- Pike	0-6	Silt loam--------	CL	A-4, A-6	0	100	100	90-100	80-95	25-35	8-15
	6-44	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	95-100	85-100	80-90	30-45	10-25
	44-60	Silt loam, loam, sandy loam.	CL, SC	A-6, A-2-6	0	80-90	70-90	60-90	30-80	20-35	10-20
	60-80	Stratified sand to sandy clay loam.	CL-ML, ML, SM, SM-SC	A-4, A-2-4, A-1	0	70-90	65-85	35-70	15-65	<20	NP-5
PrA--------------- Princeton	0-8	Fine sandy loam	SM, SC, ML, CL	A-4, A-2-4	0	100	100	60-85	30-55	<25	NP-10
	8-56	Sandy clay loam, fine sandy loam, loam.	SC, CL	A-6	0	100	100	70-90	35-70	25-35	10-15
	56-60	Stratified loamy fine sand to loam.	SC, SM-SC, CL, CL-ML	A-4, A-6, A-2-4, A-2-6	0	100	100	60-90	30-70	15-25	5-15
ReA--------------- Reesville	0-12	Silt loam--------	ML, CL-ML	A-4	0	100	90-100	90-100	85-100	25-35	4-10
	12-32	Silty clay loam	CL, CL-ML	A-6, A-7, A-4	0	100	90-100	90-100	90-100	20-50	4-28
	32-39	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	90-100	85-100	80-90	20-40	4-20
	39-60	Loam, silt loam	ML, CL, CL-ML	A-4, A-6	0	90-100	85-95	80-90	70-90	20-40	3-18
Se, Sf------------ Steff	0-8	Silt loam--------	ML	A-4	0	95-100	90-100	80-100	55-95	<35	NP-10
	8-38	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
	38-60	Silt loam, channery silt 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
So---------------- Stendal	0-9	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	75-90	25-40	5-15
	9-60	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	75-90	25-40	5-15
Sw---------------- Stonelick	0-11	Fine sandy loam	SM, ML, SM-SC, CL-ML	A-4, A-2	0	85-100	70-100	45-75	25-55	<24	NP-6
	11-60	Stratified loam to loamy sand.	SM, SP-SM	A-2, A-4, A-3, A-1-b	0	85-100	70-95	40-60	5-40	<15	NP
SyB2-------------- Sylvan	0-8	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	8-39	Silt loam, silty clay loam.	CL, ML	A-4, A-6	0	100	100	100	95-100	30-40	7-15
	39-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-50	20-30

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
SyC3------------- Sylvan	0-6	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	6-29	Silt loam--------	CL, ML	A-4, A-6	0	100	100	100	95-100	30-40	7-15
	29-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-50	20-30
SyF-------------- Sylvan	0-5	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	100	95-100	25-35	5-15
	5-30	Silt loam--------	CL, ML	A-4, A-6	0	100	100	100	95-100	30-40	7-15
	30-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	100	95-100	35-50	20-30
Vn--------------- Vincennes Variant	0-9	Clay loam--------	CL	A-6	0	100	90-100	80-100	60-80	30-40	10-20
	9-51	Clay loam, sandy clay loam.	CL, SC	A-6	0	100	90-100	70-100	35-80	30-40	10-20
	51-60	Stratified clay loam to sand.	SC, CL, SM, ML	A-6, A-4, A-2	0	100	90-100	50-90	15-70	<35	NP-15
Wa--------------- Wakeland	0-8	Silt loam--------	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
	8-60	Silt loam--------	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
WeE-------------- Wellston	0-8	Silt loam--------	ML	A-4	0	95-100	90-100	85-100	70-95	25-35	3-10
	8-28	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
	28-60	Silt loam, loam, fine sandy 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
	60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Wh--------------- Wilhite	0-9	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	30-45	10-20
	9-47	Silty clay, silty clay loam.	CL, ML	A-6, A-7	0	100	100	95-100	85-95	35-50	12-21
	47-60	Silty clay, clay, silty clay loam.	CH, CL	A-6, A-7	0	100	100	90-100	80-95	35-60	12-30
ZaB-------------- Zanesville	0-7	Silt loam--------	CL-ML, CL, ML	A-4, A-6	0	95-100	95-100	90-100	80-100	25-40	4-15
	7-28	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	95-100	95-100	90-100	80-100	25-40	5-20
	28-68	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	0-3	90-100	85-100	80-100	60-100	20-40	2-20
	68-78	Sandy clay loam, clay loam, channery sandy clay loam.	SC, CL, SM, GM	A-6, A-4, A-2, A-1-b	0-10	65-100	50-100	40-100	20-85	20-40	2-20
	78	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
ZaC3, ZaD3-------- Zanesville	0-7	Silt loam--------	CL-ML, CL, ML	A-4, A-6	0	95-100	95-100	90-100	80-100	25-40	4-15
	7-21	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	95-100	95-100	90-100	80-100	25-40	5-20
	21-50	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	0-3	90-100	85-100	80-100	60-100	20-40	2-20
	50-65	Sandy clay loam, silt loam, channery sandy clay loam.	SC, CL, SM, GM	A-6, A-4, A-2, A-1-b	0-10	65-100	50-100	40-100	20-85	20-40	2-20
	65	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					Pct
AdA, AdB2, AdC2--	0-7	12-26	1.25-1.40	0.6-2.0	0.22-0.24	3.6-7.3	Low----------	0.37	5	5	1-2
Alford	7-73	22-30	1.35-1.50	0.6-2.0	0.18-0.20	3.6-6.0	Moderate-----	0.37			
	73-80	8-20	1.30-1.45	0.6-2.0	0.20-0.22	4.5-7.3	Low----------	0.37			
AnB--------------	0-10	10-15	1.45-1.65	2.0-6.0	0.14-0.20	5.1-6.5	Low----------	0.24	5	3	.5-1
Alvin	10-42	15-18	1.45-1.65	2.0-6.0	0.12-0.20	4.5-6.5	Low----------	0.24			
	42-65	3-10	1.55-1.75	2.0-6.0	0.05-0.13	5.1-7.8	Low----------	0.24			
AoC*:											
Alvin-----------	0-8	10-15	1.45-1.65	2.0-6.0	0.14-0.20	5.1-6.5	Low----------	0.24	5	3	.5-1
	8-62	15-18	1.45-1.65	2.0-6.0	0.12-0.20	4.5-6.5	Low----------	0.24			
	62-80	3-10	1.55-1.75	2.0-6.0	0.05-0.13	5.1-7.8	Low----------	0.24			
Bloomfield------	0-28	5-10	1.50-1.70	6.0-20	0.10-0.12	5.1-7.8	Low----------	0.15	5	2	.5-1
	28-80	2-10	1.60-1.80	6.0-20	0.06-0.11	5.1-7.3	Low----------	0.15			
	80-99	5-13	1.60-1.80	2.0-20	0.05-0.10	5.1-7.8	Low----------	0.15			
Ar---------------	0-14	25-35	1.30-1.45	0.6-2.0	0.21-0.23	6.1-7.3	Moderate-----	0.28	5	6	2-4
Armiesburg	14-60	30-35	1.30-1.45	0.6-2.0	0.18-0.20	6.1-7.8	Moderate-----	0.28			
Ay---------------	0-13	7-15	1.30-1.45	0.6-2.0	0.16-0.18	5.6-7.3	Low----------	0.24	5	3	.5-1
Ayrshire	13-60	16-27	1.40-1.60	0.2-0.6	0.12-0.19	5.1-8.4	Low----------	0.32			
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	1-2
Bartle	7-27	22-35	1.40-1.60	0.6-2.0	0.20-0.22	4.5-5.5	Low----------	0.43			
	27-39	22-35	1.60-1.80	<0.06	0.06-0.08	4.5-5.5	Low----------	0.43			
	39-60	22-35	1.40-1.60	0.2-0.6	0.15-0.18	5.1-7.3	Low----------	0.43			
Bb---------------	0-10	27-35	1.25-1.45	0.2-0.6	0.21-0.23	5.6-7.8	Moderate-----	0.32	5	7	2-4
Beaucoup	10-42	27-35	1.30-1.50	0.2-0.6	0.18-0.20	5.6-7.8	Moderate-----	0.32			
	42-60	15-30	1.35-1.55	0.2-0.6	0.18-0.22	5.6-7.8	Moderate-----	0.32			
Bf, Bg-----------	0-10	8-18	1.30-1.50	0.6-2.0	0.22-0.24	4.5-7.3	Low----------	0.37	5	5	1-3
Belknap	10-60	8-25	1.25-1.50	0.6-2.0	0.20-0.22	4.5-6.5	Low----------	0.37			
Bh, Bk-----------	0-8	15-25	1.20-1.40	0.2-0.6	0.22-0.24	5.6-7.8	Low----------	0.43	5	6	1-3
Birds	8-60	18-27	1.40-1.60	0.2-0.6	0.20-0.22	5.1-7.8	Low----------	0.43			
BlF--------------	0-20	5-10	1.50-1.70	6.0-20	0.10-0.12	5.1-7.8	Low----------	0.15	5	2	.5-2
Bloomfield	20-48	2-10	1.60-1.80	6.0-20	0.06-0.11	5.1-7.3	Low----------	0.15			
	48-60	5-13	1.60-1.80	6.0-20	0.05-0.10	5.1-7.8	Low----------	0.15			
Bo---------------	0-9	18-27	1.20-1.40	0.6-2.0	0.22-0.24	4.5-7.3	Low----------	0.43	5	6	1-2
Bonnie	9-48	18-27	1.40-1.60	0.2-0.6	0.20-0.22	4.5-5.5	Low----------	0.43			
	48-60	18-30	1.45-1.65	0.2-0.6	0.18-0.20	4.5-7.8	Low----------	0.43			
Bp---------------	0-6	18-27	1.20-1.40	0.6-2.0	0.22-0.24	4.5-7.3	Low----------	0.43	5	6	1-3
Bonnie	6-16	18-27	1.40-1.60	0.2-0.6	0.20-0.22	4.5-5.5	Low----------	0.43			
	16-60	18-30	1.45-1.65	0.2-0.6	0.18-0.20	4.5-7.8	Low----------	0.43			
ClF--------------	0-7	12-24	1.30-1.50	0.6-2.0	0.20-0.24	4.5-7.3	Low----------	0.32	5	5	1-3
Chetwynd	7-39	18-25	1.40-1.60	0.6-2.0	0.13-0.17	4.5-5.5	Moderate-----	0.32			
	39-60	3-10	1.40-1.60	2.0-6.0	0.12-0.19	5.1-6.0	Low----------	0.15			
DbA--------------	0-19	10-20	1.35-1.45	0.6-2.0	0.22-0.24	4.5-7.3	Low----------	0.43	4	5	1-3
Dubois	19-31	20-35	1.45-1.65	0.6-2.0	0.18-0.20	3.6-6.0	Moderate-----	0.43			
	31-55	16-30	1.75-1.85	<0.06	0.06-0.08	3.6-5.5	Moderate-----	0.43			
	55-70	15-35	1.45-1.65	<0.06	0.06-0.08	4.5-6.5	Moderate-----	0.43			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
Du*. Dumps											
EkA-------------- Elkinsville	0-10	7-18	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low-----------	0.37	5	5	1-2
	10-26	19-30	1.40-1.60	0.6-2.0	0.18-0.22	4.5-6.5	Moderate-----	0.37			
	26-56	16-30	1.45-1.65	0.6-2.0	0.15-0.19	4.5-5.5	Moderate-----	0.37			
	56-60	14-30	1.40-1.60	0.6-2.0	0.11-0.20	4.5-6.0	Low-----------	0.37			
FaB-------------- Fairpoint	0-20	18-27	1.35-1.50	0.6-2.0	0.14-0.20	5.6-7.3	Low-----------	0.43	3	6	<.5
	20-60	18-35	1.60-1.80	0.2-0.6	0.03-0.10	5.6-7.3	Moderate-----	0.32			
FbC*, FbG*:											
Fairpoint--------	0-3	18-27	1.40-1.55	0.6-2.0	0.09-0.18	5.6-7.3	Low-----------	0.37	5	6	<.5
	3-60	18-35	1.60-1.80	0.2-0.6	0.03-0.10	5.6-7.3	Moderate-----	0.37			
Bethesda---------	0-3	18-27	1.40-1.55	0.6-2.0	0.10-0.16	3.6-5.5	Low-----------	0.32	5	6	<.5
	3-60	18-35	1.60-1.90	0.2-0.6	0.04-0.13	3.6-5.5	Low-----------	0.32			
GnE, GnE3-------- Gilpin	0-6	15-27	1.20-1.40	0.6-2.0	0.12-0.18	3.6-5.5	Low-----------	0.32	3	6	1-4
	6-30	18-35	1.20-1.50	0.6-2.0	0.12-0.16	3.6-5.5	Low-----------	0.24			
	30-35	15-35	1.20-1.50	0.6-2.0	0.08-0.12	3.6-5.5	Low-----------	0.24			
	35	---	---	---	---	---	-------------	----			
GoF*:											
Gilpin-----------	0-2	15-27	1.20-1.40	0.6-2.0	0.12-0.18	3.6-5.5	Low-----------	0.32	3	6	1-4
	2-29	18-35	1.20-1.50	0.6-2.0	0.12-0.16	3.6-5.5	Low-----------	0.24			
	29-37	15-35	1.20-1.50	0.6-2.0	0.08-0.12	3.6-5.5	Low-----------	0.24			
	37	---	---	---	---	---	-------------	----			
Berks------------	0-2	5-23	1.20-1.50	0.6-6.0	0.12-0.17	3.6-6.5	Low-----------	0.24	3	5	1-3
	2-18	5-32	1.20-1.60	0.6-6.0	0.04-0.10	3.6-6.5	Low-----------	0.17			
	18-22	5-20	1.20-1.60	2.0-6.0	0.04-0.10	3.6-6.5	Low-----------	0.17			
	22	---	---	---	---	---	-------------	----			
HbB-------------- Haubstadt	0-8	18-27	1.25-1.40	0.6-2.0	0.18-0.20	4.5-6.5	Low-----------	0.43	3	6	1-2
	8-27	20-35	1.30-1.45	0.6-2.0	0.16-0.19	4.5-5.5	Low-----------	0.43			
	27-40	24-35	1.60-1.80	0.06-0.2	0.06-0.08	4.5-5.5	Moderate-----	0.43			
	40-80	18-30	1.55-1.65	0.6-2.0	0.12-0.16	4.5-7.3	Low-----------	0.43			
Hd--------------- Haymond	0-10	10-18	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low-----------	0.37	5	5	1-3
	10-54	10-18	1.30-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low-----------	0.37			
	54-60	10-18	1.30-1.45	0.6-2.0	0.20-0.22	6.1-7.3	Low-----------	0.37			
HeA-------------- Henshaw	0-9	12-27	1.20-1.40	0.6-2.0	0.18-0.23	5.6-6.5	Low-----------	0.43	4	5	.5-2
	9-48	18-34	1.20-1.40	0.2-0.6	0.15-0.19	5.1-7.8	Low-----------	0.43			
	48-60	15-34	1.20-1.40	0.2-0.6	0.17-0.22	6.6-8.4	Low-----------	0.43			
HkF-------------- Hickory	0-23	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
	23-50	27-35	1.45-1.65	0.6-2.0	0.15-0.19	4.5-6.0	Moderate-----	0.37			
	50-60	15-32	1.50-1.70	0.6-2.0	0.11-0.19	5.1-8.4	Low-----------	0.37			
HoA, HoB2-------- Hosmer	0-8	10-17	1.20-1.40	0.6-2.0	0.22-0.24	4.5-6.5	Low-----------	0.43	4	5	1-2
	8-31	24-30	1.30-1.50	0.6-2.0	0.18-0.22	4.5-5.5	Moderate-----	0.43			
	31-80	16-26	1.60-1.70	<0.06	0.06-0.08	4.5-6.0	Low-----------	0.43			
HoC3, HoD3------- Hosmer	0-6	10-17	1.20-1.40	0.6-2.0	0.22-0.24	4.5-6.5	Low-----------	0.43	4	5	.5-2
	6-32	24-30	1.30-1.50	0.6-2.0	0.18-0.22	4.5-5.5	Moderate-----	0.43			
	32-80	16-26	1.60-1.70	<0.06	0.06-0.08	4.5-6.0	Low-----------	0.43			
Hu--------------- Huntsville	0-31	18-27	1.15-1.35	0.6-2.0	0.22-0.24	5.6-7.8	Moderate-----	0.28	5	6	3-4
	31-53	18-27	1.20-1.40	0.6-2.0	0.20-0.22	5.6-7.8	Moderate-----	0.28			
	53-60	10-25	1.20-1.50	0.6-2.0	0.17-0.21	5.6-7.8	Low-----------	0.28			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					Pct
IoA--------------	0-10	10-27	1.30-1.50	0.6-2.0	0.22-0.24	5.1-7.3	Low-----------	0.37	5	5	1-4
Iona	10-46	18-35	1.40-1.60	0.2-0.6	0.18-0.22	5.1-7.3	Moderate------	0.37			
	46-60	10-27	1.30-1.40	0.6-2.0	0.20-0.22	7.4-8.4	Low-----------	0.37			
IvA--------------	0-18	18-27	1.25-1.40	0.6-2.0	0.22-0.24	5.1-7.3	Low-----------	0.43	4	5	1-3
Iva	18-42	22-30	1.35-1.55	0.6-2.0	0.18-0.20	5.1-6.5	Moderate------	0.43			
	42-60	10-20	1.35-1.55	0.6-2.0	0.20-0.22	5.6-6.5	Low-----------	0.43			
Ln---------------	0-9	15-27	1.20-1.40	0.6-2.0	0.20-0.26	5.1-7.8	Low-----------	0.32	5	6	2-4
Lindside	9-60	18-35	1.20-1.40	0.6-2.0	0.17-0.22	5.1-7.8	Low-----------	0.37			
MbC3-------------	0-6	28-40	1.35-1.50	0.2-0.6	0.18-0.20	5.1-7.3	Moderate------	0.43	2	7	.5-3
Markland	6-31	40-55	1.55-1.70	0.06-0.2	0.11-0.13	5.1-8.4	High----------	0.32			
	31-60	35-50	1.55-1.70	0.06-0.2	0.09-0.11	7.4-8.4	High----------	0.32			
MgA--------------	0-8	28-40	1.40-1.60	0.2-0.6	0.20-0.22	6.6-7.3	Moderate------	0.43	3	7	1-4
McGary	8-38	35-50	1.60-1.75	0.06-0.2	0.11-0.13	5.6-7.8	High----------	0.32			
	38-60	35-50	1.60-1.75	0.06-0.2	0.14-0.16	7.9-8.4	High----------	0.32			
Mt---------------	0-15	40-48	1.40-1.60	0.2-0.6	0.12-0.14	6.1-7.8	High----------	0.37	5	4	3-6
Montgomery	15-50	40-55	1.45-1.65	0.06-0.2	0.11-0.18	6.1-7.8	High----------	0.37			
	50-60	35-48	1.50-1.70	0.06-0.2	0.18-0.20	7.4-8.4	Moderate------	0.37			
MuA--------------	0-12	15-27	1.25-1.40	0.6-2.0	0.22-0.24	5.1-6.5	Low-----------	0.37	5	5	.5-2
Muren	12-47	22-30	1.35-1.50	0.6-2.0	0.18-0.20	4.5-6.0	Moderate------	0.37			
	47-60	8-20	1.30-1.45	0.6-2.0	0.20-0.22	5.6-6.5	Low-----------	0.37			
No---------------	0-10	27-35	1.20-1.40	0.6-2.0	0.18-0.23	5.6-8.4	Low-----------	0.43	5	7	2-4
Nolin	10-50	18-35	1.25-1.50	0.6-2.0	0.18-0.23	5.6-8.4	Low-----------	0.43			
	50-60	10-30	1.30-1.55	0.6-6.0	0.10-0.23	5.1-8.4	Low-----------	0.43			
OtB2-------------	0-6	18-27	1.25-1.40	0.6-2.0	0.22-0.24	4.5-7.3	Low-----------	0.43	3	5	.5-2
Otwell	6-27	22-35	1.30-1.45	0.06-0.2	0.18-0.22	5.1-5.5	Low-----------	0.43			
	27-39	18-30	1.60-1.80	<0.06	0.06-0.08	4.5-5.5	Moderate------	0.43			
	39-90	20-30	1.55-1.65	0.06-0.2	0.19-0.21	5.1-5.5	Moderate------	0.43			
OtC3, OtD3-------	0-6	18-27	1.25-1.40	0.6-2.0	0.22-0.24	4.5-7.3	Low-----------	0.43	3	5	.5-2
Otwell	6-11	22-35	1.30-1.45	0.06-0.2	0.18-0.22	4.5-5.5	Low-----------	0.43			
	11-46	18-30	1.60-1.80	<0.06	0.06-0.08	4.5-5.5	Moderate------	0.43			
	46-70	20-30	1.55-1.65	0.06-0.2	0.19-0.21	5.1-6.5	Moderate------	0.43			
PcB--------------	0-8	15-26	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low-----------	0.43	4	5	1-3
Pekin	8-29	25-35	1.40-1.60	0.6-2.0	0.20-0.22	4.5-5.5	Low-----------	0.43			
	29-56	22-30	1.60-1.80	<0.06	0.06-0.08	4.5-5.5	Low-----------	0.43			
	56-60	20-34	1.40-1.60	0.6-2.0	0.06-0.08	4.5-7.3	Low-----------	0.43			
Pe---------------	0-18	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
Peoga	18-59	22-34	1.40-1.60	0.06-0.2	0.18-0.20	4.5-5.5	Moderate------	0.43			
	59-80	20-34	1.40-1.60	0.06-0.2	0.19-0.21	4.5-6.5	Low-----------	0.43			
Ph---------------	0-7	27-35	1.20-1.40	0.2-0.6	0.21-0.23	5.6-8.4	Moderate------	0.32	5	7	2-3
Petrolia	7-27	27-35	1.35-1.45	0.2-0.6	0.18-0.20	6.1-7.3	Moderate------	0.32			
	27-60	20-35	1.40-1.60	0.2-0.6	0.18-0.20	4.5-7.8	Moderate------	0.32			
Pm---------------	0-8	27-35	1.20-1.40	0.2-0.6	0.21-0.23	5.6-8.4	Moderate------	0.32	5	7	2-3
Petrolia	8-60	27-35	1.35-1.45	0.2-0.6	0.18-0.20	6.1-7.3	Moderate------	0.32			
PpD3-------------	0-6	18-27	1.25-1.40	0.6-2.0	0.22-0.24	5.1-7.3	Low-----------	0.37	5	5	.5-2
Pike	6-44	22-35	1.30-1.45	0.6-2.0	0.18-0.22	4.5-6.0	Low-----------	0.37			
	44-60	18-35	1.30-1.45	0.6-2.0	0.12-0.18	4.5-5.5	Low-----------	0.37			
	60-80	14-20	1.45-1.65	2.0-6.0	0.05-0.12	4.5-8.4	Low-----------	0.37			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
PrA-------------- Princeton	0-8	12-20	1.35-1.50	0.6-2.0	0.13-0.18	5.6-7.3	Low----------	0.24	5	3	.5-3
	8-56	18-25	1.40-1.55	0.6-2.0	0.16-0.18	5.1-6.5	Low----------	0.32			
	56-60	8-18	1.40-1.55	2.0-6.0	0.12-0.14	5.1-7.3	Low----------	0.32			
ReA-------------- Reesville	0-12	12-20	1.20-1.45	0.6-2.0	0.17-0.24	5.1-7.3	Low----------	0.37	5	5	2-4
	12-32	27-35	1.30-1.55	0.6-2.0	0.17-0.22	5.1-7.8	Moderate-----	0.37			
	32-39	20-25	1.30-1.60	0.6-2.0	0.15-0.20	6.6-8.4	Low----------	0.37			
	39-60	12-25	1.45-1.70	0.2-0.6	0.15-0.18	7.4-8.4	Low----------	0.37			
Se, Sf----------- Steff	0-8	12-25	1.30-1.50	0.6-2.0	0.15-0.23	4.5-7.3	Low----------	0.43	5	5	1-2
	8-38	12-34	1.30-1.55	0.6-2.0	0.18-0.23	4.5-6.5	Low----------	0.43			
	38-60	10-25	1.40-1.65	0.6-6.0	0.08-0.21	4.5-5.5	Low----------	0.43			
So--------------- Stendal	0-9	18-35	1.30-1.45	0.6-2.0	0.22-0.24	4.5-6.5	Low----------	0.37	5	5	1-3
	9-60	18-35	1.45-1.65	0.6-2.0	0.20-0.22	4.5-5.5	Low----------	0.37			
Sw--------------- Stonelick	0-11	8-18	1.25-1.50	2.0-6.0	0.09-0.14	5.6-8.4	Low----------	0.24	5	3	.5-2
	11-60	5-18	1.20-1.55	2.0-6.0	0.05-0.11	7.4-8.4	Low----------	0.24			
SyB2------------- Sylvan	0-8	18-27	1.20-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.37	5	6	1-2
	8-39	15-25	1.25-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low----------	0.37			
	39-60	25-35	1.30-1.50	0.6-2.0	0.18-0.20	5.6-8.4	Moderate-----	0.37			
SyC3------------- Sylvan	0-6	18-27	1.20-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.37	5	6	.5-1
	6-29	15-25	1.25-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low----------	0.37			
	29-60	25-35	1.30-1.50	0.6-2.0	0.18-0.20	5.6-8.4	Moderate-----	0.37			
SyF-------------- Sylvan	0-5	18-27	1.20-1.40	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.37	5	6	1-2
	5-30	15-25	1.25-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low----------	0.37			
	30-60	25-35	1.30-1.50	0.6-2.0	0.18-0.20	5.6-7.3	Moderate-----	0.37			
Vn--------------- Vincennes Variant	0-9	27-32	1.30-1.45	0.6-2.0	0.17-0.19	5.1-7.3	Moderate-----	0.32	5	7	1-2
	9-51	25-35	1.40-1.60	0.06-0.2	0.15-0.19	5.1-6.0	Moderate-----	0.32			
	51-60	10-30	1.50-1.70	0.2-0.6	0.10-0.14	5.6-7.3	Low----------	0.32			
Wa--------------- Wakeland	0-8	10-17	1.30-1.50	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.37	5	5	1-3
	8-60	10-17	1.30-1.50	0.6-2.0	0.20-0.22	5.6-7.3	Low----------	0.37			
WeE-------------- Wellston	0-8	13-27	1.30-1.50	0.6-2.0	0.18-0.22	4.5-6.5	Low----------	0.37	4	6	1-3
	8-28	18-35	1.30-1.65	0.6-2.0	0.17-0.21	4.5-6.0	Low----------	0.37			
	28-60	15-30	1.30-1.60	0.6-2.0	0.12-0.17	4.5-6.0	Low----------	0.37			
	60	---	---	---	---	---	-------------	----			
Wh--------------- Wilhite	0-9	27-40	1.50-1.55	0.2-0.6	0.21-0.23	5.1-7.3	Moderate-----	0.37	5	7	1-3
	9-47	35-45	1.40-1.65	<0.06	0.08-0.18	5.1-6.5	Moderate-----	0.32			
	47-60	35-50	1.40-1.65	<0.06	0.08-0.18	5.1-6.5	High---------	0.32			
ZaB-------------- Zanesville	0-7	12-27	1.35-1.40	0.6-2.0	0.19-0.23	4.5-5.5	Low----------	0.43	3	5	1-2
	7-28	18-35	1.35-1.45	0.6-2.0	0.17-0.22	4.5-5.5	Low----------	0.37			
	28-68	18-33	1.50-1.75	0.06-0.6	0.08-0.12	4.5-5.5	Low----------	0.37			
	68-78	20-40	1.50-1.70	0.2-2.0	0.08-0.12	4.5-5.5	Low----------	0.28			
	78	---	---	---	---	---	-------------	----			
ZaC3, ZaD3------- Zanesville	0-7	12-27	1.35-1.40	0.6-2.0	0.19-0.23	4.5-5.5	Low----------	0.43	3	5	.5-1
	7-21	18-35	1.35-1.45	0.6-2.0	0.17-0.22	4.5-5.5	Low----------	0.37			
	21-50	18-33	1.50-1.75	0.06-0.6	0.08-0.12	4.5-5.5	Low----------	0.37			
	50-65	20-40	1.50-1.70	0.2-2.0	0.08-0.12	4.5-5.5	Low----------	0.28			
	65	---	---	---	---	---	-------------	----			

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--SOIL AND WATER FEATURES

("Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
AdA, AdB2, AdC2--- Alford	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Moderate	High.
AnB--------------- Alvin	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	High.
AoC*:												
Alvin------------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	High.
Bloomfield-------	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Low------	High.
Ar---------------- Armiesburg	B	Occasional	Brief-----	Oct-Jun	>6.0	---	---	>60	---	High-----	Moderate	Low.
Ay---------------- Ayrshire	C	None--------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Moderate.
Ba---------------- Bartle	D	None--------	---	---	1.0-2.0	Perched	Jan-Apr	>60	---	High-----	High-----	High.
Bb---------------- Beaucoup	B/D	Frequent----	Brief-----	Mar-Jun	+.5-2.0	Apparent	Mar-Jun	>60	---	High-----	High-----	Low.
Bf---------------- Belknap	C	Rare--------	---	---	1.0-3.0	Apparent	Jan-Jun	>60	---	High-----	High-----	High.
Bg---------------- Belknap	C	Frequent----	Brief to long.	Jan-Jun	1.0-3.0	Apparent	Jan-Jun	>60	---	High-----	High-----	High.
Bh---------------- Birds	C/D	Occasional	Brief-----	Mar-Jun	+.5-1.0	Apparent	Mar-Jun	>60	---	High-----	High-----	Moderate.
Bk---------------- Birds	C/D	Frequent----	Long------	Mar-Jun	+.5-1.0	Apparent	Mar-Jun	>60	---	High-----	High-----	Moderate.
BlF--------------- Bloomfield	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Low------	High.
Bo, Bp------------ Bonnie	C/D	Frequent----	Brief to long.	Jan-Jun	+.5-1.0	Apparent	Jan-Jun	>60	---	High-----	High-----	High.
ClF--------------- Chetwynd	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	High.

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
DbA: Dubois	C	None	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High	High	High.
Du*. Dumps												
EkA: Elkinsville	B	None	---	---	>6.0	---	---	>60	---	High	Moderate	High.
FaB: Fairpoint	C	None	---	---	>6.0	---	---	>60	---	Moderate	High	Moderate.
FbC*, FbG*:												
Fairpoint	C	None	---	---	>6.0	---	---	>60	---	Moderate	High	Moderate.
Bethesda	C	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	High.
GnE, GnE3: Gilpin	C	None	---	---	>6.0	---	---	20-40	Soft	Moderate	Low	High.
GoF*:												
Gilpin	C	None	---	---	>6.0	---	---	20-40	Soft	Moderate	Low	High.
Berks	C	None	---	---	>6.0	---	---	20-40	Soft	Low	Low	High.
HbB: Haubstadt	C	None	---	---	1.5-3.0	Perched	Jan-Apr	>60	---	Moderate	Moderate	High.
Hd: Haymond	B	Frequent	Brief	Jan-May	>6.0	---	---	>60	---	High	Low	Low.
HeA: Henshaw	C	None	---	---	1.0-2.0	Apparent	Nov-Mar	>60	---	High	High	Moderate.
HkF: Hickory	C	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
HoA, HoB2, HoC3, HoD3: Hosmer	C	None	---	---	2.5-3.0	Perched	Mar-Apr	>60	---	High	Moderate	High.
Hu: Huntsville	B	Rare	---	---	>6.0	---	---	>60	---	High	Low	Low.
IoA: Iona	B	None	---	---	2.0-4.0	Perched	Mar-Apr	>60	---	High	High	Moderate.
IvA: Iva	C	None	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High	High	Moderate.

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
Ln. Lindside	C	Frequent	Brief	Dec-Apr	1.5-3.0	Apparent	Dec-Apr	>60	---	High	Moderate	Low.
MbC3. Markland	C	None	---	---	3.0-6.0	Perched	Mar-Apr	>60	---	Moderate	High	Moderate.
MgA. McGary	C	None	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	Moderate	High	Low.
Mt. Montgomery	D	None	---	---	+1-1.0	Apparent	Dec-May	>60	---	Moderate	High	Low.
MuA. Muren	B	None	---	---	2.0-6.0	Apparent	Mar-Apr	>60	---	High	High	Moderate.
No. Nolin	B	Frequent	Brief to long.	Feb-May	3.0-6.0	Apparent	Feb-Mar	>60	---	High	Low	Moderate.
OtB2, OtC3, OtD3. Otwell	C	None	---	---	3.5-6.0	Perched	Jan-Apr	>60	---	High	Moderate	High.
PcB. Pekin	C	None	---	---	2.0-6.0	Apparent	Mar-Apr	>60	---	High	Moderate	High.
Pe. Peoga	C	None	---	---	0-1.0	Apparent	Jan-May	>60	---	High	High	High.
Ph, Pm. Petrolia	C/D	Frequent	Long to very long.	Mar-Jun	+.5-3.0	Apparent	Apr-Jun	>60	---	High	High	Low.
PpD3. Pike	B	None	---	---	>6.0	---	---	>60	---	High	Low	High.
PrA. Princeton	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
ReA. Reesville	C	None	---	---	1.0-2.5	Perched	Jan-Apr	>60	---	High	High	Moderate.
Se. Steff	C	Rare	---	---	1.5-3.0	Apparent	Dec-Apr	>60	---	High	Moderate	High.
Sf. Steff	C	Frequent	Brief	Dec-Apr	1.5-3.0	Apparent	Dec-Apr	>60	---	High	Moderate	High.
So. Stendal	C	Frequent	Brief	Jan-May	1.0-3.0	Apparent	Jan-Apr	>60	---	High	High	High.

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
Sw---------------- Stonelick	B	Frequent----	Very brief	Nov-Jun	>6.0	---	---	>60	---	Moderate	Low------	Low.
SyB2, SyC3, SyF--- Sylvan	B	None---------	---	---	>6.0	---	---	>60	---	High-----	Moderate	Moderate.
Vn---------------- Vincennes Variant	C/D	Occasional	Brief-----	Jan-May	0-1.0	Apparent	Jan-May	>60	---	High-----	High-----	Moderate.
Wa---------------- Wakeland	C	Frequent----	Brief to long.	Jan-May	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Low.
WeE--------------- Wellston	B	None---------	---	---	>6.0	---	---	>40	Hard	High-----	Moderate	High.
Wh---------------- Wilhite	C/D	Frequent----	Brief to long.	Dec-Jun	+.5-1.0	Apparent	Dec-May	>60	---	Moderate	High-----	Moderate.
ZaB, ZaC3, ZaD3--- Zanesville	C	None---------	---	---	2.0-3.0	Perched	Dec-Apr	>60	---	High-----	Moderate	High.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 19.--CLASSIFICATION OF THE SOILS

(An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series)

Soil name	Family or higher taxonomic class
*Alford	Fine-silty, mixed, mesic Typic Hapludalfs
Alvin	Coarse-loamy, mixed, mesic Typic Hapludalfs
Armiesburg	Fine-silty, mixed, mesic Fluventic Hapludolls
Ayrshire	Fine-loamy, mixed, mesic Aeric Ochraqualfs
*Bartle	Fine-silty, mixed, mesic Aeric Fragiaqualfs
Beaucoup	Fine-silty, mixed, mesic Fluvaquentic Haplaquolls
Belknap	Coarse-silty, mixed, acid, mesic Aeric Fluvaquents
Berks	Loamy-skeletal, mixed, mesic Typic Dystrochrepts
Bethesda	Loamy-skeletal, mixed, acid, mesic Typic Udorthents
Birds	Fine-silty, mixed, nonacid, mesic Typic Fluvaquents
Bloomfield	Sandy, mixed, mesic Psammentic Hapludalfs
Bonnie	Fine-silty, mixed, acid, mesic Typic Fluvaquents
Chetwynd	Fine-loamy, mixed, mesic Typic Hapludults
Dubois	Fine-silty, mixed, mesic Aeric Fragiaqualfs
Elkinsville	Fine-silty, mixed, mesic Ultic Hapludalfs
Fairpoint	Loamy-skeletal, mixed, nonacid, mesic Typic Udorthents
Gilpin	Fine-loamy, mixed, mesic Typic Hapludults
Haubstadt	Fine-silty, mixed, mesic Aquic Fragiudalfs
Haymond	Coarse-silty, mixed, nonacid, mesic Typic Udifluvents
Henshaw	Fine-silty, mixed, mesic Aquic Hapludalfs
*Hickory	Fine-loamy, mixed, mesic Typic Hapludalfs
Hosmer	Fine-silty, mixed, mesic Typic Fragiudalfs
Huntsville	Fine-silty, mixed, mesic Cumulic Hapludolls
Iona	Fine-silty, mixed, mesic Typic Hapludalfs
Iva	Fine-silty, mixed, mesic Aeric Ochraqualfs
Lindside	Fine-silty, mixed, mesic Fluvaquentic Eutrochrepts
Markland	Fine, mixed, mesic Typic Hapludalfs
McGary	Fine, mixed, mesic Aeric Ochraqualfs
Montgomery	Fine, mixed, mesic Typic Haplaquolls
*Muren	Fine-silty, mixed, mesic Aquic Hapludalfs
Nolin	Fine-silty, mixed, mesic Dystric Fluventic Eutrochrepts
Otwell	Fine-silty, mixed, mesic Typic Fragiudalfs
Pekin	Fine-silty, mixed, mesic Aquic Fragiudalfs
Peoga	Fine-silty, mixed, mesic Typic Ochraqualfs
Petrolia	Fine-silty, mixed, nonacid, mesic Typic Fluvaquents
Pike	Fine-silty, mixed, mesic Ultic Hapludalfs
*Princeton	Fine-loamy, mixed, mesic Typic Hapludalfs
Reesville	Fine-silty, mixed, mesic Aeric Ochraqualfs
Steff	Fine-silty, mixed, mesic Fluvaquentic Dystrochrepts
Stendal	Fine-silty, mixed, acid, mesic Aeric Fluvaquents
*Stonelick	Coarse-loamy, mixed (calcareous), mesic Typic Udifluvents
Sylvan	Fine-silty, mixed, mesic Typic Hapludalfs
Vincennes Variant	Fine-loamy, mixed, nonacid, mesic Typic Fluvaquents
Wakeland	Coarse-silty, mixed, nonacid, mesic Aeric Fluvaquents
*Wellston	Fine-silty, mixed, mesic Ultic Hapludalfs
Wilhite	Fine, mixed, nonacid, mesic Typic Fluvaquents
Zanesville	Fine-silty, mixed, mesic Typic Fragiudalfs

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