United States Department of Agriculture

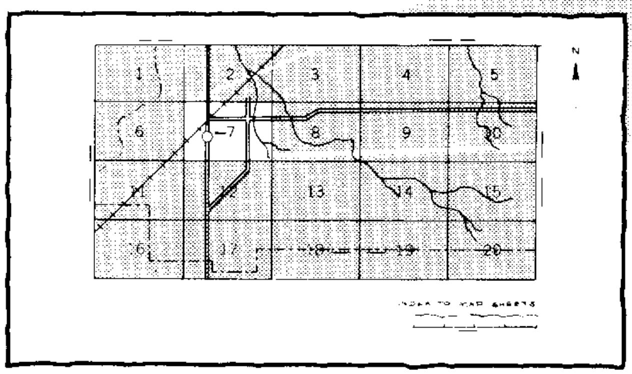
Soil Conservation Service

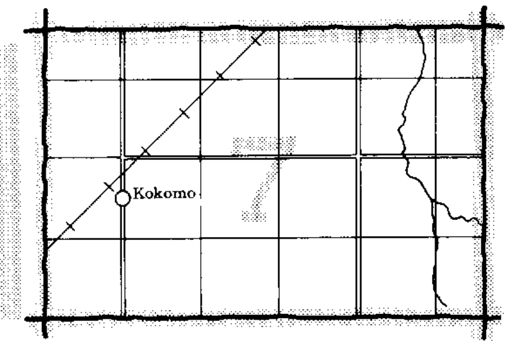
In cooperation with the United States Department of Agriculture, Forest Service, the Purdue University Agricultural Experiment Station, and the Indiana Department of Natural Resources Soil and Water Conservation Committee

Soil Survey of Lawrence County, Indiana

HOW TO USE

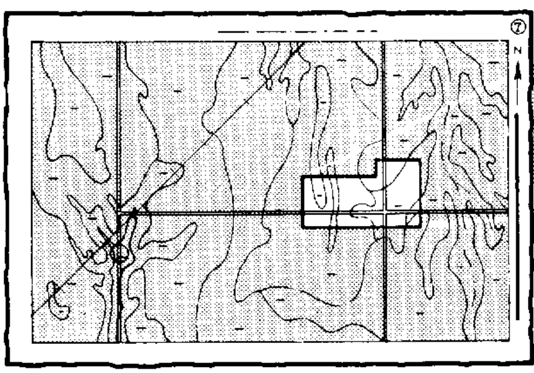
1. Locate your area of interest on the "Index to Map Sheets"

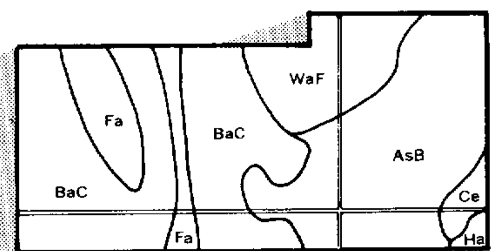




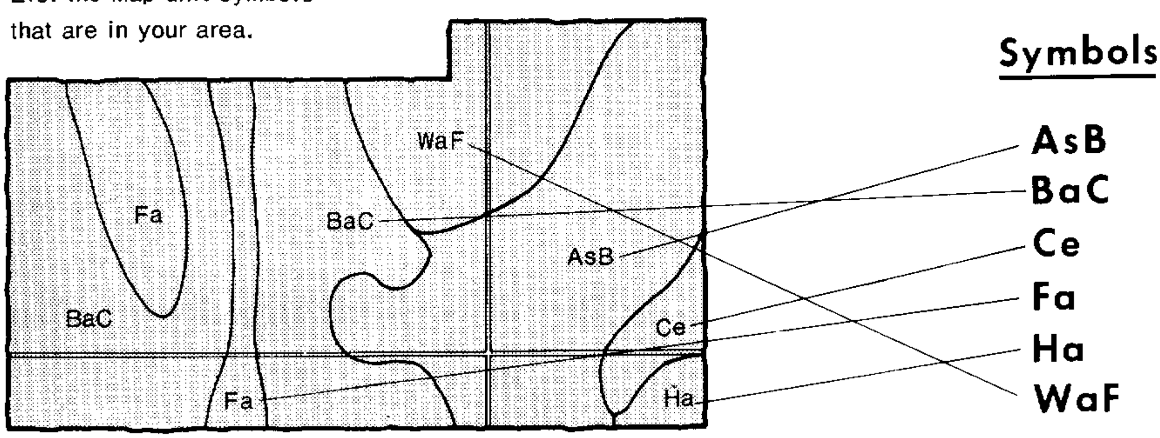
2. Note the number of the map sheet and turn to that sheet.

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



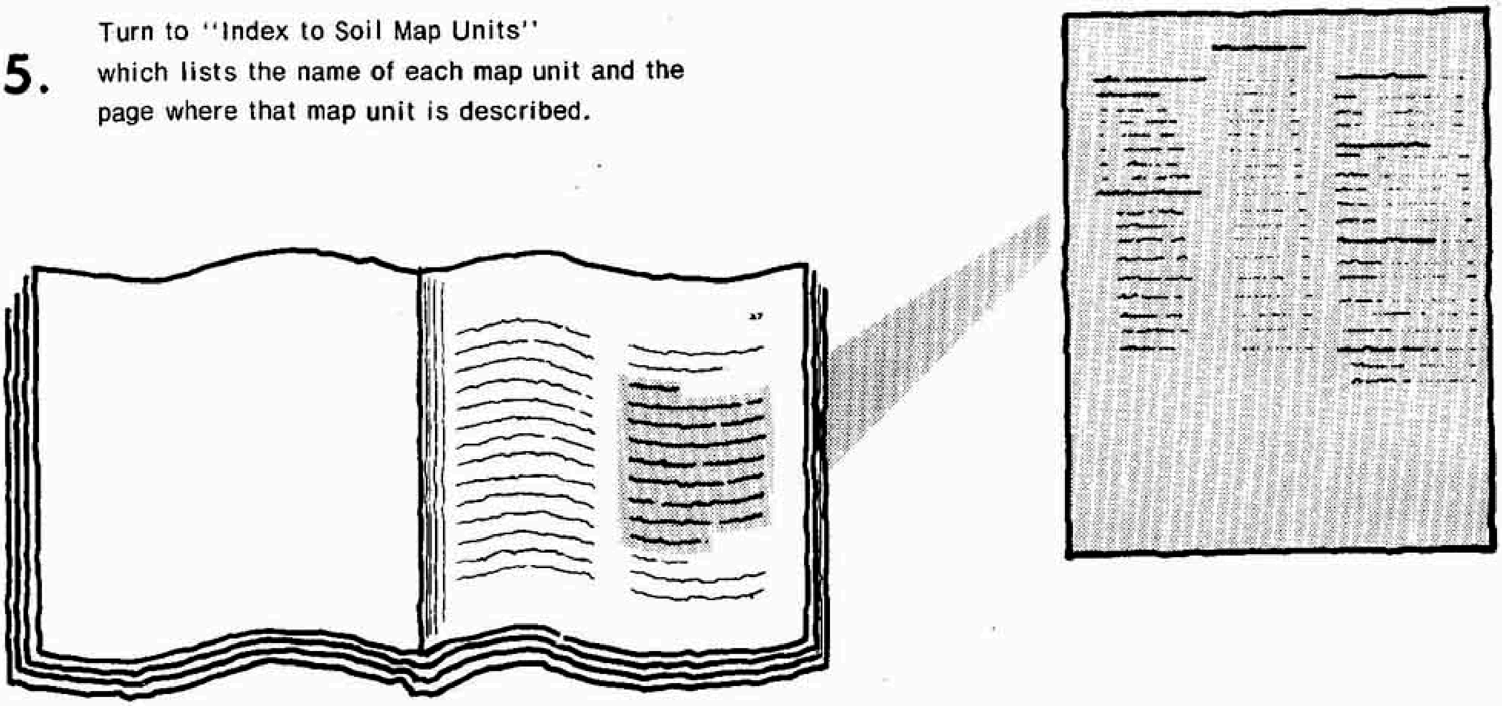


4. List the map unit symbols that are in your area.

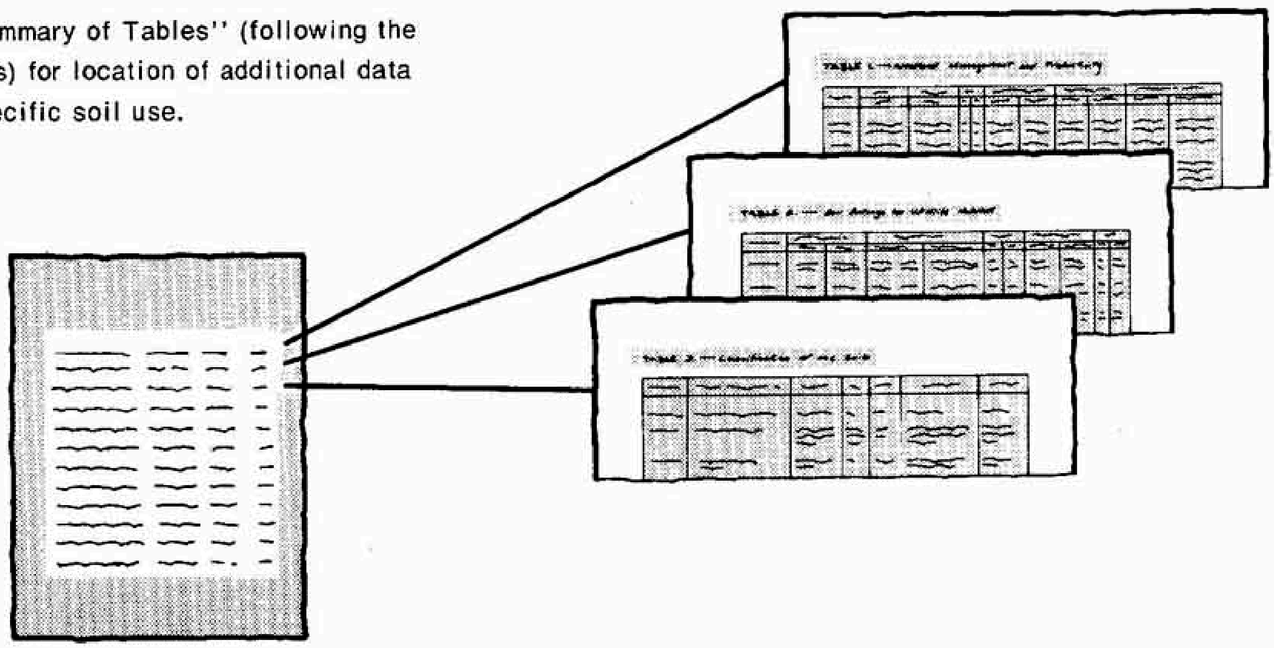


THIS SOIL SURVEY

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 1978-81. Soil names and descriptions were approved in 1982. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1981. This survey was made cooperatively by the Soil Conservation Service, the Forest Service, Purdue University Agricultural Experiment Station, and Indiana Department of Natural Resources, Soil and Water Conservation Committee. It is part of the technical assistance furnished to the Lawrence County Soil and Water Conservation District. Financial assistance was made available by Lawrence County Commissioners.

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

Cover: Typical landscape in Lawrence County. Crider soils are in the foreground, and Nolin soils are along the White River.

Contents

Soil Series

Issued April 1985

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Summary of Tables

Foreword

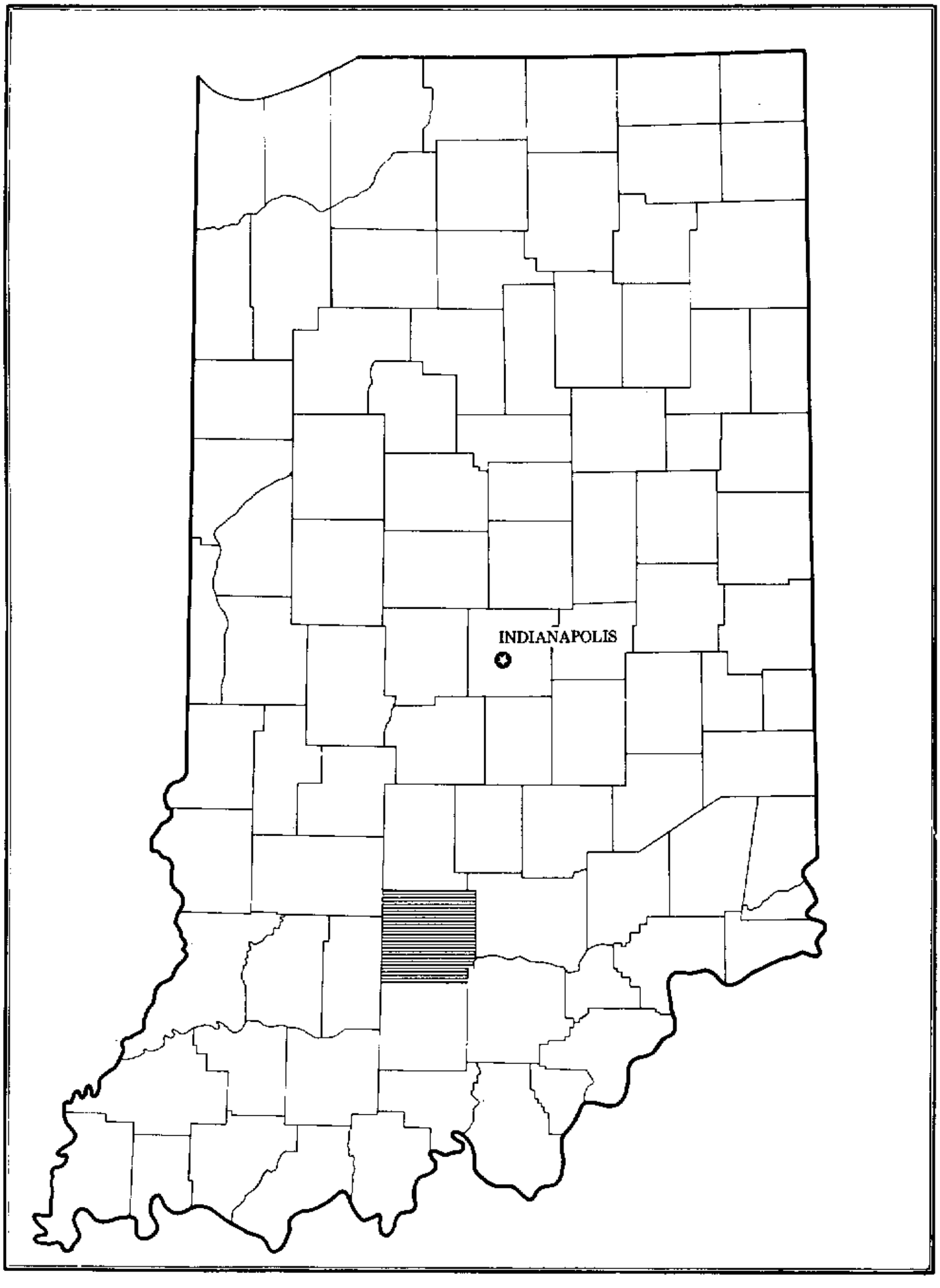
This soil survey contains information that can be used in land-planning programs in Lawrence County, Indiana. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and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

Soil Survey of
Lawrence County, Indiana

By Jerry A. Thomas, Soil Conservation Service

Fieldwork by Jerry A. Thomas and Robert C. Wingard, Jr., Soil Conservation Service, and Mark A. Eastman, Phillip A. Kempf, and Richard A. Noble, Indiana Department of Natural Resources, Soil and Water Conservation Committee

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

LAWRENCE COUNTY is in the south-central part of Indiana. It has a total area of 293,760 acres, or 459 square miles. The county extends about 21 miles from north to south and 22 miles from west to east. Bedford, the largest city, is the county seat. In 1976 Lawrence County had an estimated population of 40,230. In 1977 Bedford had a population of 16,110. The economic base of the county is primarily light and heavy manufacturing and industry. There is increasing expansion of commercial activity and very heavy tourist activity. About 40 percent of the work force is engaged in manufacturing (*6, 3*).

General Nature of the Survey Area

Much of the county is on uplands and ranges from nearly level areas to very steep escarpments. Many areas of the bottom lands along the East Fork White River, Indian Creek, and Salt Creek are subject to flooding. Elevation of the land ranges from 480 to 940 feet above sea level.

The first soil survey of Lawrence County was completed in 1922 and published in 1928 (*7*). This survey updates the first survey and provides additional information and larger maps that show the soils in greater detail.

Settlement of the County

Lawrence County was purchased from the Indians in three treaties. The last treaty, called the Harrison Purchase of 1809, included Shawswick township. Shawswick township was heavily settled because of the rich farmland in most of the area. Many springs, creeks, and streams provided water for several mills built from 1870-90, but frequent flooding in the area discouraged the development of a milling industry (*3*).

Lawrence County was established by legislative act on January 7, 1818. It was named for naval hero Captain James Lawerence. The earliest settlers were from Kentucky. They moved north across the Ohio River. The first county seat was Palestine, on the East Fork of the White River; on March 30, 1825, it was moved to Bedford because the water supply at Palestine was contaminated. Bedford lies in the center of the county, near White River, Leatherwood Creek, and Salt Creek (*3*).

In 1814 Samuel Jackson built a grist mill and a limestone quarry in the hilly area of Spring Mill, near present day Mitchell. This property was sold to Cuthbert and Thomas Bullitt, who enlarged the mill and later sold the holding to William and Joseph Montgomery. They added a tavern and a distillery. Hugh and Thomas Hamer encouraged settlement when they bought Spring Mill. Several businesses, including a cobbler's establishment, a pottery shop, a cabinet shop, a lime kiln, a loom house, and a tannery and blacksmith shop were established, and a post office, a church, and a school were built. A boat yard was constructed about a mile away. By 1850 Spring Mill was a thriving village and an important stop for stagecoaches travelling to New Harmony. Development was halted, however, when the railroad came to Indiana. Surveyors routed their lines several miles north of Spring Mill to avoid the hills surrounding the village. Today the site of Spring Mill is included in Spring Mill State Park (*3*).

The population of Lawrence County was 28,228 in 1920 (*7*). It was 42,348 in 1977. Bedford, the county seat, had a population of 10,000 in 1920 and 16,110 in 1977. Mitchell, the largest town, has a population of 4,092.

Natural Resources

Soil is the most important natural resource in Lawrence County. It provides the growing medium for cultivated crops and for the grasses grazed by livestock. Limestone quarries are the oldest industry in the area. The production of building stone from the quarries and mills in the Bedford-Bloomington limestone belt is one of the largest such operations in the world. Much of the building stone used in the country is mined in this area. The quarrying industry is fifth in providing employment in Lawrence County. Timber production is another large industry. Approximately 40 percent of the county is in woodland.

The Hoosier National Forest is in south-central Indiana. It has a total acreage of 644,291 acres, of which 67,685 acres is in Lawrence County. Hardwoods and planted pine trees are the two forest types favored in this area. The hardwoods are mostly of the oak-hickory type. White pine, red pine, shortleaf pine, and Virginia pine are the favored pine species for planting. The small saw timber size hardwood stands are usually about 50 to 90 years old. They include a large variety of species but are predominantly oak trees. Plantations include older pine trees and pole size and newer plantations that are still of seedling sapling age. Newer plantings are being made of hardwood species. Unstocked areas may vary from recently abandoned agricultural lands to those areas nearly restocked by natural regeneration. Natural restocking takes a long time and often results in poor density and trees that are of undesirable quality for commercial production. The Hoosier National Forest has been inventoried, and the cut area and volume allowed has been determined. Management of the forest is by the Timber Management Staff of the Hoosier National Forest, with technical assistance from Region 9, Division of Timber Management.

Spring Mill State Park, a popular recreation area in the southeastern part of the county, covers 1,280 acres. Scenic attractions include a number of caves noted for their stalactite formations, underground rivers containing rare blind fish, nearly 100 acres of virgin woodland, and a 30-acre lake. Hiking trails, and facilities for swimming, fishing, boating, and horseback riding are some of the recreational attractions at the park. A restored pioneer village is a main attraction. In addition, Spring Mill State Park has a summer naturalist service, a well equipped playground for children, a museum, a campground, and cabins (*5*).

Monroe Reservoir, about two miles north of the Lawrence County line, is the largest body of water in Indiana. It was completed in 1964. The Reservoir is about 30 miles long and is operated for purposes of flood control, low flow regulation, water supply, and recreation. Flood waters are impounded as necessary regardless of season, and when the danger of downstream flooding has passed, the water is released and the pool returned to its proper level. Recreational uses for the lake include boating, fishing, picnicking, swimming, camping, and waterfowl hunting.

Physiography, Relief, and Drainage

Henry H. Gray, head stratigrapher, geology section, Geological Survey, Indiana Department of Natural Resources, assisted in the preparation of this section.

Lawrence County is made up of three topographic units: the Norman Upland, the Mitchell Plain, and the Crawford Upland. These topographic units are underlain by rocks of Mississippian (aproximately 250 million years) age, except for some of the capping sandstone in the Crawford Upland, which is of Pennsylvanian (approximately 230 million years) age.

The Norman Upland is a severely dissected plain in the northeastern and eastern parts of the county. It mainly includes the area drained by Back Creek and Little Salt Creek. The main divides are small flats and long narrow ridges, the crests of which represent remnants of old plains into which the creeks and their tributaries have cut V-shaped valleys 200 to 250 feet deep. Generally, the stream bottoms are narrow and the slopes are rather steep. In some places, however, dissection has proceeded so far that the divides have been lowered from level-topped ridges to a series of high points or knobs with intervening low gaps. These hillsides have slopes that vary from 18 to 60 percent. Siltstone and shale are the main rock types.

The Mitchell Plain lies just west of the Norman Uplands. It extends to the range of hills that lie in the western and southwestern parts of the county. All of the largest towns in the county and most of the smaller ones are on the Mitchell Plain. Near the town of Mitchell, the plain is gently rolling and contains many sinkholes. In most other parts of the county, the plain includes many highly dissected areas, particularly along the streams. In these areas the uplands are undulating or gently rolling, with occasional small tracts that are nearly level. Sinkholes are the most striking surface feature of the

Mitchell Plain. These depressions range from slight sags and watertight basins to huge hollows 50 to 100 feet deep and as much as a quarter of a mile wide. Throughout the area there are a few sinkholes into which creeks disappear. Streams along the eastern margin of the Mitchell Plain have cut rather deep valleys, and a sharp relief has developed, particularly along the river. Where this Plain meets the Crawford Upland in the western part of the county, the main interstream divides rise sharply from the valleys. Limestone is the main rock type.

The Crawford Upland includes the rest of the county west of the Mitchell Plain. It is similar to the Norman Upland in that it is a dissected plain; however, the ridgetops are broader and more rounded, the hill slopes are more gentle, and the valleys are broader. Surface drainage is not complete, and some streams that rise in the hills disappear into sinkholes when they reach the valleys. The southwestern part of the county is hilly, and differences in elevation are as great as 200 to 300 feet. High narrow divides that have occasional domelike eminences rise in the eastern part of the Crawford Upland. The ridgetops generally are less than one-fourth of a mile wide. North of the East Fork of the White River, the ridgetops are much wider and the limestone crops out at a higher elevation, so that the lower slopes include some soils formed in limestone residuum. Sandstone, shale, and limestone are the main rock types.

The East Fork of the White River crosses the county from east to west, and its sinuous course, as seen on the map, suggests wide meanders in a great flood plain. These great bends, however, are incised into the uplands and are usually bordered by bluffs as much as 150 to 200 feet high. The River, which is west of Highway 37, receives comparatively little surface drainage from the south, because in that area there are no tributaries of even local importance. Mill Creek is the lower course of a subterranean stream that emerges from a cave in a deep glen 2 miles east of Mitchell. Water power developed at a restored grist mill dam on the East Fork of the White River at Williams formerly furnished power for a hydroelectric plant.

The largest tributary to the East Fork of the White River from the north is Salt Creek, which rises in Brown County. Its lower valley is wider in some places than that of the White River, and it is further marked by terraces extending several miles up from the river. The narrow winding valley of Indian Creek has some small well-defined benches, remnants of a former higher level drainage network than the present one. In the eastern part of the county, the small creeks flow into deep narrow valleys with high wooded hills on each side. The erratic course of Guthrie Creek brings it to within one-half mile of the White River at the Devil's Backbone, but it turns northwest, enters a valley comparable in size to that of the river, and finally enters the river about seven miles farther west.

Relief

The average elevation of Lawrence County is about 735 feet above sea level. The highest elevation is 940 feet, and the lowest elevation is 480 feet. The total relief is approximately 460 feet. Local relief measures as much as 300 feet along Back Creek, the East Fork of the White River, Guthrie Creek, Indian Creek, Leatherwood Creek, and Salt Creek. The Mitchell Plain is between 700 and 800 feet (*7*).

Farming

During the settlement of Lawrence County, the pioneers usually established their scattered holdings along the major streams on the most favorable soils. After these soils were settled, they began to clear the moderately steep and steep areas. During this period lumbering became almost as important as farming. The virgin soils produced excellent crops, but in the steeper areas the productive surface soil was lost through erosion within a few years, and as a result, crop yields were reduced. When this occurred, these areas were abandoned and grew up in brush. Later, many acres of the gently sloping to sloping land were also abandoned because of depleted fertility and soil erosion. The farmers then moved away, leaving the areas to nature to salvage by natural reforestation.

Today some of these areas are covered by good quality stands of timber, but in most areas the quality ranges from good to poor. Some of the abandoned areas were reclaimed during periods when farm prices were high, but when farm prices decreased during the 1930's and when the areas became depleted once more, many tracts of land were again abandoned (*5*).

Many farmers lived on farms of 40 to 100 acres for years and were content. However, as the standard of living improved, many small farmers acquired more land or intensified their farming systems to achieve this higher standard. On farms with a large amount of marginal cropland, however, intensified farming caused a rapid depletion of soil fertility and a rapid increase in soil erosion. Many farmers then left the farm for other employment, and some farms were left idle. On other farms gradual soil erosion over the years caused the land to be left idle, and it became covered with broomsedge and briers (*7*). Poor farming methods and soil erosion also caused damage to more fertile, nearly level to gently sloping cropland.

In 1957, recognizing the need for help with the problem of soil erosion, farmers voted to form the Lawrence County Soil and Water Conservation District. The District, with the aid of the USDA Soil Conservation Service and other agencies, gives technical assistance to farmers concerning problems of soil and water conservation. Since the organization of the District, several thousand acres have been protected from further excessive erosion. Each year, conservation practices are applied to a large additional acreage. Through the technical assistance of the District, several thousand acres of forest have been protected.

In 1880 the average farm was 157 acres; in 1920, 108 acres (*7*); in 1969, 176 acres; and in 1974, 183 acres (*11*). There are some specialized farms in Lawrence County, but most farmers are engaged in general farming. In 1974 about 62 percent of the farmers worked away from the farm for additional income (*11*).

About 93,200 acres, or 32 percent of the county, is cultivated cropland. Of this acreage, about 24,722 acres of hay and pasture is used in a rotation system. About 47,891 acres, or 16 percent of the county, is in permanent pasture, and 117,416 acres, or 40 percent, is in woodland (*4*).

Use of farmland in Lawrence County is as follows: 93,200 acres is used for cropland, 47,891 acres is in pasture, and 117,416 acres is in forest. About 87 percent of the cropland needs soil protection, either erosion control or drainage, and approximately 73 percent of the pasture soil needs treatment (*4*).

In 1880, the number of farms in Lawrence County was 1,764; in 1920, 2,332 (*7*); in 1964, 1,234; in 1969, 1,004; and in 1974, 975 (*11*). The average size of farms and the average value per acre, however, have increased. The amount of farm income from the sale of livestock, livestock products, and forest products has increased (*11, 7*).

Climate

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

In Lawrence County summers are hot in the valleys and slightly cooler in the hills. Winters are moderately cold. Rains are fairly heavy and are well distributed throughout the year. Snow falls nearly every winter, but the snow cover generally lasts only a few days.

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

In winter the average temperature is 35 degrees F, and the average daily minimum temperature is 25 degrees. The lowest temperature on record, which occurred at Bedford on January 28, 1963, is -20 degrees. In summer the average temperature is 74 degrees, and the average daily maximum temperature is 86 degrees. The highest recorded temperature, which occurred on July 14, 1954, is 106 degrees.

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

Of the total annual precipitation 21 inches, or 60 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 18 inches. The heaviest 1-day rainfall during the period of record was 4.25 inches at Bedford on August 31, 1962. Thunderstorms occur on about 45 days each year, and most occur in summer.

The average seasonal snowfall is 14 inches. The greatest snow depth at any one time during the period of record was 11 inches. On an average of 4 days, at least 1 inch of snow is on the ground. The number of such days varies greatly from year to year.

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

How This Survey Was Made

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

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

Commonly, individual soils on the landscape merge into one 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 soils on the landscape.

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

General Soil Map Units

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

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

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

The soils in the survey area vary widely in their potential for major land uses. Table 4 shows the extent of the map units shown on the general soil map. It lists the potential of each, in relation to that of the other map units, for major land uses and shows soil properties that limit use. Soil potential ratings are based on the practices commonly used in the survey area to overcome soil limitations. These ratings reflect the ease of overcoming the limitations. They also reflect the problems that will persist even if such practices are used.

Each map unit is rated for *cultivated crops, specialty crops, woodland, urban uses,* and *recreation areas.* Cultivated crops are those grown extensively in the survey area. Specialty crops are the vegetables and fruits that generally require intensive management. Woodland refers to areas of native or introduced trees. Urban uses include residential, commercial, and industrial developments. Intensive recreation areas are campsites, picnic areas, ballfields, and other areas that are subject to heavy foot traffic. Extensive recreation areas are those used for nature study and as wilderness.

The names, descriptions and delineations of soils on the general soils map of this county do not always agree or join fully with those of adjoining counties published at an earlier date. This difference is due to changes in concepts of soil series in the application of the soil classification system. Other differences are brought about by a different predominance of soils in map units made up by two or three series. Still other differences may be caused by the range in slope allowed within the map unit if adjoining surveys. In this county or in adjacent counties a map unit is sometimes too small to be delineated.

Descriptions of the general soil map units follow.

1. Crider-Frederick-Bedford

Deep, gently sloping to strongly sloping, well drained and moderately well drained, medium textured soils that formed in loess and the underlying residuum from limestone; on uplands

This map unit is generally a loess-covered plain on the uplands that contains some sinkholes and some dissected areas along drainageways. There are a few sinkholes into which drainageways disappear throughout the unit. Most of the larger streams have cut below the general plain and formed rocky, steepsided, gorge-like valleys. The areas are large and are separated only by stream bottoms and terraces. Slopes range from 2 to 18 percent.

This map unit makes up about 32 percent of the county. It is about 45 percent Crider soils, 18 percent Frederick soils, 17 percent Bedford soils, and 20 percent soils of minor extent.

The gently sloping and moderately sloping, deep, well drained Crider soils are on both narrow and broad, convex ridgetops on loess-covered uplands. The surface layer is dark brown silt loam, and the subsoil is dark yellowish brown silt loam in the upper part, strong brown silty clay loam in the middle part, and red and strong brown silty clay and clay in the lower part.

The moderately sloping and strongly sloping, deep, well drained Frederick soils are on both narrow and broad, convex ridgetops and side slopes on loess-covered uplands. The surface layer is very dark grayish brown and yellowish brown silt loam, and the subsoil is yellowish brown silt loam in the upper part, yellowish red silty clay loam in the middle part, and red clay in the lower part.

The gently sloping, moderately well drained Bedford soils are moderately deep over a fragipan. They are on both narrow and broad interfluves of the ridgetop and on side slopes on loess-covered uplands. The surface layer is yellowish brown silt loam, and the subsoil is yellowish brown silt loam and silty clay loam in the upper part, a fragipan of yellowish brown and strong brown, mottled silty clay loam in the middle part, and strong brown clay in the lower part.

The soils of minor extent in this unit are the moderately deep Caneyville soils and the shallow Weikert soils on the steep side slopes.

This unit is used mainly for cultivated crops. Some areas are used for hay or pasture, and a few areas are in woodland. The hazard of erosion and steepness of slope limit the use of these soils for farming and for most other purposes. In addition, the Bedford soil is limited by a very slowly permeable fragipan.

This unit is generally suited to building site development and to most sanitary facilities. The Bedford soil is limited by wetness and a very slowly permeable fragipan. The Crider and Frederick soils are limited by steepness of slope. This unit is generally suited to intensive recreational areas. The Bedford soil is limited by restricted permeability and wetness, and the Crider and Frederick soils are limited by slope. Use for picnic areas and camp areas is limited to the drier time of the year.

2. Wellston-Gilpin

Deep and moderately deep, moderately sloping to very steep, well drained, medium textured soils that formed in loess and residuum from sandstone, siltstone, or shale; on uplands

This map unit is a deeply dissected plain where the main divides are small flats and long narrow ridges. The stream bottoms are long and narrow. This unit is on moderately sloping to very steep side slopes of ridges along drainageways that dissect the uplands and on sharp slope breaks that border the valleys. Areas are large and are separated only by stream bottoms and terraces. Slopes range from 6 to 50 percent.

This map unit makes up about 14 percent of the county. It is about 50 percent Wellston soils, 25 percent Gilpin soils, and 25 percent soils of minor extent.

The moderately sloping to very steep, deep, well drained Wellston soils have a surface layer of dark brown silt loam and a subsoil that is yellowish brown silt loam in the upper part and yellowish brown silty clay loam in the lower part. Sandstone bedrock is at a depth of 46 inches.

The moderately sloping to very steep, moderately deep, well drained Gilpin soils have a surface layer of yellowish brown and light yellowish brown silt loam in the upper part and yellowish brown channery silt loam in the lower part. Weathered sandstone bedrock is at a depth of 26 inches.

The soils of minor extent in this unit are the well drained Burnside and Haymond soils and the moderately well drained Wilbur soils. They are along streams and are subject to flooding. The moderately well drained Hosmer soils are on broad, convex ridgetops, and the well drained Berks, Caneyville, and Weikert soils are on steep side slopes.

This unit is used mainly for woodland. The very severe hazard of erosion and steepness of slope are the main limitations for farming and for most other purposes.

This unit is generally unsuited to cultivated crops because of the very severe hazard of erosion and steepness of slope. It is generally suited to timber production but is limited by steepness of slope. Although woodland is the best use, this unit is not a good production site for high quality woods.

This unit is generally unsuited to building site development and to most sanitary facilities. Steepness of slope and depth to bedrock are severe limitations that are difficult to overcome. This unit is generally unsuited to intensive recreational areas because of slope.

3. Crider-Frederick

Deep, moderately sloping and strongly sloping, well drained, medium textured soils that formed in loess and the underlying residuum from limestone; on uplands

This map unit is a karst or sinkhole region on the Mitchell Plains (fig. 1). The topography was originally gently sloping or moderately sloping, but the landscape now has many large sinkholes. Because the unit has a limited surface drainage system, all surface water must drain internally through underground passageways that connect a series of sinkholes. This network of passageways is very complex, and the exact locations of them are not known. The sinkholes are the most striking surface feature of the area. They range from slight sags and watertight basins to huge hollows 50 feet deep or more. The areas are large and are separated only by stream bottoms and terraces. Slopes range from 6 to 20 percent.

This map unit makes up about 13 percent of the county. It is about 60 percent Crider soils, 35 percent Frederick soils, and 5 percent soils of minor extent.

The moderately sloping and strongly sloping, deep, well drained Crider soils are on the ridgetops and upper half of the side slope of the sinkhole. They have a surface layer of dark brown silt loam and a subsoil of dark yellowish brown silt loam in the upper part, strong brown silty clay loam in the middle part, and strong brown silty clay and clay in the lower part.

The moderately sloping, deep, well drained Frederick soils are on the lower half of the sinkhole. They have a surface layer of very dark grayish brown and yellowish brown silt loam and a subsoil of yellowish brown silt loam in the upper part, yellowish red silty clay loam in the middle part, and red clay in the lower part.

The soils of minor extent in this unit are the well drained Burnside and Haymond soils on the long, narrow stream bottoms that dissect the area. These soils are subject to flooding.

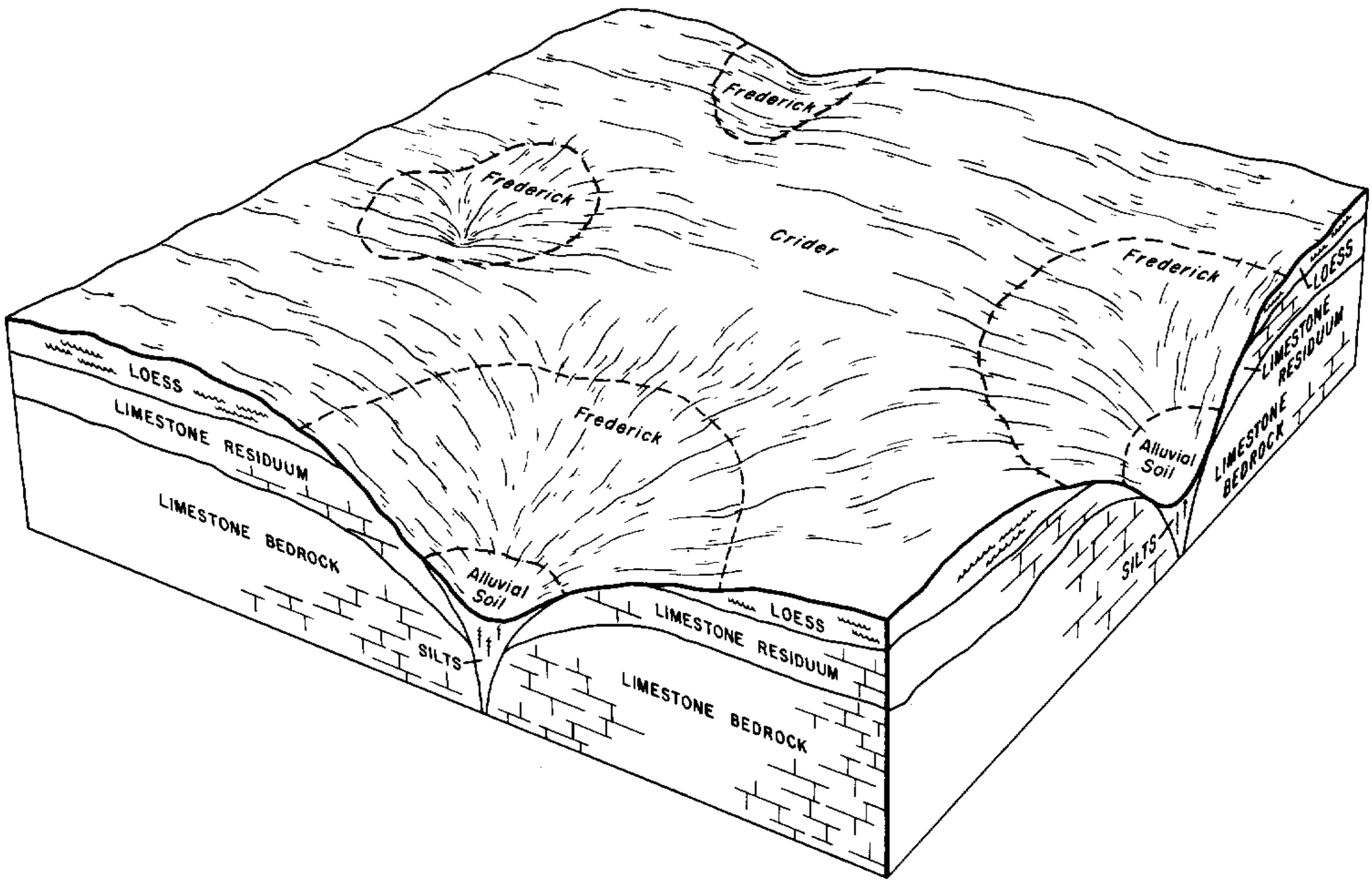


Figure 1.—Pattern of soils and underlying material in the Crider-Frederick map unit.

This unit is used mainly for hay or pasture. Some areas are used for cultivated crops, and a few areas are in woodland. The hazard of erosion and steepness of slope are the main limitations for the use of these soils for farming and for most other purposes. The sinkholes are an additional major limitation. This unit is generally suited to cultivated farm crops. The karst topography limits the effectiveness of the conservation practices that can be used, however, and makes contour farming almost impossible.

This unit is generally suited to timber production. It is generally suited to building site development and to most sanitary facilities but is limited by steepness of slope. The gently sloping ridgetops, which make up a small part of this unit, have the highest potential for scattered, random type building sites. This unit is generally suited to intensive recreational areas but is limited by slope.

4. Ebal-Hosmer-Crider

Deep, gently sloping to moderately steep, moderately well drained and well drained, medium textured soils that formed in loess deposits, or in loess or colluvium and the underlying residuum from sandstone, limestone, or shale; on uplands

This map unit is a dissected plain on which the main divides are broad, rounded ridgetops. The stream bottoms are broad, and the hillsides are moderately sloping to moderately steep. Some drainageways start on the hillsides and disappear into sinkholes when they reach the valley floor. The area is large and is mapped as a single unit. Slopes range from 1 to 24 percent.

This map unit makes up about 12 percent of the county. It is about 31 percent Ebal soils, 14 percent Hosmer soils, 14 percent Crider soils, and 41 percent soils of minor extent.

The moderately sloping to moderately steep, deep, moderately well drained Ebal soils are on side slopes of the unit or are small bench-like slips directly below steeper slopes that contain rock outcrops. They have a surface layer of very dark grayish brown silt loam, and a subsoil of brown and pale brown channery silt loam in the upper part, strong brown channery silty clay loam in the middle part, and reddish brown, light reddish brown, and gray clay loam in the lower part.

The gently sloping, moderately well drained Hosmer soils are on broad, convex ridgetops of loess-covered uplands. They are moderately deep to a fragipan. These soils have a surface layer of brown silt loam. The upper part of the subsoil is dark yellowish brown silt loam and silty clay loam, the middle part is a fragipan of yellowish brown, mottled silty clay loam, and the lower part is yellowish brown, mottled silt loam.

The strongly sloping, deep, well drained Crider soils are on the lower part of the side slopes. They have a surface layer of dark brown silt loam and a subsoil of dark yellowish brown silt loam in the upper part, strong brown silty clay loam in the middle part, and red and strong brown silty clay and clay in the lower part.

The soils of minor extent in this unit are the well drained Caneyville and Gilpin soils that are moderately deep to bedrock and the shallow Weikert soils that are on side slopes. The well drained Burnside soils and the moderately well drained Wilbur soils are on the bottom lands, and the well drained Elkinsville Variant soils are on terraces.

This unit is used mainly for woodland. Some areas are used for hay or pasture, and a few areas are in cultivated crops. The Hosmer part of this unit is mainly used for cultivated crops. The Ebal and Crider soils are mainly limited for farming and for most other purposes because of the hazard of erosion and steepness of slope. The Hosmer soil is limited by the very slowly permeable fragipan.

The Ebal and Crider soils are poorly suited to cultivated farm crops because of the hazard of erosion and slope. The Hosmer soil is limited for cultivated crops because of the fragipan. This unit is generally suited to timber production. The Ebal and Crider soils are limited by steepness of slope. The Hosmer soil is limited by wetness and the fragipan.

This unit is poorly suited to building site development and to most sanitary facilities. The Ebal and Crider soils are limited by steepness of slope and shrinking and swelling of the soil. The Hosmer soil is limited by wetness and the fragipan. Dwellings should be constructed without basements in the Hosmer soils.

This unit is poorly suited to intensive recreational areas mainly because of steepness of slope and wetness or reduced permeability of the soils.

5. Gilpin-Weikert-Berks

Moderately deep and shallow, strongly sloping to very steep, well drained, medium textured soils that formed in residuum from sandstone, siltstone, and shale; on uplands

This map unit is a deeply dissected plain where the main divides are small flats and long narrow ridges. The stream bottoms are long and narrow. This unit is on strongly sloping to very steep side slopes of ridges along drainageways that dissect the upland areas and on sharp slope breaks that border the valleys. The areas are large and are separated only by stream bottoms and terraces. Slopes range from 15 to 50 percent.

This map unit makes up about 12 percent of the county. It is about 30 percent Gilpin soils, 30 percent Weikert soils, 19 percent Berks soils, and 21 percent soils of minor extent.

The strongly sloping to very steep, moderately deep, well drained Gilpin soils have a surface layer of yellowish brown and light yellowish brown silt loam, and a subsoil that is yellowish brown silt loam in the upper part and yellowish brown channery silt loam in the lower part. Weathered sandstone bedrock is at a depth of 26 inches.

The steep and very steep, shallow, well drained Weikert soils have a surface layer of very dark grayish brown channery silt loam, and a subsoil of yellowish brown very channery silt loam. Weathered siltstone bedrock is at a depth of 16 inches.

The steep and very steep, moderately deep, and well drained Berks soils have a surface layer of very dark grayish brown and brown silt loam, and a subsoil that is yellowish brown silt loam in the upper part and yellowish brown very channery silt loam in the lower part. Siltstone bedrock is at a depth of 34 inches.

The soils of minor extent in this unit are the deep, well drained Frederick soils that are on moderately sloping and strongly sloping side slopes and the nearly level, well drained Burnside and Haymond soils that are on the bottom lands.

This unit is used mainly for woodland. The very severe hazard of erosion, steepness of slopes, and depth to bedrock are the main limitations for farming and for most other purposes.

This unit is generally unsuited to cultivated crops because of the very severe hazard of erosion, steepness of slopes, and depth to bedrock. It is generally suited to timber production but is limited by steepness of slope and depth to bedrock. Although woodland is the best use, this unit is not a good production site for high quality woods.

This unit is generally unsuited to building site development and to sanitary facilities. Steepness of slope and depth to bedrock are severe limitations that are difficult to overcome. This unit is generally unsuited to intensive recreational areas because of slope.

6. Caneyville-Haymond-Stendal

Moderately deep and deep, moderately sloping to very steep and nearly level, well drained and somewhat poorly drained, medium textured soils that formed in limestone residuum or in silty alluvium; on uplands and flood plains

This map unit is along the broad bottom lands of creeks that drain to the East Fork of the White River. The bottom lands range from 200 feet to half a mile wide and are several hundred feet below the adjoining uplands. Areas are generally variable in size and shape and are scattered throughout the county. Slopes range from 0 to 75 percent.

This map unit makes up about 9 percent of the county. It is about 34 percent Caneyville soils, 22 percent Haymond soils, 9 percent Stendal soils, and 35 percent soils of minor extent.

The moderately sloping to very steep, moderately deep, well drained Caneyville soils are on side slopes of uplands. The surface layer is brown silt loam, and the subsoil is dark yellowish brown silty clay loam in the upper part and yellowish red clay in the lower part. Limestone bedrock is at a depth of 33 inches.

The nearly level, deep, well drained Haymond soils are on broad flats and narrow stream channels on bottom lands. They formed in medium acid to neutral alluvium washed from the loess-covered, limestone uplands. The surface layer is brown silt loam, and the subsoil is dark yellowish brown silt loam.

The nearly level, deep, somewhat poorly drained Stendal soils are on broad flats and narrow stream channels on bottom lands. They formed in acid alluvium washed from loess-covered sandstone, siltstone, and shale on the uplands. These soils are in the more depressional areas, in swales, and along poorly defined drainageways. The surface layer is brown and yellowish brown, mottled silt loam. The substratum is light brownish gray, mottled silt loam in the upper part; light brownish gray and gray, mottled silty clay loam in the middle part; and yellowish brown, mottled silty clay in the lower part.

The soils of minor extent in this map unit are the somewhat poorly drained Bartle and Henshaw soils, the moderately well drained Pekin soils, the well drained Elkinsville Variant soils, and the moderately well drained and well drained Markland soils that are on small bench terraces along the valley floor.

The soils on the bottom lands are used mainly for cultivated crops. The soils on the upland areas are used for hay, pasture, or woodland. The hazard of erosion, steepness of slope, and depth to rock are limitations to the Caneyville soil on the uplands. Flooding is the main hazard for the soils on the bottom lands.

This unit is suited to cultivated crops. The Caneyville soil is unsuited by the hazard of erosion, slope, and depth to rock. The soils on the bottom lands are subject to flooding early in spring. This map unit is suited to timber production.

This unit is generally unsuited to building site development and to most sanitary facilities. The Caneyville soil is limited by steepness of slope and depth to rock. The soils on the bottom lands are subject to flooding. This unit is generally suited to intensive recreational areas; however, the Caneyville soil is limited by steepness of slope, and the bottom land areas are subject to frequent flooding. Use of this map unit should be limited to the drier time of the year when the hazard of flooding is past.

7. Nolin-Alvin-Bloomfield

Deep, nearly level to moderately steep, well drained and somewhat excessively drained, medium textured to coarse textured soils that formed in alluvial and eolian deposits; on flood plains, terraces, and uplands

This map unit is on or adjacent to the broad bottom lands of the East Fork of the White River. The bottom lands range from 1/4 mile to 1 1/2 miles wide and are 50 to 300 feet below the adjoining uplands. These areas are generally variable in size and shape. Slopes range from 0 to 22 percent.

This map unit makes up about 5 percent of the county. It is about 30 percent Nolin soils, 21 percent Alvin soils, 18 percent Bloomfield soils, and 31 percent soils of minor extent.

The nearly level, deep, well drained Nolin soils are on broad flats and stream channels on the bottom lands. They formed in recent alluvium washed from the loess-covered uplands. The surface layer is dark brown silt loam, and the subsoil is dark yellowish brown and yellowish brown silty clay loam.

The gently sloping to moderately steep, deep, well drained Alvin soils are on ridge summits and side slopes of terrace breaks along the large stream channels of the East Fork of the White River. They formed in loamy and sandy sediment along stream channels. The surface layer is very dark grayish brown sandy loam or loamy sand, and the subsoil is dark yellowish brown and dark brown sandy loam in the upper part and yellowish brown loamy sand in the lower part.

The gently sloping and moderately sloping, deep, somewhat excessively drained Bloomfield soils are on ridge summits and side slopes of the terrace breaks along large stream channels of the East Fork of the White River. They formed in sandy sediment along the stream channel. The surface layer is very dark grayish brown loamy sand. The underlying layers are yellowish brown, brown, and dark yellowish brown sand and loamy sand.

The soils of minor extent in this unit are the somewhat poorly drained Newark soils and the poorly drained Petrolia soils. These soils are on the lower lying broad flats and depressions in the bottom lands. Also included are the well drained Martinsville soils and the somewhat excessively drained Tyner soils on the terraces above the river bottoms and the moderately deep, well drained Caneyville soils on the side slopes of the uplands.

The soils on the bottom lands are used mainly for cultivated crops, and the soils on the upland areas are used for hay, pasture, or woodland. Frequent flooding is the main hazard for most purposes for the soils on the bottom lands. The Alvin and Bloomfield soils on the ridge summits and side slopes of terrace breaks are limited by the hazard of erosion and steepness of slope.

This unit is generally suited to cultivated farm crops. The soils on the bottom lands are subject to frequent flooding early in spring. The Alvin and Bloomfield soils are limited by the hazard of erosion and steepness of slope. This unit is generally suited to timber production. It is generally unsuited to building site development and to most sanitary facilities. The soils on the bottom lands are subject to frequent flooding. The Alvin and Bloomfield soils are limited by steepness of slope, and, in addition, the Bloomfield soils have poor filtering qualities.

This unit is generally suited to intensive recreational areas. The soils on bottom lands are subject to frequent flooding. The Bloomfield soils are limited by steepness of slope. Use of this unit should be limited to the drier time of the year when the hazard of flooding is past.

8. Hoosierville-Bedford

Deep, nearly level and gently sloping, poorly drained and moderately well drained, medium textured soils that formed in loess or in loess and residuum from limestone; on uplands

This map unit is generally on broad ridgetops. Slopes range from 0 to 6 percent.

This map unit makes up about 3 percent of the county. It is about 43 percent Hoosierville soils, 35 percent Bedford soils, and 22 percent soils of minor extent.

The nearly level, deep, poorly drained Hoosierville soils are on broad, loess-covered ridgetops on uplands. The surface layer is grayish brown silt loam, and the subsoil is light gray, mottled silt loam in the upper part and strong brown and yellowish brown, mottled silt loam in the lower part.

The gently sloping, moderately well drained Bedford soils are on broad, loess-covered ridgetops on uplands. They are moderately deep over a fragipan. These soils are on slight rises within the landscape. They have a surface layer of yellowish brown silt loam. The upper part of the subsoil is yellowish brown silt loam and silty clay loam, the middle part is a fragipan of yellowish brown and strong brown, mottled silty clay loam, and the lower part is strong brown clay.

The soils of minor extent in this unit are the well drained Frederick soils on moderately sloping and strongly sloping side slopes and the moderately well drained Muren soils on higher positions of flats. The Muren soils formed in loess.

This unit is used mainly for cultivated crops. Some of the areas are used for hay, pasture, or woodland. Wetness is the main limitation for farming and for most other uses of these soils. In addition, the Bedford soil is limited by very slow permeability in the fragipan.

This unit is generally suited to cultivated crops but is limited because of the seasonal high water table. In addition, the Bedford soil is limited by very slow permeability in the fragipan. Adequate drainage is needed for maximum crop production. This map unit is generally suited to timber production but is limited by wetness.

This unit is generally unsuited to building site development and to most sanitary facilities. It is limited by wetness or very slow permeability in the fragipan. It is generally unsuited to intensive recreational areas because of wetness.

Broad Land Use Considerations

Deciding which land should be used for urban development is an important issue in the survey area. Each year a considerable amount of land is developed for urban uses in Marion and Shawswick townships. Bono and Guthrie townships have the smallest amount of urban development. In 1974 there was about 24,199 acres of urban and built-up land in the county (*11*). Development has been expanding at the rate of about 110 acres per year (*9*). The general soil map is helpful for planning the general outline of urban areas, but it cannot be used for the selection of sites for specific urban structures. Data concerning specific soils in this survey area can be helpful in planning future land use patterns.

Areas where the soils are so unfavorable that urban development is not desirable or is nearly prohibited are extensive in the survey area. The Gilpin-Weikert-Berks and Wellston-Gilpin map units, for example, are severely limited because of steep slopes and depth to bedrock. The Crider-Frederick map unit is severely limited because of steep slopes and a sinkhole topography. The Caneyville-Haymond-Stendal and Nolin-Alvin-Bloomfield map units are dominantly on flood plains, and flooding is a severe hazard. The Hoosierville-Bedford map unit is on broad, flat ridgetops of upland plains, and in these areas the seasonal high water table is a severe hazard.

The Crider-Frederick-Bedford and Ebal-Hosmer-Crider map units have many sites that can be developed for urban uses at lower cost than the preceding soils. Crider soils that are gently sloping are well suited to building site development, sanitary facilities, and cultivated crops. The more sloping Crider and Frederick soils are unsuited to building sites, sanitary facilities, and cultivated crops because of slope. Ebal soils are poorly suited to building sites, sanitary facilities, and farmland because of slope, low strength, and shrinking and swelling of the soil. Bedford and Hosmer soils have a fragipan that limits use for building site development, sanitary facilities, and agricultural uses. Caneyville, Gilpin, and Weikert soils are limited because of steepness of slope and depth to bedrock.

Units 5, 6, 7, and 8 on the general soil map have poor or fair potential for farming, and poor potential for nonfarm uses. Dominant in area 6 are the Caneyville, Haymond, and Stendal soils; and dominant in area 7 are the Nolin, Alvin, and Bloomfield soils. Flooding is a severe limitation for nonfarm uses of Haymond, Nolin, and Stendal soils. In addition, Stendal soils are restricted because of wetness. Steepness of slope is a severe limitation for Bloomfield and Caneyville soils. A different location should be selected for building sites and sanitary facilities. Bottom land areas in these map units are subject to frequent flooding. In unit 8 the dominant soils are Hoosierville and Bedford soils. Wetness is a severe limitation for nonfarm uses of these soils. In addition, Bedford soils have a fragipan that limits its use for building site development, sanitary facilities, and agricultural uses. The installation of proper subsurface and surface drainage systems can overcome the limitation of wetness; however, in many of the soils adequate drainage for farm crops has not been provided.

Although most of the soils in Lawrence County have fair potential for timber production, the steeper soils of the Gilpin-Weikert-Berks and Wellston-Gilpin map units are less productive. Commercially valuable trees are less common, and they do not grow so rapidly on these soils.

The Crider-Frederick-Bedford, Caneyville-Haymond-Stendal, Hoosierville-Bedford, and Nolin-Alvin-Bloomfield map units have fair potential for camp areas, picnic areas, playgrounds, and paths and trails. Bedford, Hoosierville, Hosmer, and Stendal soils are restricted because of a seasonal high water table; Bloomfield, Caneyville, Crider, and Frederick soils are restricted because of slope; and Haymond, Nolin, and Stendal soils are restricted because they are subject to flooding. The more sloping Wellston-Gilpin and Gilpin-Weikert-Berks map units are severely restricted because of slope.

Detailed Soil Map Units

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

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

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

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

Soils of one series can differ in texture of the surface layer or of the underlying material. They also can differ in slope, stoniness, 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, Frederick silt loam, 6 to 12 percent slopes, eroded, is one of several phases in the Frederick series.

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

A *soil complex* consists of two or more soils 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. Caneyville-Gilpin-Rock outcrop complex is an example.

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

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

Table 5 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.

Description of the detailed soil map units follow.

Ab—Abscota sand, frequently flooded. This nearly level, deep, well drained soil is on broad flood plains along large streams. It is subject to frequent flooding from March to June for brief periods. This soil usually is in a bend of the stream where the flood water first leaves the stream channel. Individual areas are generally elongated. They range from 5 to 80 acres but are dominantly about 30 acres.

In a typical profile, the surface layer is yellowish brown sand about 6 inches thick. The subsoil is brown, very friable loamy sand about 6 inches thick. The substratum to a depth of 60 inches is yellowish brown sand in the upper part and dark yellowish brown loamy sand in the lower part. In places the surface layer is thicker.

Included with this soil in mapping are small areas of well drained, more clayey Chagrin and Nolin soils, somewhat poorly drained Newark soils, and poorly drained Petrolia soils. The Chagrin and Nolin soils are on slightly higher positions and are farther away from the stream than Abscota soils. The Newark and Petrolia soils are in depressions. The included soils make up about 20 percent of the map unit.

Available water capacity is low in this Abscota soil, and permeability is rapid. The organic matter content in the surface layer is low. Surface runoff from cultivated area is slow.

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

This soil is poorly suited to corn and soybeans. Droughtiness and flooding are the main management concerns. Small grain is subject to severe damage during periods of prolonged flooding. Planting short-season varieties of adapted crops and late planting help to avoid damage or loss of crops from flooding. The use of conservation tillage that leaves all or part of the crop residue on the surface, green manure crops, cover crops, and crop residue management helps to improve and maintain tilth and organic matter content of this soil.

This soil is suited to grasses and legumes for pasture or hay. Alfalfa and other deep-rooted legumes are subject to severe damage during periods of prolonged flooding. Droughtiness, flooding, overgrazing, and grazing when the soil is wet are the major concerns of management. Species of grasses that are drought resistant should be considered for planting. Overgrazing reduces the plant density and hardiness and causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedling mortality and plant competition are the main management concerns. Flooding may hinder harvesting and logging operations and the planting of seedlings. Generally, this soil is not suited to black walnut plantings. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Seedling mortality can be reduced by planting additional seedlings and by selecting species that are tolerant to drought conditions. Thinning may be required later. Additional management practices include restricting livestock, harvesting trees at maturity, and saving desirable seed trees.

This soil is generally unsuitable for building sites because of frequent flooding. It is severely limited for local roads and streets because it is subject to flooding; however, elevating the roadbed helps to overcome the limitation of flooding. This soil is generally unsuited to septic tank absorption fields because it is subject to flooding and has poor filtering qualities. Seepage of effluent into ground water supplies often becomes a problem.

This Abscota soil is in capability subclass IVs and woodland suitability group 1s.

AnD—Alvin sandy loam, 12 to 22 percent slopes. This strongly sloping and moderately steep, deep, well drained soil is on side slopes of terrace breaks along large streams. This map unit has dune topography. Individual areas are usually narrow and elongated. They range from 5 to 75 acres but are dominantly about 20 acres.

In a typical profile, the surface layer is very dark grayish brown and dark brown sandy loam about 13 inches thick. The subsoil is about 46 inches thick. The upper part is dark yellowish brown, firm sandy loam; the middle part is dark brown and dark yellowish brown, firm and friable sandy loam; and the lower part is yellowish brown, friable loamy sand. The substratum to a depth of 80 inches is yellowish brown sand. A few places have higher clay content in the subsoil. In some places slopes are less than 12 percent, and in other places they are more than 22 percent.

Included with this soil in mapping are small areas of somewhat excessively drained Bloomfield and Tyner soils on lower lying positions. Also included are small, severely eroded areas of soils on nose slopes and sharp breaks where the subsoil is exposed. The included soils make up 15 percent of the map unit.

Available water capacity is low in this Alvin soil, and permeability is moderately rapid. The organic matter content in the surface layer is low. Surface runoff from cultivated areas is medium.

Many areas of this soil are used for hay and pasture. A few areas are in woodland.

The soil is generally unsuited to cultivated crops. Runoff is rapid and the hazard of erosion is very severe on these strongly sloping and moderately steep slopes.

This soil is poorly suited to grasses and legumes for hay or pasture. Slope, the hazard of erosion, and moderately rapid permeability are the main management concerns. This soil is droughty, and it is subject to wind erosion. A permanent cover of drought-resistant grasses and legumes helps to slow runoff and control erosion. Overgrazing and grazing when the soil is dry are other management concerns. Overgrazing reduces the plant density and hardiness, causes excessive runoff, and increases wind erosion. Proper stocking rates, pasture rotation, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. The hazard of erosion, restricted use of equipment, and plant competition are the main management concerns. This soil is suited to plantings of black locust for firewood and fencepost production. Seedlings survive and grow best if competing vegetation is removed. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Erosion may become a problem if vegetation is removed. Logging roads and skid trails should be constructed on the contour. The use of road ditches, culverts, and grade stabilization structures help to control runoff from roads and skid trails. Steepness of slopes hinders the use of some logging equipment. Yarding the logs uphill with cable may be needed. Additional management practices include restricting livestock, harvesting trees at maturity, and saving desirable seed trees.

This soil is severely limited for building sites because of slope. Selection of an alternate site may be necessary. Grading to modify slope or designing the structure to complement the slope helps to overcome the slope hazard. Areas disturbed during construction should be revegetated as soon as possible so that soil loss from erosion will be kept to a minimum. Topsoil should be stockpiled and spread over critical areas where vegetation may be difficult to establish. This soil is severely limited for local roads and streets because of slope. Roads should be placed on the contour where possible. Cutting and filling operations may be needed. This soil is severely limited for septic tank absorption fields because of slope. The soil is underlain by sand below an average depth of 50 inches. Grading the area of the filter field to modify the slope and installing the lateral field on the contour help to relieve the slope hazard. The absorption field may not adequately filter the effluent if the distribution lines are placed too deep in this soil. If the effluent is not adequately filtered, ground water supplies in the area may become contaminated.

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

Ba—Bartle silt loam, rarely flooded. This nearly level, somewhat poorly drained soil is on low terraces along narrow stream channels. It is moderately deep over a fragipan. Individual areas are usually long and narrow. They range from 3 to 40 acres but are dominantly about 10 acres.

In a typical profile, the surface layer is dark brown silt loam about 9 inches thick. The subsurface layer is light brownish gray, mottled silt loam about 7 inches thick. The subsoil to a depth of 80 inches is light brownish gray, mottled, friable silt loam in the upper part; yellowish brown, mottled, very firm and brittle silt loam in the fragipan; and yellowish brown, mottled, firm silty clay in the lower part.

Included with this soil in mapping are small areas of well drained Elkinsville Variant soils and moderately well drained Pekin soils that are on steeper slopes than Bartle soil. The included soils make up about 10 to 15 percent of the map unit.

Available water capacity is moderate in this Bartle soil. Permeability is moderate above the fragipan and very slow within the fragipan. The organic matter content in the surface layer is moderately low. Surface runoff from cultivated areas is slow. This soil has a seasonal high water table at a depth of 1 foot to 2 feet. The fragipan, which is at a depth of 24 to 36 inches, restricts root penetration and perches the water.

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

This soil is well suited to corn, soybeans, and small grain. Most areas are drained. Wetness is the main management concern. The soil is wet and seepy in spring but may become droughty late in summer. Depth to the fragipan determines the amount of water available to plants. The fragipan restricts the downward movement of roots. The use of conservation tillage that leaves all or part of the crop residue on the surface, green manure crops, and cover crops helps to improve and maintain tilth and the organic matter content of this soil. Frost and water damage can be reduced if short-season varieties of adapted crops are grown.

This soil is well suited to grasses and water-tolerant legumes for hay or pasture if it is adequately drained. Wetness prohibits the use of most legumes. This soil is poorly suited to deep-rooted legumes because the fragipan restricts the downward movement of roots. Drainage is needed for high yields of hay and pasture crops. Overgrazing and grazing when the soil is wet are other management concerns. Overgrazing reduces plant density and hardiness and causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees, but only a few areas are in woodland. Rare flooding may hinder harvesting and logging operations and the planting of seedlings. Water-tolerant species are favored in timber stands. Generally, this soil is not suited to black walnut plantings. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include restricting livestock, harvesting trees at maturity, and saving desirable seed trees.

This soil is generally unsuited to building sites because of wetness and flooding. An alternate site is needed. This soil is severely limited for local roads and streets because of potential frost action. Maintaining a crown in the roads and streets; constructing roads and streets on raised, well compacted fill material; and providing adequate side ditches and culverts help to reduce the hazard of frost action. This soil is severely limited for septic tank absorption fields because of wetness and very slow permeability in the fragipan. Drainage around the outer edges of the absorption field removes excess water. Most systems function poorly in this soil.

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

BdB2—Bedford silt loam, 2 to 6 percent slopes, eroded. This gently sloping, moderately well drained soil is on ridgetops of loess-covered uplands. It is moderately deep over a fragipan. Individual areas are usually narrow and long. They range from 3 to 100 acres but are dominantly about 20 acres.

In a typical profile, the surface layer is yellowish brown silt loam about 7 inches thick. The subsoil to a depth of 80 inches is yellowish brown, friable silt loam and silty clay loam in the upper part; a fragipan of yellowish brown, mottled, firm silty clay loam and strong brown, mottled, very firm and brittle silty clay loam in the next part; and strong brown, firm clay in the lower part. In some places the upper part of the subsoil has coarse fragments. In some areas the loess mantle is more than

40 inches thick. In places slopes are less than 2 percent, and in other places they are more than 6 percent.

Included with this soil in mapping are small areas of well drained Crider and Frederick soils that are on slight rises or steeper slopes and small, slightly concave, lower lying areas of poorly drained Hoosierville soils and moderately well drained Muren soils that do not have a fragipan. Also included are some severely eroded areas of soils on nose slopes and sharp slope breaks where the subsoil may be exposed. A few sinkholes may also occur. The included soils make up about 15 percent of the map unit.

Available water capacity is moderate in this Bedford soil. Permeability is moderate above the fragipan and very slow within the fragipan. The organic matter content in the surface layer is moderately low. Surface runoff from cultivated areas is medium. This soil has a seasonal high water table at a depth of 2 to 4 feet. The fragipan, which is at a depth of 20 to 36 inches, restricts root penetration and perches the water.

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

This soil is well suited to corn, soybeans, and small grain. The hazard of erosion is the main management concern. The very slowly permeable fragipan affects the use and management of this soil. The soil is wet and seepy in spring but may become droughty late in summer. Most of the water available for plant use in this soil is above the fragipan. The fragipan also restricts the downward movement of the roots. Conservation practices, such as crop rotation, terraces, diversions, contour farming, grassed waterways, or grade stabilization structures, help to control erosion and surface runoff. The use of conservation tillage that leaves protective amounts of crop residue on the surface, green manure crops, and cover crops also helps to control erosion, improve tilth, and add organic matter content to the soil.

This soil is well suited to grasses and legumes for hay and pasture. This soil is poorly suited to deep-rooted legumes because the fragipan restricts the downward movement of roots. Overgrazing and grazing when the soil is wet are other management concerns. Overgrazing reduces the plant density and hardiness and causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees, but only a few areas are in woodland. The fragipan layer limits the effective rooting depth. This soil generally is not suited to black walnut plantings. Plant competition is the main management concern. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include restricting livestock, harvesting trees at maturity, and saving desirable seed trees.

This soil is moderately limited for dwellings without basements because of wetness and the shrinking and swelling of the soil. It is severely limited for dwellings with basements because of wetness. The installation of subsurface drainage helps to lower the water table. Foundation footings and basement walls should be strengthened. Backfilling with coarser material helps to prevent structural damage caused by shrinking and swelling of the soil. Disturbed areas should be revegetated as soon as possible after construction so that erosion can be kept to a minimum. Topsoil should be stockpiled and spread over critical areas where vegetation is difficult to establish. This soil is severely limited for local roads and streets because of the potential for frost action and low strength. The upper layer of the soil should be replaced or strengthened with more suitable base material. Maintaining a crown in roads and streets, constructing roads and streets on raised, well compacted fill material, and providing adequate side ditches and culverts help to reduce the hazard of frost action. This soil is severely limited for septic tank absorption fields because of wetness and very slow permeability in the fragipan. Perimeter drains placed around the filter field help to remove excess water. Increasing the size of the filter field also helps to compensate for restricted permeability in the fragipan. Most systems function poorly in this soil.

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

BmC—Bloomfield loamy sand, 3 to 10 percent slopes. This gently sloping and moderately sloping, deep, somewhat excessively drained soil is on ridge summits, side slopes, and terrace breaks along large streams. This map unit has dune topography. Individual areas are usually narrow and elongated. They range from 10 to 80 acres but are dominantly about 20 acres.

In a typical profile, the surface layer is very dark grayish brown loamy sand about 7 inches thick. The subsurface layer is brown and dark yellowish brown sand about 19 inches thick. Alternate bands of yellowish brown sand or loamy sand and dark yellowish brown loamy sand are between depths of about 26 and 74 inches. The substratum to a depth of 80 inches is yellowish brown, calcareous sand. In some places slopes are less than 2 percent, and in other places they are more than 10 percent. In places lamellae do not occur within a depth of 40 inches.

Included with this soil in mapping are small areas of well drained Alvin and Princeton soils. Also included are small, severely eroded areas of soils on sharp slope breaks where the subsoil may be exposed. The included soils make up 10 to 20 percent of the map unit.

Available water capacity is moderate in this Bloomfield soil, and permeability is rapid or moderately rapid. The organic matter content in the surface layer is low. Surface runoff from cultivated areas is medium.

Many areas of this soil are used for hay or pasture. A few areas are in woodland.

This soil is poorly suited to corn, soybeans, and small grain. The hazard of erosion and steepness of slope are the main management concerns. These slopes are usually too short for terraces, diversions, contour farming, or grassed waterways; however, the use of conservation tillage that leaves all or part of the crop residue on the surface, green manure crops, and cover crops helps to control erosion and improve and maintain the tilth and organic matter content of the soil. If rainfall is less than normal or is poorly distributed, this soil becomes somewhat droughty and crops are likely to be damaged.

This soil is suited to grasses and legumes for hay or pasture. Alfalfa is grown on this soil. Droughtiness and slope are the main limitations. This soil is droughty during the drier parts of the growing season and is subject to wind erosion. A permanent cover of drought-resistant grasses and legumes helps to slow runoff and control erosion. Overgrazing and grazing when the soil is too dry are additional management concerns. Overgrazing reduces the plant density and hardiness, causes excessive runoff, and increases wind erosion. Proper stocking rates, pasture rotation, and restricted use during dry periods help to keep the pasture and the soil in good condition.

This soil is suited to trees. This soil generally is not suited to black walnut plantings, but it is suited to plantings of black locust for firewood and fencepost production. Seedling mortality is the main management concern. Seedlings survive and grow best if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Seedling mortality can be reduced by planting additional seedlings and thinning to the desired stand density later. Additional management practices include restricting livestock, harvesting trees at maturity, and saving desirable seed trees.

This soil is moderately limited for building sites because of slope. Grading the area to modify the slope or designing the structure to complement the slope helps to overcome the slope hazard. Areas disturbed during construction should be revegetated as soon as possible so that soil loss from erosion will be kept to a minimum. Topsoil should be stockpiled and spread over critical areas where vegetation may be difficult to establish. This soil is moderately limited for local roads and streets because of slope. Roads should be placed on the contour where possible. Cutting and filling operations may be needed. This soil is severely limited for septic tank absorption fields because the soil is underlain by sand below the distribution lines. The absorption field may not adequately filter the effluent in this soil, and ground water supplies may become contaminated.

This Bloomfield soil is in capability subclass IVs and woodland suitability group 3s.

Bo—Bonnie silt loam, frequently flooded. This nearly level, deep, poorly drained soil is on broad flats and in depressions on flood plains along narrow stream channels. It is subject to frequent flooding from March to June for long periods. Individual areas are usually broad and irregular in shape. They range from 5 to 100 acres but are dominantly about 40 acres.

In a typical profile, the surface layer is light gray, mottled silt loam about 9 inches thick. The substratum to a depth of 60 inches is light brownish gray, light gray, and gray, mottled silt loam. In some places the upper part of the subsoil is not so gray. In other places the substratum has more clay. In some areas reaction is medium acid to neutral throughout.

Included with this soil in mapping are small areas of moderately well drained Wilbur soils and somewhat poorly drained McGary soils. These soils are on slightly convex or higher lying areas. The included soils make up about 10 to 15 percent of the map unit.

Available water capacity is very high in this Bonnie soil, and permeability is moderately slow. The organic matter content in the surface layer is moderately low. Surface runoff from cultivated areas is very slow. This soil has a seasonal high water table at or near the surface.

Many areas of this soil are used for cultivated crops, hay, and pasture. Some areas are in woodland.

This soil is suited to corn and soybeans. Usually small grain is not planted because it is subject to severe damage during periods of flooding. Wetness and frequent flooding are the main management concerns. Adequate drainage is needed for maximum crop production. Excess water can be removed by open ditches, subsurface drains, surface drains, pumping, or by a combination of these practices. Frequently, diversions are placed on higher lying areas to intercept the surface runoff before it reaches this soil. If drainage is adequate, and proper management is used, this soil is suited to intensive row cropping. Late plantings of crops help to avoid damage or loss from flooding. The use of conservation tillage that leaves all or part of the crop residue on the surface, green manure crops, and cover crops helps to improve and maintain tilth and the organic matter content of this soil.

This soil is well suited to grasses and water-tolerant legumes for hay or pasture. It is poorly suited to deep-rooted legumes, such as alfalfa, because of prolonged flooding and wetness. Overgrazing and grazing when the soil is wet are other management concerns. Overgrazing reduces the plant density and hardiness and causes surface compaction and poor tilth. Proper stocking rates, rotational grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suited to trees. Restricted use of equipment, seedling mortality, the hazard of windthrow, and plant competition are the main management concerns. This soil generally is not suited to black walnut plantings. Because seasonal wetness and frequent flooding may hinder harvesting and logging operations and delay the planting of seedlings, woodland operations should be timed to seasons of the year when the soil is relatively dry or frozen. Harvesting methods that do not leave trees standing alone or widely spaced should be used. Water-tolerant species are favored in timber stands. Seedlings survive and grow best if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include restricting livestock, harvesting trees at maturity, and saving desirable seed trees.

This soil is generally unsuited to building sites because of wetness and frequent flooding. It is severely limited for local roads and streets because of frequent flooding, wetness, and low strength. Constructing roads on raised, well compacted fill material helps to prevent damage from flooding. Surface drainage helps to lower the water table. The upper layer of the soil needs to be replaced or strengthened with more suitable base material. This soil is generally unsuited to septic tank absorption fields because of wetness, frequent flooding, and moderately slow permeability.

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

Bu—Burnside silt loam, frequently flooded. This nearly level, deep, well drained soil is on narrow flood plains. It is subject to flooding for brief periods from March to June. Individual areas are usually narrow and elongated. They range from 5 to 60 acres but are dominantly about 10 acres.

In a typical profile, the surface layer is dark yellowish brown silt loam about 9 inches thick. The subsoil is about 33 inches thick. The upper part is dark yellowish brown, firm silt loam and channery silt loam, and the lower part is dark yellowish brown, friable extremely channery loam. Sandstone bedrock is at a depth of 42 inches. In some areas, the surface layer is more than 15 percent sandstone, siltstone, or shale fragments. In places limestone, sandstone, siltstone, or shale bedrock is within a depth of 20 to 40 inches. In a few areas the dark surface layer is more than 10 inches thick. Some areas are neutral to medium acid throughout.

Included with this soil in mapping are small areas of well drained Haymond soils that have very few coarse fragments and that have less sand throughout. Also included are colluvium deposits of soil material from higher elevations that have slopes of 6 to 12 percent. The included soils make up about 10 to 15 percent of the map unit.

Available water capacity and permeability are moderate in this Burnside soil. The organic matter content in the surface layer is moderately low. Surface runoff from cultivated areas is slow. This soil has a seasonal high water table at a depth of 3 to 5 feet.

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

This soil is well suited to corn and soybeans. If proper management is used, this soil is suited to intensive row cropping. Flooding is the main concern in use and management of this soil. Small grain is subject to severe damage during periods of prolonged flooding. Late planting of crops helps to avoid damage or loss from flooding. The use of conservation tillage that leaves all or part of the crop residue on the surface and green manure crops helps to improve and maintain tilth and the organic matter content of the soil.

This soil is well suited to grasses and legumes for pasture or hay. It is poorly suited to deep-rooted legumes, such as alfalfa, because of prolonged flooding. Overgrazing and grazing when the soil is wet are other management concerns. Overgrazing reduces the plant density and hardiness and causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition, which is moderate, is the main management concern. Flooding hinders harvesting and logging operations and delays the planting of seedlings. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include restricting livestock, harvesting trees at maturity, and saving desirable seed trees.

This soil is generally unsuited to building sites because of frequent flooding. It is severely limited for local roads and streets because of frequent flooding. Constructing roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent damage from flooding. This soil is generally unsuited to septic tank absorption fields because of frequent flooding and wetness.

This Burnside soil is in capability subclass IIs and woodland suitability group 1o.

CcC2—Caneyville silt loam, 6 to 12 percent slopes, eroded. This moderately sloping, moderately deep, well drained soil is on ridgetops and side slopes of uplands. Individual areas are usually elongated. They range from 5 to 200 acres but are dominantly about 30 acres.

In a typical profile, the surface layer is dark brown silt loam about 4 inches thick. The subsoil to a depth of 28

Figure 2.—Outcrops of limestone in a wooded area of Caneyville silt loam, 6 to 12 percent slopes, eroded.

inches is dark yellowish brown, friable silt loam in the upper part; dark brown, friable silty clay loam in the next part; dark brown, firm silty clay loam below that; red, firm silty clay loam in the next part; and reddish brown, firm clay in the lower part. Limestone bedrock is at a depth of 28 inches. In some areas bedrock is above a depth of 20 inches, and in other areas it is below a depth of 40 inches. In some places slopes are less than 6 percent, and in other areas they are more than 12 percent.

Included with this soil in mapping are small areas of well drained Crider and Frederick soils. In these soils limestone bedrock is at a depth of 40 inches or more. Also included are a few areas of soils that formed in material weathered from siltstone, sandstone, or shale, and some severely eroded areas of soils on nose slopes and sharp slope breaks where the subsoil may be exposed. Most of these delineations have rock outcrops (fig. 2). The included soils make up about 5 to 10 percent of the map unit.

Available water capacity is low in this Caneyville soil, and permeability is moderately slow. The organic matter content in the surface layer is moderate. Surface runoff from cultivated areas is medium.

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

This soil is poorly suited to corn, soybeans, and small grain. The hazard of erosion is the main management concern. Conservation practices, such as crop rotation, diversions, contour farming, grassed waterways, or grade stabilization structures help to control erosion and surface runoff, but the depth to bedrock may limit the installation of some conservation practices. Usually slopes are too short for terracing. The use of conservation tillage that leaves all or part of the crop residue on the surface, green manure crops, and cover crops helps to control erosion and improve and maintain the tilth and organic matter content of this soil. If rainfall is less than normal or is poorly distributed, these soils become somewhat droughty and crops are likely to be damaged.

This soil is suited to grasses and legumes for hay or pasture. Deep-rooted legumes may be restricted by depth to bedrock. Runoff, the hazard of erosion, and the depth to bedrock are the main management concerns when areas are reseeded to hay or pasture. A permanent cover of vegetation helps to slow runoff and control erosion. Overgrazing and grazing when this soil is wet are other management concerns. Overgrazing reduces the plant density and hardiness and causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing or restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suited to trees. Restricted use of equipment and seedling mortality are the main management concerns. This soil is suited to plantings of black locust for firewood and fencepost production. Seedling mortality can be reduced by planting species that are tolerant to drought conditions and by planting additional seedlings and thinning to the desired stand density later. Logging roads and skid trails should be constructed on the contour. Road ditches and culverts help to control runoff from roads and skid trails. Seedlings survive and grow best if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include excluding livestock, harvesting trees at maturity, and saving desirable seed trees.

This soil is moderately limited for dwellings without basements because of depth to rock, shrinking and swelling of the soil, and slope. It is severely limited for dwellings with basements because of depth to rock. Grading to modify slope or designing the structure to complement the slope helps to overcome the slope hazard. Foundation footings should be strengthened. Backfilling with coarser material helps to prevent structural damage caused by shrinking and swelling of the soil. Areas disturbed during construction should be revegetated as soon as possible so that soil loss from erosion is kept to a minimum. Topsoil should be stockpiled and spread over critical areas where vegetation is difficult to establish. This soil is severely limited for local roads and streets because of low strength. The upper layer of the soil should be replaced or strengthened with more suitable base material. This soil is severely limited for septic tank absorption fields because of depth to rock and moderately slow permeability. These limitations can be overcome by filling or mounding the site with suitable filtering material and by replacing the slowly permeable material with more permeable material.

This Caneyville soil is in capability subclass IVe and woodland suitability group 3c.

CcD2—Caneyville silt loam, 12 to 20 percent slopes, eroded. This strongly sloping, moderately deep, well drained soil is on side slopes of uplands. Individual areas are usually elongated. They range from 3 to 200 acres but are dominantly about 40 acres.

In a typical profile, the surface layer is brown silt loam about 8 inches thick. The subsoil is about 25 inches thick. The upper part is dark yellowish brown, friable silt loam, and the lower part is yellowish red, firm silty clay. Limestone bedrock, which occurs as pinnacles and crevasses rather than in a flat plane, is at a depth of 33 inches. In some areas bedrock is above a depth of 20 inches, and in other areas it is below a depth of 40 inches. In some places slopes are less than 12 percent, and in other places they are more than 18 percent.

Included with this soil in mapping are small areas of well drained Crider and Frederick soils. In these soils limestone bedrock is at a depth of 40 inches or more. Also included are soils that formed in material weathered from siltstone, sandstone, and shale and some severely eroded areas of soils on nose slopes and sharp slope breaks where the subsoil may be exposed. Most of these delineations have many rock outcrops, a few sinkholes, or a few abandoned quarries. The included soils make up about 10 to 15 percent of the map unit.

Available water capacity is low in this Caneyville soil, and permeability is moderately slow. The organic matter content in the surface layer is moderate. Surface runoff from cultivated areas is rapid.

Many areas of this unit are used for hay or pasture. Some areas are used for woodland, and a few areas are used for cultivated crops.

This soil is generally unsuited to corn, soybeans, and small grain because of the very severe hazard of erosion.

This soil is poorly suited to grasses and legumes for hay or pasture. Deep-rooted legumes may be restricted by the depth to bedrock. Runoff and the hazard of erosion are the main concerns when reseeding areas of this soil to hay or pasture. A permanent cover of vegetation helps to slow runoff and control erosion.

Overgrazing and grazing when the soil is wet are other management concerns. Overgrazing reduces the plant density and hardiness and causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing or restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suited to trees. Woodland is the most suitable use of this soil, but it is not a good site for the production of high quality woods. The hazard of erosion, restricted use of equipment, and seedling mortality are the main management concerns. This soil is not suited to black walnut plantings, but it is suited to plantings of black locust for firewood and fencepost production. Seedling mortality can be reduced by planting species that are tolerant to drought conditions and by planting additional seedlings and thinning to the desired stand later. Logging roads and skid trails should be constructed on the contour. The use of road ditches, culverts, and grade stabilization structures helps to control runoff from roads and skid trails. Steepness of slopes hinders the use of some kinds of logging equipment. Seedlings survive and grow best if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include restricting livestock, harvesting trees at maturity, and saving desirable seed trees.

This soil is severely limited for dwellings without basements because of slope. It is severely limited for dwellings with basements because of depth to rock and slope. An alternate site may be needed. Grading the area to modify the slope or designing the structure to complement the slope helps to overcome the slope hazard. Depth to rock hinders the construction of basements. Areas disturbed during construction should be revegetated as soon as possible so that soil loss from erosion can be kept to a minimum. Topsoil should be stockpiled and spread over critical areas where vegetation may be difficult to establish. This soil is severely limited for local roads and streets because of low strength and slope. The upper layer of soil should be replaced or strengthened with more suitable base material. Placing the roads on the contour helps to overcome the slope hazard. Cutting and filling operations can help to reduce the slope, but depth to rock may limit the use of this practice. This soil is generally unsuited to septic tank absorption fields because of depth to rock, slope, and moderately slow permeability. Installing the absorption field in one of the deeper included areas may be desirable.

This Caneyville soil is in capability subclass VIe and woodland suitability group 3c.

CfF—Caneyville-Gilpin-Rock outcrop complex, 25 to 75 percent slopes. This map unit consists of Rock outcrop and steep and very steep, moderately deep, well drained soils on sharp breaks that border the valleys and on side slopes of drainageways that deeply dissect the uplands. Individual areas are usually long and narrow. They range from 10 to 100 acres but are dominantly about 60 acres. Areas are about 55 percent Caneyville soil, 25 percent Gilpin soil, and 10 percent Rock outcrop. The Caneyville soil is generally in the upper two-thirds of the landform, and the Gilpin soil is generally in the lower one-third of the landform. Rock outcrop dominantly is within areas of Caneyville soil. The soils and Rock outcrop are so intricately mixed or so small that it is not practical to separate them in mapping.

In a typical profile of Caneyville soil, the surface layer is dark brown silt loam about 4 inches thick. The subsoil is about 30 inches thick. The upper part is dark yellowish brown, firm silt loam; the next part is strong brown, firm silty clay loam; below that is reddish brown, firm silty clay; and the lower part is reddish brown, firm clay. Limestone bedrock is at a depth of 34 inches. In some areas bedrock is above a depth of 20 inches, and in other areas it is below a depth of 40 inches. In places slopes are less than 25 percent.

In a typical profile of Gilpin soil, the surface layer is very dark grayish brown silt loam about 2 inches thick. The subsoil is about 24 inches thick. The upper part is brown, friable silt loam, and the lower part is yellowish brown, firm channery silty clay loam. The substratum to a depth of 33 inches is weathered sandstone bedrock. Hard sandstone bedrock is at a depth of 33 inches. In some places bedrock is above a depth of 20 inches, and in other places it is below a depth of 40 inches. In some areas less clay is in the upper part of the subsoil. In places this soil formed in material weathered from limestone. In places slopes are more than 75 percent.

Rock outcrop consists of small areas where sandstone bedrock is exposed or small areas where only a very small amount of soil covers the bedrock. In a few places the soil material is more than 8 inches thick over bedrock.

Included with these soils in mapping are small areas of deep, well drained Crider soils on the upper part of the landform, shallow, well drained Weikert soils on the lower part of the landform, and deep, well drained Frederick soils throughout the entire map unit. Limestone bedrock is below a depth of 40 inches in the Crider and Frederick soils, and it is above a depth of 20 inches in the Weikert soils. Also included are some severely eroded areas of soils on nose slopes and sharp slope breaks where the subsoil may be exposed. A few abandoned quarries are in some areas. The included areas make up about 10 to 15 percent of the map unit.

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

Most areas of these soils are in woodland. These soils are generally unsuited to corn, soybeans, and small grain because of the very severe hazard of erosion and steepness of slope. They are also generally unsuited to grasses and legumes for hay and pasture; however, some of the less sloping areas are suitable for limited grazing.

These soils are poorly suited to trees. Although woodland is the most suitable use of these soils, they are not a good site for the production of high quality woods. The hazard of erosion, restricted use of equipment, and seedling mortality are the main management concerns. Seedling mortality can be reduced by planting additional seedlings and thinning to the desired stand density later. Logging roads and skid trails should be constructed on the contour. The use of road ditches, culverts, and grade stabilization structures help to control runoff from roads and skid trails. Steepness of slopes hinders the use of some kinds of logging equipment. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Restricting livestock, harvesting trees at maturity, and saving desirable seed trees are additional good management practices.

These soils are generally unsuited to building sites because of slope or depth to rock and slope. They are severely limited for local roads and streets, dominantly because of slope and low strength. Placing the roads on the contour helps to relieve the slope hazard. Cutting and filling operations can help to reduce the slope, but depth to bedrock may limit the use of this practice. The upper layer of the soils should be replaced or strengthened with more suitable base material. These soils are generally unsuited to septic tank absorption fields because of steep slope, depth to bedrock, and restricted permeability.

This Caneyville-Gilpin-Rock outcrop complex is in capability subclass VIIe. The Caneyville soil is in woodland suitability group 3c, and the Gilpin soil is in woodland suitability group 3r.

Cg—Chagrin loam, frequently flooded. This nearly level, deep, well drained soil is on broad flood plains along large streams. It is subject to flooding for brief periods from November to May. Individual areas are usually elongated. They range from 5 to 120 acres but are dominantly about 70 acres.

In a typical profile, the surface layer is dark brown loam about 10 inches thick. The subsoil is dark brown and dark yellowish brown, friable sandy loam about 32 inches thick. The substratum to a depth of 60 inches is dark yellowish brown sandy loam. In places the subsoil is loam.

Included with this soil in mapping are small areas of well drained Abscota soils which have more sand throughout than Chagrin soil. Also included are small areas of somewhat poorly drained Newark soils and poorly drained Petrolia soils, both of which are in depressions. In places sandy overwash has been recently deposited by flood waters. The included soils make up about 15 to 20 percent of the map unit.

Available water capacity is high in this Chagrin soil, and permeability is moderate. The organic matter content in the surface layer is moderate. Surface runoff from cultivated areas is slow. This soil has a seasonal high water table at a depth of 4 to 6 feet.

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

This soil is well suited to corn and soybeans. If properly managed, this soil is suited to intensive row cropping. Frequent flooding is the main management concern. Late planting of short-season varieties of crops helps to avoid damage or loss of crops from flooding. The use of conservation tillage that leaves all or part of the crop residue on the surface and green manure crops helps to improve and maintain the tilth and organic matter content of this soil.

This soil is well suited to grasses and legumes for pasture or hay. Alfalfa and other deep-rooted legumes are subject to severe damage during periods of prolonged flooding. Water-tolerant species are best suited to this soil. Overgrazing and grazing when the soil is wet are the main management concerns. Overgrazing reduces the plant density and hardiness and causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and restricted use during wet periods help to keep the pasture and the soil 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. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include restricting livestock, harvesting trees at maturity, and saving desirable seed trees.

This soil is generally unsuited to building sites and septic tank absorption fields because of frequent flooding. It is severely limited for local roads and streets because of frequent flooding; however, constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts help to protect them from flood damage.

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

CrB—Crider silt loam, 2 to 6 percent slopes. This gently sloping, deep, well drained soil is on narrow and broad, convex ridgetops on uplands. Individual areas are usually elongated. They range from 3 to 400 acres but are dominantly about 40 acres.

In a typical profile, the surface layer is dark yellowish brown silt loam about 6 inches thick. The subsoil to a depth of 80 inches is dark yellowish brown, friable silt loam in the upper part; brown and strong brown, firm silty clay loam in the next part; red, firm silty clay below that; and red, firm clay in the lower part. In places this soil formed in material weathered from siltstone, sandstone, and shale. In places the soil has gray mottles within a depth of 30 inches. In some areas the loess is less than 20 inches thick, and in other areas it is more than 45 inches thick. In places slopes are less than 2 percent or more than 6 percent.

Included with this soil in mapping are small, slightly concave, lower lying areas of moderately well drained Bedford and Muren soils and poorly drained Hoosierville soils and small areas of moderately deep Caneyville soils on the steeper slopes. Also included are some severely eroded areas of soils on nose slopes and sharp slope breaks where the subsoil may be exposed. The included soils make up about 10 to 15 percent of the map unit.

Available water capacity is high in this Crider soil, and permeability is moderate. The organic matter content in the surface layer is moderate. Surface runoff from cultivated areas is medium.

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

This soil is well suited to corn, soybeans, and small grain. The hazard of erosion is the main management concern. Conservation practices, such as crop rotation, terraces, diversions, contour farming, grassed waterways, or grade stabilization structures, help to control erosion and surface runoff. The use of conservation tillage that leaves all or part of the crop residue on the surface, green manure crops, and cover crops helps to improve and maintain the tilth and organic matter content of this soil.

This soil is well suited to grasses and legumes for hay or pasture. It is especially suitable for alfalfa. A permanent cover of vegetation helps to slow runoff and control erosion. Overgrazing and grazing when the soil is wet are management concerns. Overgrazing reduces plant density and plant hardiness and causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition, which is moderate, is the main management concern. This soil is suited to plantings of black locust for firewood and fencepost production. Where needed, black locust can provide erosion control and, like most legumes, produce nitrogen throughout a shallow but wide-spreading root system. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include restricting livestock, harvesting trees at maturity, and saving desirable seed trees.

This soil is suitable for building sites. Disturbed areas should be revegetated as soon as possible after construction so that erosion can be held to a minimum. Topsoil should be stockpiled and spread over critical areas where vegetation may be difficult to establish. This soil is severely limited for local roads and streets because of low strength. The upper layer of the soil should be replaced or strengthened with more suitable base material. This soil is suitable for septic tank absorption fields, but because runoff collects in the sinkholes and contamination of under ground water supplies is a possibility, these structures should receive careful attention.

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

CrC2—Crider silt loam, 6 to 12 percent slopes, eroded. This moderately sloping, deep, well drained soil is on narrow and broad, convex ridgetops and side slopes on uplands. Individual areas are usually elongated. They range from 3 to 200 acres but are dominantly about 40 acres.

In a typical profile, the surface layer is dark brown silt loam about 7 inches thick. The subsoil to a depth of 80 inches is dark yellowish brown, friable silt loam in the upper part; strong brown, friable and firm silty clay loam in the next part; and red and strong brown, firm clay in the lower part. In places this soil formed in material weathered from siltstone, sandstone, and shale. In some areas the loess mantle is less than 20 inches thick, and in other areas it is more than 45 inches thick. In some places slopes are less than 6 percent, and in other places they are more than 12 percent.

Included with this soil in mapping are small areas of moderately deep Caneyville soils and moderately well drained Bedford soils, both of which are on slightly convex, higher lying ridgetops. Also included are small areas of soils where limestone bedrock occurs either as solid bedrock or as layers of rock and soil above a depth of 20 inches and some areas of severely eroded soils on nose slopes and sharp slope breaks where the subsoil may be exposed. Sinkholes, outcrops of rock, and abandoned quarries occur in places. The included areas make up 10 to 15 percent of the map unit.

Available water capacity is high in this Crider soil, and permeability is moderate. The organic matter content in the surface layer is moderate. Surface runoff from cultivated areas is medium.

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

This soil is suited to corn, soybeans, and small grain. The hazard of erosion is the main management concern. Conservation practices, such as crop rotation, diversions, contour farming, grassed waterways, grade stabilization structures, or terracing, help to control erosion and surface runoff. The use of conservation tillage that leaves all or part of the crop residue on the surface, green manure crops, and cover crops also helps to control erosion and to improve and maintain the tilth and organic matter content of this soil.

This soil is well suited to grasses and legumes for hay or pasture. It is especially suited to alfalfa. A permanent cover of vegetation helps to slow runoff and control erosion. Overgrazing and grazing when the soil is wet are management concerns. Overgrazing reduces the plant density and hardiness and causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is the main management concern. This soil is suited to plantings of black locust for firewood and fencepost production. Where needed, black locust can provide erosion control and, like most legumes, produce nitrogen throughout a shallow but wide-spreading root system. Seedlings survive and grow well if competing vegetation is controlled. The control and removal of unwanted trees and shrubs can be accomplished by site preparation, or by spraying, cutting, or girdling. Additional management practices include restricting livestock, harvesting trees at maturity, and saving desirable seed trees.

This soil is moderately limited for building sites because of slope. Grading the area to modify the slope or designing the structure to complement the slope helps to overcome the slope hazard. Disturbed areas should be revegetated as soon as possible after construction so that erosion can be held to a minimum. Topsoil should be stockpiled and spread over critical areas where vegetation may be difficult to establish. This soil is severely limited for local roads and streets because of low strength. The upper layer of the soil should be replaced or strengthened with more suitable base material. This soil is moderately limited for septic tank absorption fields because of slope. Grading or land shaping to modify the slope and installing the absorption field on the contour help to overcome the slope hazard.

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

CrD2—Crider silt loam, 12 to 18 percent slopes, eroded. This strongly sloping, deep, well drained soil is on side slopes between the tops of ridges and drainageways on uplands. Individual areas are generally long and narrow. They range from 3 to 40 acres but are dominantly about 20 acres.

In a typical profile, the surface layer is dark grayish brown silt loam about 3 inches thick. The subsurface layer is brown silt loam about 3 inches thick. The subsoil to a depth of 70 inches is pale brown and yellowish brown, friable silt loam in the upper part; strong brown, friable silt loam and silty clay loam in the next part; and strong brown or yellowish red, firm silty clay in the lower part. Limestone bedrock is at a depth of 70 inches. In some areas the loess mantle is less than 20 inches thick. In places slopes are less than 12 percent.

Included with this soil in mapping are small areas of well drained Caneyville soils in which limestone bedrock is above a depth of 40 inches. Also included are areas of soils that formed in material weathered from siltstone, shale, and sandstone and some areas of severely eroded soils on nose slopes and sharp slope breaks where the subsoil may be exposed. Sinkholes, outcrops of rock, and abandoned quarries occur in places. The included areas make up about 10 to 15 percent of the map unit.

Available water capacity is high in this Crider soil, and permeability is moderate. The organic matter content in the surface layer is moderate. Surface runoff from cultivated areas is rapid.

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

This soil is poorly suited to corn, soybeans, and small grain. The very severe hazard of erosion and steepness of slope are the main management concerns. Conservation practices, such as crop rotation, contour farming, and grassed waterways, help to control erosion and surface runoff. The use of conservation tillage that leaves all or part of the crop residue on the surface, green manure crops, and cover crops also helps to control erosion and to improve and maintain the tilth and organic matter content of this soil.

This soil is suited to grasses and legumes for hay and pasture. It is especially suited to alfalfa. A permanent cover of vegetation helps to slow runoff and control erosion. Overgrazing and grazing when the soil is wet are management concerns. Overgrazing reduces the plant density and hardiness and causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. The hazard of erosion, restricted use of equipment, and plant competition are the main management concerns. This soil is suited to plantings of black locust for firewood and fencepost production. Where needed, black locust can provide erosion control and, like most legumes, produce nitrogen throughout a shallow but wide-spreading root system. Logging roads and skid trails should be constructed on the contour. The use of road ditches, culverts, and grade stabilization structures help to control the runoff from roads and skid trails. Steepness of slope hinders the use of some logging equipment. Seedlings survive and grow well if competing vegetation is controlled. The control and removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include restricting livestock, harvesting trees at maturity, and saving desirable trees.

This soil is severely limited for building site development because of slope. An alternate site may be needed. Grading the area to modify the slope or designing the structure to complement the slope helps to overcome the slope hazard. Disturbed areas should be revegetated as soon as possible after construction so that erosion can be held to a minimum. Topsoil should be stockpiled and spread over critical areas where vegetation may be difficult to establish. This soil is severely limited for local roads and streets because of slope and low strength. The upper layer of the soil should be replaced or strengthened with more suitable base material. Roads should be placed on the contour where possible. Such placement may include cutting and filling. This soil is severely limited for septic tank absorption fields because of slope. Grading or land shaping to modify the slope and installing the absorption field on the contour help to overcome the slope hazard.

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

CsD2—Crider-Caneyville silt loams, 12 to 18 percent slopes, eroded. This map unit consists of strongly sloping, deep and moderately deep, well drained soils on the lower part of side slopes between the tops of ridges and drainageways on uplands. Individual areas are usually elongated. They range from 5 to 200 acres but are dominantly about 60 acres. Areas are about 50 percent Crider soil and 35 percent Caneyville soil. This unit is slightly below the limestone contact with interbedded sandstone, siltstone, and shale. It also has some soils that formed in colluvial deposits of material from higher elevations that moved down the slope as slips during periods of geologic erosion. The Crider and Caneyville soils are so intricately mixed that it is not practical to separate them in mapping.

In a typical profile of Crider soil, the surface layer is dark brown silt loam about 7 inches thick. The subsoil to a depth of 80 inches is strong brown, friable silt loam in the upper part; strong brown, firm silty clay loam in the middle part; and strong brown and red, firm silty clay in the lower part. In places the limestone bedrock is above a depth of 60 inches. In some areas the loess mantle is less than 20 inches thick.

In a typical profile of Caneyville soil, the surface layer is dark brown silt loam about 5 inches thick. The subsoil to a depth of 38 inches is yellowish brown, friable silt loam in the upper part; strong brown, firm silty clay loam in the next part; yellowish red and red firm silty clay and clay below that; and brown, firm clay in the lower part. Limestone bedrock is at a depth of 38 inches. In some areas the bedrock is within a depth of 20 inches.

Included with these soils in mapping are small areas of moderately well drained Ebal soils and well drained Wellston soils, both of which are underlain by sandstone, siltstone, or shale. Also included are some areas of severely eroded soils on nose slopes and sharp slope breaks where the subsoil may be exposed. Rock outcrop is in most areas. The included soils make up about 10 to 15 percent of the map unit.

Available water capacity is high in the Crider soil and low in the Caneyville soil. Permeability is moderate in the Crider soil and moderately slow in the Caneyville soil. The organic matter content in the surface layer is moderate in both soils. Surface runoff is rapid on both soils.

Most areas of these soils are used for hay or pasture. Some areas are in woodland.

These soils are generally unsuited to corn, soybeans, and small grain because of geologic erosion.

These soils are poorly suited to grasses and legumes for hay or pasture. Runoff and the hazard of erosion are the main concerns in areas that are reseeded to hay or pasture. A permanent cover of vegetation helps to slow runoff and control erosion. Overgrazing and grazing when the soil is wet are management concerns. Overgrazing reduces the plant density and hardiness and causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and restricted use during wet periods help to keep the pastures and the soils in good condition.

The Crider part of this map unit is well suited to trees, and the Caneyville part is suited to trees. Woodland is the best use of these soils, but they are not good sites for the production of high quality woods. The hazard of erosion, restricted use of equipment, and plant competition are the main management concerns for the Crider soil, and the hazard of erosion and restricted use of equipment are the main concerns for the Caneyville soil. These soils are suited to black locust for firewood and fencepost production. Logging roads and skid trails should be built on the contour. The use of road ditches and culverts help to control runoff from roads and skid trails. Steepness of slopes hinders the use of some logging equipment. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include restricting livestock, harvesting trees at maturity, and saving desirable seed trees.

These soils are severely limited for building sites. Both soils are limited for dwellings without basements because of slope. The Crider soil is limited for dwellings with basements because of slope, and the Caneyville soil is limited because of slope and depth to rock. Grading the area to modify the slope or designing the structure to complement the slope helps to overcome the slope hazard. Areas disturbed during construction should be revegetated as soon as possible so that soil loss from erosion is kept to a minimum. Topsoil should be stockpiled and spread over critical areas where vegetation may be difficult to establish. These soils are severely limited for local roads and streets because of low strength and slope. The upper layer of the soil should be replaced or strengthened with more suitable base material. Placing roads on the contour can help to overcome the slope hazard. Such placement may include cutting and filling operations, but depth to rock in the Caneyville soil may limit the use of this practice. These soils are generally unsuited to septic tank absorption fields.

These Crider and Caneyville soils are in capability subclass IVe. The Crider soil is in woodland suitability group 1r, and the Caneyville soil is in woodland suitability group 3c.

CwD2—Crider-Frederick silt loams, karst, 6 to 20 percent slopes, eroded. This map unit consists of moderately sloping to moderately steep, deep, well drained soils on ridgetops and side slopes on uplands. Individual areas are variable in shape. They range from 3 to 1,800 acres but are dominantly about 80 acres. Areas are about 55 percent Crider soil and 25 percent Frederick soil. The topography was originally gently sloping or moderately sloping, but the landscape now has many large sinkholes. This unit has no defined surface drainage system; therefore, all surface water drains through underground passages that connect a series of sinkholes. This network of passages is very complex and exact locations are not known. Drainageways entering this unit quickly terminate in a sinkhole. Water that collects in the sinkholes drains very rapidly. The sinkholes are separated by narrow ridgetop areas. Soils on the ridgetops usually have a deeper solum than adjacent soils on the side slopes of the sinkholes. The ridgetop areas range from 45 to 200 feet in width and average about 80 feet. The sinkholes have slopes that range from 6 to 20 percent and are less steep near the ridgetops. Generally, the Crider soil is on the ridgetop and upper half of the sinkhole, and the Frederick soil is on the lower half of the sinkhole. Soils that formed in alluvium are in the bottom of the sinkhole. Crider and Frederick soils are so intricately mixed throughout the landscape that it is not practical to separate them in mapping.

In a typical profile of Crider soil, the surface layer is dark brown silt loam about 8 inches thick. The subsoil to a depth of 62 inches is yellowish brown, friable silt loam in the upper part; strong brown, friable silty clay loam in the next part; strong brown, firm very channery silty clay loam below that; and yellowish red, firm very channery silty clay in the lower part. Limestone bedrock is at a depth of 62 inches. In many areas more limestone and chert fragments (or stoneline) are in the upper part of the subsoil. In a few places the underlying bedrock is siltstone, sandstone, and shale. In some areas the loess mantle is less than 20 inches thick, and in a few areas it is more than 45 inches thick. In some places slopes are less than 6 percent, and in other places they are more than 25 percent.

In a typical profile of Frederick soil, the surface layer is dark yellowish brown silt loam about 6 inches thick. The subsoil to a depth of 80 inches is strong brown, friable silt loam in the upper part; strong brown, friable silty clay loam in the next part; yellowish red, firm silty clay loam below that; yellowish red, firm silty clay in the next part; and dark reddish brown, firm very stony clay in the lower part. In places limestone bedrock is at a depth of 40 to 60 inches. In some areas the loess mantle is more than 20 inches thick. In some places slopes are less than 6 percent, and in other places they are more than 20 percent.

Included with these soils in mapping are small areas of moderately well drained Bedford soils which are on narrow ridgetops. Also included are areas of soils that are moderately deep to limestone bedrock and some areas of severely eroded soils on nose slopes and sharp slope breaks where the subsoil may be exposed. The included soils make up about 10 to 15 percent of the map unit.

Available water capacity is high for the Crider soil and moderate for the Frederick soil. Permeability is moderate for both soils. The organic matter content in the surface layer is moderately low in both soils. Surface runoff from cultivated areas is rapid on both soils.

Many areas of these soils are used for hay or pasture. Some areas are used for cultivated crops, and a few areas are in woodland. The areas on the ridgetops have the highest potential for cultivated crops.

This unit is generally unsuited to corn, soybeans, and small grain. Only the small areas on the ridgetops can be cultivated.

These soils are suited to grasses and legumes for hay or pasture. Runoff and the hazard of erosion are the main concerns where areas are reseeded to hay or pasture. A permanent cover of vegetation helps to slow runoff and control erosion. Conservation tillage can be used when preparing new stands of pasture species. Overgrazing and grazing when the soils are wet are other management concerns. Overgrazing reduces the plant density and hardiness and causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and timely deferment of grazing or restricted use during wet periods helps to keep the pasture and the soils in good condition.

These soils are suited to trees. Plant competition is moderate for both soils. The hazard of erosion, restricted use of equipment, and plant competition are the main management concerns. These soils are suited to black locust for firewood and fencepost production. Where needed, black locust can provide erosion control and, like most legumes, produce nitrogen throughout a shallow but wide-spreading root system. In addition, the Crider soil is limited by slope, and the Frederick soil is limited by the clayey nature of the subsoil. Harvesting and planting are restricted to the drier seasons of the year in the Frederick soil because of the clayey nature of the subsoil. Logging roads and skid trails should be constructed on the contour. The use of road ditches, culverts, and grade stabilization structures helps to control runoff from roads and skid trails. Because steepness of slope hinders the use of some kinds of logging equipment, yarding the logs uphill with cable may be necessary. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include restricting livestock, harvesting trees at maturity, and saving desirable seed trees.

These soils are severely limited for dwellings without basements because of slope and the karst topography. They are moderately limited for dwellings with basements because of the shrinking and swelling of the soil. Grading the areas to modify the slope or designing the structure to complement the slope helps to overcome the slope hazard. Foundation footings and basement walls should be strengthened. Backfilling with coarser material helps to prevent structural damage caused by shrinking and swelling of the soil. Disturbed areas should be revegetated as soon as possible after construction so that erosion can be held to a minimum. Topsoil should be stockpiled and spread over critical areas where vegetation may be difficult to establish. The less sloping ridgetops of the Crider soil, which are a smaller part of this map unit, have the highest potential for scattered building site development. These soils are severely limited for local roads and streets mostly because of slope, low strength, and potential frost action. Roads are usually constructed on the ridgetops. The upper layer of the soil should be replaced or strengthened with more suitable base material. These soils are severely limited for septic tank absorption fields because of slopes and sinkholes. The less sloping areas on ridgetops have the highest potential for absorption fields. Installing the absorption field on the contour helps to overcome the slope limitation. Because runoff collects in the sinkholes, there is a possibility of contamination of under ground water supplies.

These Crider and Frederick soils are in capability subclass IVe. The Crider soil is in woodland suitability group 1r, and the Frederick soil is in woodland suitability group 2r.

Dp—Dumps-Pits-Udorthents complex. This map unit consists of dumps, pits, and nearly level to very steep, deep to shallow, well drained soils on uplands. It includes material from limestone and sandstone quarries and areas of disturbed soils. Map units are usually rectangular. They range from 10 to 600 acres but are dominantly about 60 acres. This map unit is about 35 percent dumps, 25 percent pits, and 25 percent soils. The dumps, pits, and soils are so intricately mixed or so small that it is not practical to separate them in mapping.

The areas of dumps have piles of waste rock, spoil, and general refuse which were left on the surface during previous quarrying operations. The areas generally are covered with shrubs, trees, and grasses, the density of which depends upon how long the pit has been abandoned. Some areas have no vegetation.

The open excavations or pits range from 5 to 100 acres and are 25 to more than 200 feet deep. Many of the pits have been abandoned for many years, and most of the deeper pits contain water. Large amounts of waste rock have been dumped into some of the pits, and limestone or sandstone rock is exposed on the walls of the pits. Generally, these pits support few or no plants. In some of the smaller abandoned pits, however, where soil has accumulated in the bottom, vegetation, such as weeds, shrubs, trees, and wild grasses, has become established.

In areas of Udorthents, the surface layer and part of the subsoil have been removed and, as a result, the surface soil has been mixed with subsoil, substratum, and pieces of limestone rubble. The remaining soil material is a layer of subsoil or substratum over limestone, siltstone, sandstone, or shale bedrock.

Included with this unit in mapping are small areas of well drained Caneyville, Crider, Frederick, Gilpin, or Wellston soils. The included soils make up about 10 to 15 percent of the map unit.

Available water capacity for the Udorthents ranges from very low to high. Permeability is variable. The organic matter content of the surface material is moderate or low. Surface runoff is very slow to very rapid. The reaction of the profile is neutral to extremely acid.

Most areas of this map unit are idle. The small patchy areas of native grasses, low growing shrubs, or small trees provide habitat for wildlife.

This map unit is generally unsuited to agricultural uses, building sites, and sanitary facilities. It is best suited to use by wildlife and to some recreational uses.

This Dumps-Pits-Udorthents complex is not assigned to interpretative groupings.

EbC2—Ebal silt loam, 6 to 12 percent slopes, eroded. This moderately sloping, deep, moderately well drained soil is on ridgetops and side slopes of uplands. Map units are usually long and narrow. They range from 5 to 40 acres but are dominantly about 20 acres.

In a typical profile, the surface layer is dark yellowish brown silt loam about 7 inches thick. The subsoil is about 42 inches thick. The upper part is yellowish brown and strong brown, friable silty clay loam; the middle part is strong brown, firm channery silty clay; and the lower part is strong brown, firm clay. The substratum to a depth of 80 inches is yellowish brown shale. In places slopes are less than 6 percent.

Included with this soil in mapping are small areas of well drained Gilpin and Wellston soils and small areas of moderately well drained Hosmer soils, which have a fragipan. The Hosmer soils are on slightly convex, higher lying ridgetops. Also included are some areas of severely eroded soils on nose slopes and sharp slope breaks where the subsoil may be exposed. Short steep slopes are in a few places. The included areas make up about 10 to 15 percent of the map unit.

Available water capacity is moderate in this Ebal soil. Permeability is moderate in the upper part and very slow in the lower part. The organic matter content of the surface layer is low. Surface runoff from cultivated areas is medium. This soil has a water table at a depth of 3 to 6 feet from November to March.

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

This soil is suited to corn, soybeans, and small grain. The hazard of erosion is the main management concern. Conservation practices, such as crop rotation, diversions, contour farming, grassed waterways, and terracing, help to control erosion and surface runoff. The use of conservation tillage that leaves all or part of the crop residue on the surface, green manure crops, and cover crops also helps to control erosion and improve and maintain the tilth and organic matter content of the soil. When rainfall is less than normal or is poorly distributed, this soil becomes somewhat droughty, and crops are likely to be damaged.

This soil is well suited to grasses and legumes for hay or pasture. The hazard of erosion is the main management concern. A permanent cover of vegetation helps to slow runoff and control erosion. Overgrazing and grazing when the soil is wet are other management concerns. Overgrazing reduces the plant density and hardiness and causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, or restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Seedling mortality, the hazard of windthrow, and plant competition are the main management concerns. This soil generally is not suited to black walnut plantings, but it is suited to black locust plantings for firewood and fencepost production. Seedling mortality can be reduced by planting additional seedlings and thinning to the desired stand density later. Harvesting methods that do not leave trees standing alone or widely spaced are beneficial. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation, or by spraying, cutting, or girdling. Additional management practices include restricting livestock, harvesting trees at maturity, and saving desirable seed trees.

This soil is severely limited for building sites because of the shrinking and swelling of the soil. Foundation footings and basement walls should be strengthened. Backfilling with coarser material helps to prevent structural damage caused by shrinking and swelling of the soil. Revegetating disturbed areas as soon as possible after construction helps to keep erosion to a minimum. Topsoil should be stockpiled and spread over critical areas where vegetation may be difficult to establish. This soil is severely limited for local roads and streets because of low strength and shrinking and swelling of the soil. The upper layer of the soil should be replaced or strengthened with more suitable base material. This soil is severely limited for septic tank absorption fields because of wetness and very slow permeability. The use of subsurface drains helps to lower the water table. Installing the absorption field in suitable fill material and increasing the size of the filter field help to compensate for the restricted permeability of this soil.

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

EdD—Ebal-Wellston silt loams, 12 to 24 percent slopes. This map unit consists of strongly sloping and moderately steep, deep, moderately well drained and well drained soils on side slopes of uplands. Map units are usually long and narrow. Areas range from 100 to 800 acres but are dominantly about 300 acres. The map unit is about 45 percent Ebal soil and 30 percent Wellston soil. Ebal soil is on small benches throughout the unit, and the more sloping Wellston soil is on surrounding areas. The soils are so intricately mixed or so small that it is not practical to separate them in mapping.

In a typical profile of Ebal soil, the surface layer is very dark grayish brown silt loam about 3 inches thick. The subsoil to a depth of 56 inches is brown and pale brown, friable channery silt loam and channery loam in the upper part; strong brown, friable channery silty clay in the next part; reddish brown, mottled, firm clay below this; light reddish brown, firm clay in the next part; and gray, mottled, firm clay in the lower part. The substratum to a depth of 80 inches is gray, mottled, weathered shale. In places slopes are less than 12 percent.

In a typical profile of Wellston soil, the surface layer is very dark grayish brown silt loam about 5 inches thick. The subsoil is about 35 inches thick. It is yellowish brown, friable silt loam in the upper part and brown and yellowish brown, firm silty clay loam in the lower part. The substratum to a depth of 60 inches is yellowish brown silt loam. Hard sandstone bedrock is at a depth of 60 inches. In some places gray mottles are above a depth of 30 inches. In other places slopes are more than 24 percent.

Included with these soils in mapping are small areas of moderately deep Berks and Gilpin soils and shallow Weikert soils. Also included, on the lower part of the map unit, are small areas of well drained Caneyville, Crider, and Frederick soils. These soils are underlain by residuum from limestone. The included soils make up about 25 percent of the map unit.

Available water capacity is moderate in the Ebal soil and high in the Wellston soils. Permeability is moderate in the upper part of the Ebal soil and very slow in the lower part, and it is moderate in the Wellston soil. The organic matter content of the surface layer is moderately low in both soils. Surface runoff is rapid on both soils. The water table is at a depth of 3 to 6 feet in the Ebal soil from November to March.

Many areas of these soils are in woodland. Some areas are used for hay or pasture.

These soils are generally unsuited to cultivation because of the very severe hazards of erosion and steepness of slope. They are poorly suited to grasses and legumes for hay or pasture. Rapid runoff and the hazard of erosion are the main management concerns. A permanent cover of vegetation helps to slow runoff and control erosion. The use of conservation tillage when reestablishing stands of grasses and legumes helps to control erosion. Overgrazing and grazing when the soil is wet are other management concerns. Overgrazing reduces plant density and hardiness and causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, or restricted use during wet periods helps to keep the pasture and the soil in good condition.

These soils are suited to trees. Seedling mortality, the hazard of windthrow, and plant competition are the main management concerns for the Ebal soil, and the hazard of erosion, limited use of equipment, and plant competition are the main management concerns for the Wellston soil. The Ebal soil generally is not suited to black walnut plantings, but both soils are suited to black locust plantings for firewood and fencepost production. Where needed, black locust can provide erosion control and, like most legumes, produce nitrogen throughout a shallow but wide-spreading root system. Seedling mortality can be reduced by planting additional seedlings and thinning to the desired stand density later. Using harvesting methods that will not leave trees standing alone or widely spaced is beneficial. Logging roads and skid trails should be constructed on the contour. The use of road ditches, culverts, and grade stabilization structures helps to control runoff from roads and skid trails. Steepness of slope hinders the use of some kinds of logging equipment. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation, or by spraying, cutting, or girdling. Additional management practices include restricting livestock, harvesting trees at maturity, and saving desirable seed trees.

These soils are generally unsuited to building sites because of slope and the shrinking and swelling of the soils. They are severely limited for local roads and streets mostly because of slope, low strength, and the shrinking and swelling of the soils. Upper layers of the soils should be replaced or strengthened with more suitable base material. Roads should be placed on the contour where possible. These soils are generally unsuited to septic tank absorption fields because of slope.

These Ebal and Wellston soils are in capability subclass VIe. The Ebal soil is in woodland suitability subclass 2c, and the Wellston soil is in woodland suitability subclass 2r.

EkB2—Elkinsville Variant loam, 2 to 6 percent slopes, eroded. This gently sloping, deep, well drained soil is on broad low terraces along narrow stream channels. Individual areas are usually long and narrow. They range from 3 to 20 acres but are dominantly about 10 acres.

In a typical profile, the surface layer is dark yellowish brown loam about 8 inches thick. The subsoil is about 63 inches thick. The upper part is yellowish brown and strong brown, friable clay loam and loam; the middle part is strong brown, friable loam; and the lower part is strong brown and yellowish brown, mottled, friable loam. The substratum to a depth of 80 inches is red, mottled gravelly silt loam. In some places slopes are less than 2 percent, and in other places they are more than 6 percent.

Included with this soil in mapping are small areas of somewhat poorly drained Bartle soils that are on small, slightly concave, lower lying areas and areas of small, lower lying, well drained Haymond soils that have less clay in the subsoil than Elkinsville Variant soil. Also included are small areas of moderately well drained Pekin soils and, in some places, severely eroded areas of soils on nose slopes and sharp slope breaks where the subsoil may be exposed. The included soils make up about 10 to 15 percent of the map unit.

Available water capacity is high in this Elkinsville Variant soil, and permeability is moderate. The organic matter content in the surface layer is low. Surface runoff from cultivated areas is medium.

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

This soil is well suited to corn, soybeans, and small grain. The hazard of erosion is the main management concern. Conservation practices, such as crop rotation, diversions, contour farming, grassed waterways, or grade stabilization structures help to control erosion and surface runoff. The use of conservation tillage that leaves all or part of the crop residue on the surface, green manure crops, and cover crops helps to improve and maintain the tilth and organic matter content of this soil.

This soil is well suited to grasses and legumes for hay or pasture. It is suited to deep-rooted legumes, such as alfalfa. The hazard of erosion is the main management concern. A permanent cover of vegetation helps to slow runoff and control erosion. Overgrazing and grazing when the soil is wet are other management concerns. Overgrazing reduces plant density and hardiness and causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is the main management concern. This soil is suited to planting of black locust for firewood and fencepost production. Where needed, black locust can provide erosion control and, like most legumes, produce nitrogen throughout a shallow but wide-spreading root system. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include restricting livestock, harvesting trees at maturity, and saving desirable seed trees.

This soil is suitable for building sites. Disturbed areas should be revegetated as soon as possible after construction so that erosion can be held to a minimum. Topsoil should be stockpiled and spread over critical areas where vegetation may be difficult to establish. This soil is moderately limited for local roads and streets because of the potential for frost action. Maintaining a crown on roads and streets, constructing roads and streets on raised, well compacted fill material, and providing adequate side ditches and culverts reduce the hazard of frost action. This soil is suitable for septic tank absorption fields.

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

FrC2—Frederick silt loam, 6 to 12 percent slopes, eroded. This moderately sloping, deep, well drained soil is on narrow and broad, convex ridgetops and side slopes on uplands. Individual areas are usually elongated. They range from 3 to 60 acres but are dominantly about 15 acres.

In a typical profile, the surface layer is brown silt loam about 8 inches thick. The subsoil to a depth of 80 inches is dark yellowish brown, friable silt loam in the upper part; dark brown and strong brown, firm silty clay loam in the next part; and yellowish red and red, firm silty clay loam or silty clay in the lower part. In some areas the loess mantle is more than 20 inches thick. In a few places slopes are less than 6 percent.

Included with this soil in mapping are small areas of moderately deep Caneyville soils and small, slightly convex, higher lying, moderately well drained Bedford soils on ridgetops. Also included are severely eroded areas of soils on nose slopes and sharp slope breaks where the subsoil may be exposed. Some sinkholes, outcrops of rock, abandoned quarries, and short steep slopes occur in places. These included soils make up about 10 to 15 percent of the map unit.

Available water capacity is high in this Frederick soil, and permeability is moderate. The organic matter content in the surface layer is moderately low. Surface runoff from cultivated areas is medium.

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

The soil is suited to corn, soybeans, and small grain. The hazard of erosion is the main management concern. Conservation practices, such as crop rotation, diversions, contour farming, grassed waterways, grade stabilization structures, and terracing, help to control erosion and surface runoff. The use of conservation tillage that leaves all or part of the crop residue on the surface, green manure crops, and cover crops also helps to control erosion and improve and maintain the tilth and organic matter content of the soil. When rainfall is less than normal or is poorly distributed, this soil becomes somewhat droughty and crops are likely to be damaged.

This soil is well suited to grasses and legumes for hay or pasture. The hazard of erosion is the main management concern. A permanent cover of vegetation helps to slow runoff and control erosion. Overgrazing and grazing when the soil is wet are other management concerns. Overgrazing reduces the plant density and hardiness and causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Restricted use of equipment and plant competition are the main management concerns. This soil is suited to plantings of black locust for firewood and fencepost production. Where needed, black locust can provide erosion control and, like most legumes, produce nitrogen throughout a shallow but wide-spreading root system. Erosion may result if vegetation is removed. Logging roads and skid trails should be constructed on the contour. The use of road ditches, culverts, and grade stabilization structures helps to control runoff from roads and skid trails. Steepness of slope hinders the use of some kinds of logging equipment. Seedlings survive and grow well if competing vegetation is controlled. The control and removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include restricting livestock, harvesting trees at maturity, and saving desirable seed trees.

This soil is moderately limited for dwellings without basements because of slope and the shrinking and swelling of the soil. It is severely limited for dwellings with basements because of the shrinking and swelling of the soil. Backfilling with coarser material helps to prevent structural damage caused by shrink-swell. Disturbed areas should be revegetated as soon as possible after construction so that erosion can be held to a minimum. Topsoil should be stockpiled and spread over critical areas where vegetation may be difficult to establish. This soil is severely limited for local roads and streets because of low strength. The upper layer of the soil should be replaced or strengthened with more suitable base material. This soil is moderately limited for septic tank absorption fields because of slope and moderate permeability. Grading or land shaping to modify the slope and installing the absorption field on the contour help to overcome the slope hazard. Installing the absorption field in suitable fill material helps to compensate for the moderate permeability.

This Frederick soil is in capability subclass IIIe and woodland suitability group 2c.

FrD—Frederick silt loam, 12 to 18 percent slopes. This strongly sloping, deep, well drained soil is on side slopes on uplands. Individual areas are usually elongated. They range from 3 to 200 acres but are dominantly about 20 acres.

In a typical profile, the surface layer is very dark grayish brown silt loam about 1 inch thick. The subsurface layer is yellowish brown silt loam about 6 inches thick. The subsoil to a depth of 80 inches is yellowish brown, friable silt loam in the upper part; yellowish red, friable silty clay loam in the middle part; and red, firm clay in the lower part. In some areas the loess mantle is more than 20 inches thick.

Included with this soil in mapping are small areas of moderately deep Caneyville and Gilpin soils. Also included are some areas of severely eroded soils on nose slopes and sharp slope breaks where the subsoil may be exposed. Some sinkholes, outcrops of rock, abandoned quarries, bedrock escarpments, and short steep slopes occur in places. The included soils make up about 10 to 15 percent of the map unit.

Available water capacity is high in this Frederick soil, and permeability is moderate. The organic matter content in the surface layer is moderately low. Surface runoff from cultivated areas is rapid.

Many areas of this soil are in woodland. Some areas are used for cultivated crops, and other areas are used for hay or pasture.

This soil is poorly suited to corn, soybeans, and small grain. The very severe hazard of erosion is the main management concern. Conservation practices, such as crop rotation, diversions, contour farming, or grassed waterways, help to control erosion and surface runoff. Slopes are generally too short for terracing. The use of conservation tillage that leaves all or part of the crop residue on the surface, green manure crops, and cover crops helps to control erosion and improve and maintain the tilth and organic matter content of the soil. When rainfall is less than normal or is poorly distributed, this soil becomes somewhat droughty, and crops are likely to be damaged.

This soil is suited to grasses and legumes for hay or pasture. Rapid runoff and the hazard of erosion are the main management concerns. A permanent vegetative cover helps to slow runoff and control erosion. The use of conservation tillage when preparing the seedbed also helps to control erosion. Overgrazing and grazing when the soil is wet are other management concerns. Overgrazing reduces the plant density and hardiness and causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. The hazard of erosion, restricted use of equipment, and plant competition are the main management concerns. This soil is suited to plantings of black locust for firewood and fencepost production. Where needed, black locust can provide erosion control and, like most legumes, produce nitrogen throughout a shallow but wide-spreading root system. Logging roads and skid trails should be constructed on the contour. The use of road ditches, culverts, and grade stabilization structures helps to control runoff from roads and skid trails. Steepness of slope hinders the use of some kinds of logging equipment. Seedlings survive and grow well if competing vegetation is controlled. The control and removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include restricting livestock, harvesting trees at maturity, and saving desirable seed trees.

This soil is severely limited for dwellings without basements because of slope and for dwellings with basements because of slope and the shrinking and swelling of the soil. Grading the area to modify the slope or designing the structure to complement the slope helps to overcome the slope hazard. Foundation footings and basement walls should be strengthened. Backfilling with coarser material helps to prevent structural damage caused by the shrinking and swelling of the soil. Disturbed areas should be revegetated as soon as possible after construction so that erosion can be held to a minimum. Topsoil should be stockpiled and spread over critical areas where vegetation may be difficult to establish. This soil is severely limited for local roads and streets because of low strength and slope. The upper layer of the soil should be replaced or strengthened with more suitable base material. Roads should be placed on the contour where possible. Cutting and filling operations may be needed. This soil is severely limited for septic tank absorption fields because of slope. Grading or land shaping to modify the slope and installing the absorption

Figure 3.—An area of Frederick silty clay loam, gullied, 10 to 18 percent slopes.

field on the contour help to overcome the slope hazard. Surface water collects in the sinkholes, and contamination of underground water suplies is a possibility.

This Frederick soil is in capability subclass IVe and woodland suitability group 2c.

FtD3—Frederick silty clay loam, gullied, 10 to 18 percent slopes. This moderately sloping and strongly sloping, deep, well drained soil is on sharp breaks that border the ridgetops and steeper side slopes on uplands. Slopes range from 300 to 800 feet long. Five to 10 percent of this soil has gullies that have very little vegetation, and 5 to 30 percent has chert fragments on the surface. About 36 to 90 inches of soil material has been removed by the water in these gullies (fig. 3). Individual areas are usually elongated. They range from 3 to 60 acres but are dominantly about 15 acres.

In a typical profile, the subsoil is exposed. It is about 80 inches thick. The upper part is strong brown, firm silty clay loam; the next part is strong brown, mottled, firm silty clay loam; below that is yellowish brown, mottled, firm silty clay loam; and the lower part is strong brown, firm silty clay and clay. The mottles are caused by the inherent colors in the underlying material. In some places the loess mantle is more than 20 inches thick. In other places areas of uneroded soils have a surface layer of brown or yellowish brown silt loam. These areas are as much as 10 feet wide.

Included with this soil in mapping are small areas of moderately deep Caneyville soils that are on the steeper, lower lying parts of the map unit. Outcrops of rock are in the bottom of some of the gullies. The included soils make up about 5 to 10 percent of the map unit.

Available water capacity and permeability are moderate in this Frederick soil. The organic matter content in the surface layer is low. Surface runoff on cultivated areas is very rapid. The surface layer can be tilled only during a narrow range in moisture content.

Most areas of this soil are idle land. The soil has very limited vegetation or ground cover.

This soil is generally unsuited to corn, soybeans, and small grain. The very rapid runoff, very severe hazard of erosion, and steepness of slope are the main management concerns.

This soil is poorly suited to grasses and legumes for hay or pasture. Very rapid runoff and the very severe hazard of erosion are the main management concerns. A permanent cover of vegetation helps to slow runoff and control erosion. Conservation practices, such as conservation tillage, contour farming, and diversions, help to control erosion and surface runoff when preparing seedbeds for grasses and legumes. Overgrazing and grazing when the soil is wet are other management concerns. Overgrazing reduces the plant density and hardiness and causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. The hazard of erosion, restricted use of equipment, and plant competition are the main management concerns. This soil is suited to plantings of black locust for firewood and fencepost production. Where needed, black locust can provide erosion control and, like most legumes, produce nitrogen throughout a shallow but wide-spreading root system. Logging roads and skid trails should be constructed on the contour. The use of road ditches, culverts, and grade stabilization structures helps to control runoff from roads and skid trails. Steepness of slope hinders the use of some kinds of logging equipment. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include restricting livestock, harvesting trees at maturity, and saving desirable seed trees.

This soil is severely limited for dwellings without basements because of slope and for dwellings with basements because of slope and the shrinking and swelling of the soil. Grading the areas to modify the slope or designing the structure to complement the slope helps to overcome the slope hazard. Backfilling with coarser material helps to prevent structural damage caused by shrinking and swelling of the soil. Disturbed areas should be revegetated as soon as possible after construction so that erosion can be held to a minimum. Topsoil should be stockpiled and spread over the critical areas where vegetation may be difficult to establish. This soil is severely limited for local roads and streets because of low strength and slope. The upper layer of the soil should be replaced or strengthened with more suitable base material. Roads should be placed on the contour where possible. Cutting and filling operations may be needed. This soil is severely limited for septic tank absorption fields because of slope. Grading or land shaping to modify the slope and installing the absorption field on the contour help to overcome the slope hazard.

This Frederick soil is in capability subclass VIe and woodland suitability group 2c.

FwC2—Frederick-Crider silt loams, karst, 2 to 12 percent slopes, eroded. This map unit consists of gently sloping and moderately sloping, deep, well drained soils on ridgetops and side slopes on uplands. Individual areas are variable in shape. They range from 3 to 400 acres but are dominantly about 80 acres. Areas are about 65 percent Frederick soil and 30 percent Crider soil. The topography was originally gently sloping or moderately sloping, but the landscape now has many large sinkholes. This unit has no surface drainage system; therefore, all surface water drains internally through underground passages that connect a series of sinkholes. The sinkholes are separated by ridgetop areas. These areas have 2 to 4 percent slopes and range from 25 to 160 feet in width. The average ridgetop is more than 80 feet wide. These ridgetop areas make up about 25 percent of the map unit, but they are too narrow to accurately separate in mapping. The sinkholes have 4 to 12 percent slopes. Soils that formed in alluvium are in the bottom of the sinkhole. Frederick and Crider soils are so intricately mixed throughout the landscape that it is not practical to separate them in mapping.

In a typical profile of Frederick soil, the surface layer is brown silt loam about 9 inches thick. The subsoil is about 61 inches thick. It is strong brown, friable silty clay loam in the upper part; reddish brown, firm clay in the next part; red, firm channery silty clay loam below that; and reddish brown, firm stony clay in the lower part. Limestone bedrock is at a depth of 70 inches. In some places the limestone bedrock is within a depth of 60 inches, and in other places the loess mantle is more than 20 inches thick. In places slopes are more than 12 percent.

In a typical profile of Crider soil, the surface layer is dark yellowish brown silt loam about 7 inches thick. The subsoil to a depth of 70 inches is strong brown and reddish brown, friable and firm silty clay loam in the upper part; red, firm silty clay, clay, or channery clay in the next part; and red or reddish brown, firm clay or channery clay in the lower part. Limestone bedrock is at a depth of 70 inches. In some areas the subsoil has less clay. In some places the limestone bedrock is within a depth of 60 inches, and in other places the loess mantle is less than 20 inches thick.

Included with these soils in mapping are small areas of moderately well drained Bedford soils that are on ridgetops, small areas of shallow soils, and some areas of rock outcrop. Also included are some severely eroded

Figure 4.—This area of Frederick-Crider silt loams, karst, 2 to 12 percent slopes, eroded, is used for hayland. A sinkhole is in the left center.

areas of soils on the upper part of the side slopes of sinkholes. These included soils make up about 10 to 15 percent of the map unit.

Available water capacity is high in the Frederick soil and very high in the Crider soil. Permeability is moderate in both soils. The organic matter content in the surface layer is moderately low in both soils. Surface runoff from cultivated areas is medium on both soils.

Many areas of these soils are used for cultivated crops. A few areas are used for hay or pasture (fig. 4).

These soils are suited to corn, soybeans, and small grain. The hazard of erosion is the main management concern. Conservation practices are needed to control erosion and surface runoff if cultivated crops are grown; however, the karst topography limits the effectiveness of practices that can be used. Conservation practices, such as crop rotation and conservation tillage that leaves all or part of the crop residue on surface, help to control erosion and surface runoff. The use of green manure crops and cover crops also helps to control erosion and to improve and maintain the tilth and organic matter content of this soil.

These soils are well suited to grasses and legumes for hay or pasture. The hazard of erosion is the main management concern. A permanent cover of vegetation helps to slow runoff and control erosion. Overgrazing and grazing when the soils are wet are the main management concerns. Overgrazing reduces the plant density and hardiness and causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and restricted use during wet periods help to keep pasture and the soils in good condition.

These soils are well suited to trees. Restricted use of equipment and plant competition are the main management concerns for the Frederick soil, and plant competition is the main management concern for the Crider soil. The Frederick soil is suited to plantings of black locust for firewood and fencepost production. Where needed, black locust can provide erosion control and, like most legumes, produce nitrogen throughout a shallow but wide-spreading root system. Logging roads and skid trails are difficult to construct on the contour because of the karst topography. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include restricting livestock, harvesting trees at maturity, and saving desirable seed trees.

These soils are moderately limited for dwellings without basements mostly because of slope and shrinking and swelling of the soils. They are severely limited for dwellings with basements mostly because of shrinking and swelling of the soils. Crider soil, which makes up a smaller part of the map unit than Frederick soil, has higher potential for scattered random type building sites. Foundation footings and basement walls should be strengthened. Backfilling with coarser material helps to prevent structural damage caused by shrinking and swelling of the soil. Grading the areas to modify the slope or designing the structure to complement the slope helps to overcome the slope hazard. Disturbed areas should be revegetated as soon as possible after construction so that erosion can be held to a minimum. Topsoil should be stockpiled and spread over critical areas where the vegetation may be difficult to establish. These soils are severely limited for local roads and streets mostly because of low strength or because of frost action and low strength. The upper layer of these soils should be replaced or strengthened with more suitable base material. Maintaining a crown in roads and streets, constructing the roads and streets on raised, well compacted fill material, and providing adequate side ditches and culverts reduce the hazard of frost action. These soils are moderately limited for septic tank absorption fields because of slope and moderate permeability. Crider soil has higher potential for absorption fields than Frederick soil because the limitations of slope are easier to overcome. The size of the area that can be used for this purpose, however, may be small. Grading or land shaping to modify the slope and installing the absorption field on the contour help to overcome the slope hazard. Installing the absorption field in suitable fill material helps to overcome the moderate permeability.

These Frederick and Crider soils are in capability subclass IIIe. The Frederick soil is in woodland suitability group 2c, and the Crider soil is in woodland suitability group 4o.

GrC—Gilpin-Crider silt loams, 6 to 20 percent slopes. This map unit consists of moderately sloping to moderately steep, moderately deep and deep, well drained soils on convex ridgetops on uplands. Individual areas are usually narrow and elongated. They range from 5 to 400 acres but are dominantly about 60 acres. Areas are about 65 percent Gilpin soil and 15 percent Crider soil. Crider soil is generally on ridgetops, and Gilpin soil is on side slopes. The long, narrow, convex ridges are so small that it is not practical to separate them in mapping.

In a typical profile of Gilpin soil, the surface layer is yellowish brown silt loam about 6 inches thick. The subsurface layer is light yellowish brown silt loam about 3 inches thick. The subsoil is yellowish brown, friable silt loam and channery silt loam about 17 inches thick. Interbedded weathered sandstone bedrock is at a depth of 26 inches, and hard sandstone bedrock is at a depth of 34 inches. In some places bedrock is within a depth of 20 inches. In other places slopes are more than 20 percent.

In a typical profile of Crider soil, the surface layer is dark brown silt loam about 2 inches thick. The subsurface layer is dark yellowish brown silt loam about 2 inches thick. The subsoil to a depth of 80 inches is dark yellowish brown and yellowish brown, friable silt loam in the upper part; strong brown and yellowish red, friable and firm silty clay loam in the next part; yellowish red, friable cherty silty clay loam below that; and yellowish brown, friable channery silt loam in the lower part. In places coarse fragments are in the upper part of the solum. In some places the loess mantle is less than 20 inches thick, and in other places slopes are less than 6 percent.

Included with these soils in mapping are small areas of moderately well drained Bedford and Hosmer soils that are on the broader ridgetops and small areas of shallow Weikert soils on steeper, lower lying areas of side slopes. Also included are some severely eroded areas of soils on nose slopes and on sharp slope breaks. Outcrops of rock, bedrock escarpments, or short steep slopes occur in places. The included soils make up about 10 to 15 percent of the map unit.

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

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

These soils are suited to corn, soybeans, and small grain. Steepness of slope and the severe hazard of erosion are the main management concerns. Conservation practices are needed to control erosion and surface runoff in areas where crops are grown. Cultivated areas are generally small, and they are surrounded by woodland. In these areas conservation practices, such as crop rotation, contour farming, cover crops, and grassed waterways, are needed. When rainfall is less than normal or is poorly distributed, Gilpin soil becomes somewhat droughty and crops are likely to be damaged. The use of conservation tillage that leaves all or part of the crop residue on the surface, green manure crops, and cover crops helps to maintain or improve the tilth and organic matter content of these soils.

These soils are well suited to grasses and legumes for hay or pasture. Excessive runoff and the severe hazard of erosion are the main management concerns. Crider soil is well suited to alfalfa. A permanent cover of vegetation helps to slow runoff and control erosion. When stands are reestablished, conservation tillage that leaves all or part of the crop residue on the surface helps to control erosion of the seedbed. Overgrazing and grazing when the soil is wet are other management concerns. Overgrazing reduces plant density and hardiness and causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and restricted use during wet periods help to keep the pasture and the soil in good condition.

These soils are well suited to trees. Plant competition is the main management concern. These soils generally are poorly suited to black walnut plantings and to plantings of black locust for firewood and fencepost production. Seedlings of most trees survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include restricting livestock, harvesting trees at maturity, and saving desirable seed trees.

These soils are moderately limited for dwellings with basements because of slope and depth to bedrock and moderately limited for dwellings without basements because of slope. The Crider part of the map unit on ridgetops has higher potential for building sites than Gilpin soil because the limitations of slope are easier to overcome. Grading the area to modify the slope or designing the structure to complement the slope helps to overcome the slope hazard. Depth to bedrock hinders the construction of basements. Disturbed areas should be vegetated as soon as possible after construction so that erosion can be held to a minimum. Topsoil should be stockpiled and spread over critical areas where the vegetation may be difficult to establish. Most areas of these soils are moderately limited for local roads and streets because of slope and potential frost action. The Crider soil is severely limited because of low strength and potential frost action. Roads should be placed on the contour where possible. Cutting and filling operations may be needed, but they may be limited by depth to bedrock. The upper layer of these soils should be replaced or strengthened with more suitable base material. Maintaining a crown on roads and streets; constructing the roads and streets on raised, well compacted fill material, and providing adequate side ditches and culverts reduce the hazard of frost action. The Gilpin soil has severe limitations for septic tank absorption fields because of depth to rock, and the Crider soil has moderate limitations because of slope and moderate permeability. Filling or mounding the sites for septic tank absorption fields with suitable filtering material can help to overcome the shallow depth to bedrock. The slowly permeable material can be excavated and replaced with more permeable material. Installing the absorption field on the contour helps to overcome the steepness of slope.

These Gilpin and Crider soils are in capability subclass IIIe. The Gilpin soil is in woodland suitability group 2o, and the Crider soil is in woodland suitability group 4o.

GwF—Gilpin-Weikert-Wellston complex, 18 to 50 percent slopes. This map unit consists of moderately steep to very steep, deep to shallow, well drained soils on side slopes on uplands. Individual areas are usually long and narrow. They range from 10 to 500 acres but are dominantly about 150 acres. Areas are 55 percent Gilpin soil, 25 percent Weikert soil, and 20 percent Wellston soil. The Wellston soil is generally on slopes ranging from 18 to 35 percent. These soils are so intricately mixed or so small that it is not practical to separate them in mapping.

In a typical profile of Gilpin soil, the surface layer is dark grayish brown channery silt loam about 5 inches thick. The subsoil is about 22 inches thick. The upper part is yellowish brown, friable channery silt loam, and the lower part is strong brown, friable channery silty clay loam. The substratum to a depth of 34 inches is strong brown very channery silt loam. Sandstone bedrock is at a depth of 34 inches. In some places bedrock is within a depth of 20 inches. In some places the upper part of the subsoil has less clay, and in other places slopes are more than 50 percent.

In a typical profile of Weikert soil, the surface layer is very dark grayish brown and yellowish brown channery silt loam about 5 inches thick. The subsoil is yellowish brown, friable channery silt loam about 5 inches thick. The substratum to a depth of 17 inches is light yellowish brown very channery silt loam. Sandstone bedrock is at a depth of about 17 inches. In places the bedrock is rippable. In other places bedrock is within a depth of 10 inches. In some places the soil has fewer sandstone, siltstone, or shale fragments. In other places slopes are more than 50 percent.

In a typical profile of Wellston soil, the surface layer is very dark grayish brown and yellowish brown silt loam about 8 inches thick. The subsoil is about 35 inches thick. The upper part is yellowish brown, friable silt loam, and the lower part is strong brown, friable silty clay loam. Weathered bedrock is at a depth of 45 inches, and hard siltstone bedrock is at a depth of about 54 inches. In some places bedrock is below a depth of 72 inches. In other places slopes are less than 18 percent.

Included with these soils in mapping are areas of moderately well drained Ebal soils and areas of severely eroded soils on nose slopes and sharp slope breaks. Also included, in places, are bedrock escarpments or outcrops of rock. The included areas make up about 10 percent of the map unit.

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

Most areas of these soils are in woodland. These soils are not suited to cultivation because of the very severe hazard of erosion and steepness of slope.

These soils are generally unsuited to grasses and legumes for hay and pasture. Some of the less sloping areas, however, provide permanent pasture.

These soils are poorly suited to trees, but woodland is the best use of these soils. They are poorly suited to the production of high quality woods. The hazard of erosion, restricted use of equipment, and seedling mortality are the main management concerns for the Gilpin soil; the hazard of erosion, restricted use of equipment, seedling mortality, and the hazard of windthrow are the main management concerns for the Weikert soil; and the hazard of erosion, restricted use of equipment, seedling mortality, and plant competition are the main management concerns for the Wellston soil. Most areas are reseeded naturally. Logging roads and skid trails should be constructed on the contour. The use of road ditches, culverts, and grade stabilization structures help to control runoff from roads and skid trails. Steepness of slope hinders the use of some kinds of logging equipment. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include restricting livestock, harvesting trees at maturity, and saving desirable seed trees.

These soils are generally unsuited to building sites because of slope. An alternate site should be selected. These soils are severely limited for local roads and streets mostly because of slope. Placing roads on the contour helps to overcome the slope hazard. Cutting and filling operations may be useful, but they may be limited by depth to bedrock. These soils are generally unsuited to septic tank absorption fields because of steepness of slope. An alternate site should be selected.

This Gilpin-Weikert-Wellston complex is in capability subclass VIIe. The Gilpin and Wellston soils are in woodland suitability group 3r, and the Weikert soil is in woodland suitability group 4d.

Ho—Haymond silt loam, frequently flooded. This nearly level, deep, well drained soil is on flood plains along narrow stream channels. It is subject to frequent flooding for brief periods from January to May. Individual areas are usually variable in shape because of the size of the bottom. They range from 3 to 200 acres but are dominantly about 25 acres.

In a typical profile, the surface layer is brown silt loam about 12 inches thick. The subsoil is dark yellowish brown, friable silt loam about 30 inches thick. The substratum to a depth of 69 inches is yellowish brown silt loam in the upper part and yellowish brown, mottled silt loam in the lower part. In some places gray mottles are above a depth of 20 inches. In other places the subsoil has more clay, and reaction is medium acid to very strongly acid throughout the profile.

Included with this soil in mapping are small areas of well drained Burnside soils that have more sandstone, siltstone, or shale fragments throughout. They are on the upper end of drainageways. Also included are small, slightly concave, lower lying areas of somewhat poorly drained Stendal soils and well drained Elkinsville Variant soils that have more clay in the subsoil. They are on higher lying terraces. The included soils make up about 10 to 15 percent of the map unit.

Available water capacity is very high in this Haymond soil, and permeability is moderate. The organic matter content in the surface layer is moderately low. Surface runoff from cultivated areas is slow.

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

This soil is well suited to corn and soybeans. If properly managed, this soil is suited to intensive row cropping. Frequent flooding is the main management concern. Small grain is subject to severe damage during periods of flooding. Frost and flood damage can be reduced if short-season varieties of adapted crops are planted. Late plantings of crops help to avoid damage or loss from flooding. The use of conservation tillage that leaves all or part of the crop residue on the surface, green manure crops, and cover crops helps to improve and maintain the tilth and organic matter content of the soil.

This soil is well suited to grasses and legumes for pasture or hay. It is poorly suited to deep-rooted legumes, such as alfalfa, because of flooding. Flooding also restricts the growth of other kinds of legumes. Overgrazing and grazing when the soil is wet are management concerns for pasture areas. Overgrazing reduces plant density and hardiness and causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, or restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is the main management concern. These soils are suited to plantings of black locust for firewood and fencepost production. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation, or by spraying, cutting, or girdling. Additional management practices include restricting livestock, harvesting trees at maturity, and saving desirable seed trees.

This soil is generally unsuited to building sites because of frequent flooding. An alternate site should be selected. This soil is severely limited for local roads and streets because it is subject to frequent flooding and because of potential frost action. The upper layer of the soil should be replaced or strengthened with more suitable base material. Maintaining a crown on the roads and streets; constructing roads and streets on raised, well compacted fill material; and providing adequate side ditches and culverts help to reduce the hazard of frost action. This soil is generally unsuited to septic tank absorption fields because of frequent flooding.

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

HrA—Henshaw silt loam, rarely flooded, 1 to 3 percent slopes. This nearly level and gently sloping, deep, somewhat poorly drained soil is on broad terraces along stream channels. Individual areas are usually variable in shape because of the size of the terraces. They range from 3 to 60 acres but are dominantly about 15 acres.

In a typical profile, the surface layer is brown, mottled silt loam about 8 inches thick. The subsoil is about 22 inches thick. It is yellowish brown, mottled, friable silty clay loam in the upper part, and light olive brown, mottled, firm silty clay loam in the lower part. The substratum to a depth of 60 inches is grayish brown, mottled silty clay loam in the upper part and yellowish brown, mottled silty clay loam in the lower part. In a few areas carbonates are below a depth of 60 inches, and the solum is thicker. In some areas the subsoil has more clay. In places slopes are less than 1 percent.

Included with this soil in mapping are small areas of well drained Haymond soils that have less clay in the subsoil than Henshaw soil and moderately well drained Wilbur soils. Also included are small areas of moderately well drained and well drained Markland soils on small, higher lying terraces. Markland soils have more clay in the subsoil than Henshaw soil. The included soils make up about 5 to 10 percent of the map unit.

Available water capacity is high in this Henshaw soil, and permeability is moderately slow. The organic matter content in the surface layer is low. Surface runoff from cultivated areas is slow. The surface layer can be tilled only during a narrow range in moisture content. This soil has a seasonal high water table at a depth of 1 foot to 2 feet.

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

Where adequately drained, this soil is well suited to corn and soybeans. Wetness is the main management concern. Close spacing of tile lines is needed because of the reduced permeability of the soil. If proper drainage is installed and the soil is properly managed, this soil is suited to intensive row cropping. Excessive water can be removed by open ditches and surface drains. In the selection of crops, short-season varieties of adapted crops should be considered. The use of conservation tillage that leaves all or part of the crop residue on the surface, crop residue management, green manure crops, and cover crops helps to improve and maintain the tilth and organic matter content of the soil.

This soil is well suited to grasses and water-tolerant legumes for hay or pasture if it is adequately drained. The rare flooding is a restriction to use and management of the soil. Wetness limits the use of most legumes. Water-tolerant species are best suited to this soil. Drainage is needed to obtain high yields of hay or pasture. Alfalfa and other deep-rooted legumes are subject to severe damage during periods of prolonged wetness. Overgrazing and grazing when the soil is wet are other management concerns. Overgrazing reduces plant density and hardiness and causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees, but only a few areas are in woodland. Plant competition is the main management concern. This soil generally is not suited to black walnut plantings. Flooding hinders harvesting and logging operations and the planting of seedlings. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include restricting livestock, harvesting trees at maturity, and saving desirable seed trees.

This soil is generally unsuited to building sites because of wetness and because it is subject to flooding. An alternate site should be selected. This soil is severely limited for local roads and streets because of low strength. The upper layer should be replaced or strengthened with more suitable base material. This soil is generally unsuited to septic tank absorption fields because of wetness and moderately slow permeability.

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

Hs—Hoosierville silt loam. This nearly level, deep, poorly drained soil is on broad loess-covered ridgetops on uplands. Individual areas are irregular in shape. They range from 3 to 150 acres but are dominantly 60 acres.

In a typical profile, the surface layer is grayish brown silt loam about 10 inches thick. The subsoil is about 65 inches thick. The upper part is light brownish gray, mottled, friable silt loam; the middle part is strong brown, mottled, firm and brittle silt loam; and the lower part is yellowish brown, mottled, firm silt loam. The substratum to a depth of 80 inches is brown, mottled silt loam. In some places this soil is not so gray in the upper part of the subsoil. In other places the subsoil has the reduced permeability and hardness that is characteristic to the fragipan. In places slopes are more than 2 percent.

Included with this soil in mapping are small, slightly convex, higher lying areas of moderately well drained Bedford soils and well drained Crider and Frederick soils. The included soils make up about 10 to 15 percent of the map unit.

Available water capacity is high in this Hoosierville soil, and permeability is moderately slow. The organic matter content in the surface layer is moderate. Surface runoff from cultivated areas is slow. This soil has a water table at or near the surface.

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

This soil is suited to corn, soybeans, and small grain. Small grain planted in the fall is subject to severe damage during periods of prolonged wetness. Wetness is the main management concern. Adequate drainage is needed for maximum crop production. Excessive water can be removed by open ditches, subsurface drains, surface drains, or a combination of these practices. If drainage is installed and the soil is properly managed, this soil is suited to intensive row cropping. The use of conservation tillage that leaves all or part of the crop residue on the surface, green manure crops, and cover crops helps to improve and maintain the tilth and organic matter content of the soil.

This soil is well suited to grasses and water-tolerant legumes for hay or pasture. Alfalfa and other deep-rooted legumes are subject to severe damage during periods of prolonged wetness. Water-tolerant species are best suited to this soil. Drainage is needed to obtain high yields of hay or pasture. Overgrazing and grazing when the soil is wet are other management concerns. Overgrazing reduces plant density and hardiness and causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is suited to trees, but only a few areas are in woodland. Restricted use of equipment, seedling mortality, the hazard of windthrow, and plant competition are the main management concerns. This soil generally is not suited to black walnut plantings. The seasonal wetness hinders harvesting and logging operations and the planting of seedlings. Timber can be harvested during dry periods or delayed until the soil is frozen. Seedling mortality can be reduced by planting species that are tolerant to drought conditions and by planting additional seedlings and thinning to the desired stand later. Water-tolerant species are favored in timber stands. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation, or by spraying, cutting, or girdling. Additional management practices include restricting livestock, harvesting trees at maturity, and saving desirable seed trees.

This soil is severely limited for building site development because of wetness. An alternate site should be selected. If this soil is used for construction purposes, however, soil areas need to be artificially drained. Dwellings should be built without basements and placed on raised, well compacted fill material. Installing foundation drains and perimeter drains and conveying runoff to a storm sewer or other suitable outlet help to overcome the wetness. Proper landscaping to facilitate runoff and surface drainage helps to lower the water table. Disturbed areas should be vegetated as soon as possible after construction so that erosion can be held to a minimum. Topsoil should be stockpiled and spread over critical areas where vegetation may be difficult to establish. This soil is severely limited for local roads and streets because of potential frost action, wetness, and low strength. The upper layer of the soil should be replaced or strengthened with more suitable base material. Maintaining a crown on roads and streets, constructing roads and streets on raised, well compacted fill material, and providing adequate side ditches and culverts reduce the hazard of frost action and wetness. This soil is generally unsuited to septic tank absorption fields because of wetness and moderately slow permeability. An alternate site should be selected.

This Hoosierville soil is in capability subclass IIIw and woodland suitability group 3w.

HxB2—Hosmer silt loam, 1 to 6 percent slopes, eroded. This gently sloping, moderately well drained soil is on narrow or broad, convex ridgetops on loess-covered uplands. It is moderately deep over a fragipan. Individual areas are usually narrow and long. They range from 3 to 70 acres but are dominantly about 10 acres.

In a typical profile, the surface layer is brown silt loam aout 7 inches thick. The subsoil to a depth of 64 inches is dark yellowish brown and yellowish brown, friable silt loam and silty clay loam in the upper part; yellowish brown, mottled, firm or very firm and brittle silty clay loam in the fragipan; and yellowish brown, mottled, friable silt loam in the lower part. The substratum to a depth of 80 inches is yellowish brown, mottled clay. In some areas the loess mantle is less than 60 inches thick. In places slopes are more than 6 percent.

Included with this soil in mapping are small areas of well drained Gilpin and Wellston soils and moderately well drained Ebal soils. These soils do not have a fragipan, and they are on steeper slopes than Hosmer soil. Also included are small areas of severely eroded soils on nose slopes and sharp breaks. The included soils make up about 10 to 15 percent of the map unit.

Available water capacity is moderate in this Hosmer soil. Permeability is moderate above the fragipan and very slow within the fragipan. The organic matter content in the surface layer is moderately low. Surface runoff from cultivated areas is medium. This soil has a high water table at a depth of 2.5 to 3 feet during March and April. The fragipan, which is at a depth of 20 to 40 inches, perches the water and restricts root penetration.

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

This soil is well suited to corn, soybeans, and small grain. The hazard of erosion is the main management concern. The very slowly permeable fragipan affects the use and management of this soil. The soil is wet and seepy in spring but may be droughty late in summer. Depth to the fragipan determines the amount of water available to plants. The fragipan restricts the downward movement of roots. Conservation practices, such as crop rotation, terraces, diversions, contour farming, grassed waterways, or grade stabilization structures, help to control erosion and surface runoff. The use of conservation tillage that leaves all or part of the crop residue on the surface, green manure crops, and cover crops also helps to control erosion and to improve and maintain the tilth and organic matter content of the soil.

This soil is well suited to grasses and legumes for hay and pasture. The hazard of erosion is the main management concern. A permanent cover of vegetation helps to slow runoff and control erosion. This soil is poorly suited to deep-rooted legumes because the fragipan restricts the downward movement of roots. Overgrazing and grazing when the soil is wet are other management concerns. Overgrazing reduces plant density and hardiness and causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, or restricted use during wet periods helps to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is the main management concern. This soil generally is not suited to black walnut plantings, but it is suited to plantings of black locust for firewood and fencepost production. Where needed, black locust can provide erosion control and, like most legumes, produce nitrogen throughout a shallow but wide-spreading root system. The fragipan layer in this soil limits the effective rooting depth. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include restricting livestock, harvesting trees at maturity, and saving desirable seed trees.

This soil is moderately limited for dwellings without basements because of the shrinking and swelling of the soil, and it is moderately limited for buildings with basements because of wetness. The installation of subsurface drains helps to lower the water table. Backfilling with coarser material helps to prevent structural damage caused by the shrinking and swelling of the soil. Disturbed areas should be revegetated as soon as possible after construction so that erosion can be held to a minimum. Topsoil should be stockpiled and spread over critical areas where vegetation may be difficult to establish. This soil is severely limited for local roads and streets because of frost action. Maintaining a crown in roads and streets, constructing roads and streets on raised, well compacted fill material, and providing adequate side ditches and culverts reduce the hazard of frost action. This soil is severely limited for septic tank absorption fields because of wetness and very slow permeability in the fragipan. Perimeter drains placed around the filter field help to remove excess water. Increasing the size of the filter field helps to compensate for the restricted permeability of the fragipan. Excavating the fragipan and replacing the soil with more permeable material can overcome these limitations.

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

MdB2—Markland silty clay loam, 2 to 6 percent slopes, eroded. This gently sloping, deep, moderately well drained and well drained soil is on broad terraces along large streams. Individual areas are usually narrow and irregular in shape. They range from 5 to 75 acres but are dominantly about 15 acres.

In a typical profile, the surface layer is dark yellowish brown silty clay loam about 7 inches thick. The subsoil is about 21 inches thick. The upper part is strong brown, friable silty clay, and the lower part is strong brown, brown, and yellowish brown, firm silty clay. The substratum to a depth of 60 inches is yellowish brown, stratified silty clay loam and clay.

Included with this soil in mapping are small areas of somewhat poorly drained Henshaw and McGary soils. These soils are on lower lying positions than Markland soil. The included soils make up about 10 percent of the map unit.

Available water capacity is moderate in this Markland soil, and permeability is slow. The organic matter content in the surface layer is moderately low. Surface runoff from cultivated areas is medium. The surface layer can be tilled only during a narrow range in moisture content. This soil has a water table at a depth of 3 to 6 feet.

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

This soil is suited to corn, soybeans, and small grain. The hazard of erosion is the main management concern. The clayey subsoil and substratum affect the use and management of this soil. Conservation practices, such as crop rotation, terraces, diversions, contour farming, grassed waterways, or grade stabilization structures, help to control erosion and surface runoff. The use of conservation tillage that leaves all or part of the crop residue on the surface, green manure crops, and cover crops also helps to control erosion and to improve and maintain the tilth and organic matter content of the soil. Tillage of this soil when it is wet results in the formation of large clods that become very firm when dry. Soil tilth is often improved by the freezing and thawing of the soil during winter.

This soil is well suited to grasses and legumes for hay or pasture. The hazard of erosion is the main management concern. A permanent cover of vegetation helps to slow runoff and control erosion. Deep-rooted legumes may be restricted by the clayey subsoil and substratum. Overgrazing and grazing when the soil is wet are other management concerns. Overgrazing reduces plant density and hardiness and causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, or restricted use during wet periods helps to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedling mortality, the hazard of windthrow, and plant competition are the main management concerns. This soil generally is not suited to black walnut plantings. The clayey subsoil and substratum limit planting and harvesting to drier seasons of the year. Seedling mortality can be reduced by planting additional seedlings and thinning to the desired stand density later. Harvesting methods that do not leave trees standing alone or widely spaced are beneficial. Care should be taken to avoid damaging the superficial root systems of unharvested trees. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include restricting livestock, harvesting trees at maturity, and saving desirable seed trees.

This soil is severely limited for building sites because of the shrinking and swelling of the soil. Foundation footings and basement walls should be strengthened. Backfilling with coarser material helps to prevent structural damage caused by shrinking and swelling of the soil. Disturbed areas should be revegetated as soon as possible after construction so that erosion can be held to a minimum. Topsoil should be stockpiled and spread over critical areas where vegetation may be difficult to establish. This soil is severely limited for local roads and streets because of the shrinking and swelling of the soil and low strength. The upper layer of the soil should be replaced or strengthened with more suitable base material. This soil is severely limited for septic tank absorption fields because of wetness and slow permeability. Perimeter drains placed around the filter field help to remove excess water. Installing the absorption field in suitable fill material helps to overcome the slow permeability. Increasing the size of the filter field tends to compensate for the reduced permeability of the soil.

This Markland soil is in capability subclass IIIe and woodland suitability group 2c.

MhA—McGary silty clay loam, frequently flooded, 0 to 2 percent slopes. This nearly level, deep, somewhat poorly drained soil is on broad flats and in depressions on flood plains. It is subject to frequent flooding from January to May for brief periods. Individual areas are usually broad and irregular in shape. They range from 5 to 150 acres but are dominantly about 40 acres.

In a typical profile, the surface layer is dark brown silty clay loam about 8 inches thick. The subsoil to a depth of 80 inches is yellowish brown, mottled, friable silty clay loam in the upper part; gray, mottled, firm silty clay loam in the middle part; and light brownish gray, mottled, firm silty loam in the lower part. In places this soil has carbonates within a depth of 40 inches. In some areas the loess mantle is more than 12 inches thick. In some areas the subsoil has less clay.

Included with this soil in mapping are small areas of higher lying, moderately well drained Wilbur soils and lower lying, poorly drained Bonnie soils. Also included, on higher lying terrace positions, are small areas of moderately well drained and well drained Markland soils. The included soils make up about 20 percent of the map unit.

Available water capacity is moderate in this McGary soil, and permeability is slow. The organic matter content in the surface layer is moderately low. Surface runoff from cultivated areas is slow. The surface layer can be tilled only during a narrow range in moisture content. This soil has a seasonal high water table at a depth of 1 foot to 3 feet.

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

This soil is suited to corn and soybeans. Small grain is subject to severe damage during periods of prolonged flooding. Wetness and frequent flooding are the main management concerns. Drainage is needed for maximum crop production. Excessive water can be removed by open ditches and surface drains. Because water moves slowly to subsurface drains, close spacing between tile lines is required. If drainage is installed and the soil is properly managed, this soil is suited to intensive row cropping. Frost damage and water damage can be reduced if short-season varieties of adapted crops are planted. The use of conservation tillage that leaves all or part of the crop residue on the surface, green manure crops, and cover crops helps to improve and maintain the tilth and organic matter content of the soil. Tillage of this soil when it is wet results in the formation of large clods that become very firm when dry. Soil tilth is often improved by freezing and thawing of the soil during winter.

This soil is well suited to grasses and water-tolerant legumes for hay or pasture if it is adequately drained. Alfalfa and other legumes are subject to severe damage during periods of prolonged wetness. Drainage is needed to obtain high yields of hay or pasture crops. Overgrazing and grazing when the soil is wet are other management concerns. Overgrazing reduces plant density and hardiness and causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees, but only a few areas are in woodland. Seedling mortality, the hazard of windthrow, and plant competition are the main management concerns. This soil generally is not suited to black walnut plantings. Seasonal wetness and frequent flooding may hinder harvesting and logging operations and the planting of seedlings. Water-tolerant species are favored in timber stands. Seedling mortality can be reduced by planting additional seedlings and thinning to the desired stand density later. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Wetness and stickiness of the soil limits the use of equipment during wet periods. Additional management practices include restricting livestock, harvesting trees at maturity, and saving desirable seed trees.

This soil generally is unsuited to building sites because of wetness, frequent flooding, and the shrinking and swelling of the soil. An alternate site should be selected. This soil is severely limited for local roads and streets because of frequent flooding, low strength, and the shrinking and swelling of the soil. The upper layer of the soil should be replaced or strengthened with more suitable base material. Constructing roads on raised, well compacted fill material and providing adequate side ditches and culverts help protect the roads from flood damage. This soil is generally unsuited to septic tank absorption fields because of wetness, frequent flooding, and slow permeability.

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

MuA—Muren silt loam, 1 to 3 percent slopes. This nearly level and gently sloping, deep, moderately well drained soil is on broad, convex ridgetops on loess-covered uplands. Individual areas are usually broad and irregular in shape. They range from 10 to 30 acres but are dominantly about 15 acres.

In a typical profile, the surface layer is dark grayish brown silt loam about 10 inches thick. The subsoil to a depth of 80 inches is yellowish brown, mottled, friable and firm silt loam in the upper part and yellowish brown, firm silt loam in the lower part. In places the subsoil is at a depth of 24 to 48 inches and has the reduced permeability and hardness that is characteristic to the fragipan. In places the soil is grayer in the lower part of the solum. In some areas slopes are less than 1 percent.

Included with this soil in mapping are small, slightly convex, higher lying areas of moderately well drained Bedford soils that have a fragipan, and well drained Crider and Frederick soils. The included soils make up about 10 to 15 percent of the map unit.

Available water capacity is high in this Muren soil, and permeability is moderately slow. The organic matter content in the surface layer is low. Surface runoff from cultivated areas is slow. This soil has a water table at a depth of 3 to 6 feet.

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

This soil is well suited to corn, soybeans, and small grain. The use of conservation tillage that leaves all or part of the crop residue on the surface, green manure crops, and cover crops help to improve and maintain the tilth and organic matter content of this soil.

This soil is well suited to grasses and legumes for hay or pasture. Overgrazing and grazing when the soil is wet are the main concerns of management. Overgrazing reduces plant density and hardiness and causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, or restricted use during wet periods helps to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is the main management concern. This soil is suited to plantings of black locust for firewood and fencepost production. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include restricting livestock; harvesting trees at maturity, and saving desirable seed trees.

This soil is moderately limited for dwellings without basements because of the shrinking and swelling of the soil, and it is moderately limited for dwellings with basements because of wetness and the shrinking and swelling of the soil. The installation of subsurface drains helps to lower the water table. Foundation footings and basement walls should be backfilled with coarser material to help prevent structural damage caused by shrinking and swelling of the soil. Disturbed areas should be revegetated as soon as possible after construction so that erosion can be held to a minimum. Topsoil should be stockpiled and spread over critical areas where vegetation may be difficult to establish. This soil is severely limited for local roads and streets because of frost action and low strength. Maintaining a crown on roads and streets, constructing roads and streets on well compacted fill material, and providing adequate side ditches and culverts reduce the hazard of potential frost action and the limitation of wetness. The upper layer of the soil should be replaced or strengthened with more suitable base material. This soil is severely limited for septic tank absorption fields because of wetness and moderately slow permeability. Perimeter drains placed around the filter field help to remove excess water. Increasing the size of the filter field helps to compensate for the restricted permeability. Installing the absorption field in suitable fill material helps to overcome the moderately slow permeability.

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

Ne—Newark silt loam, frequently flooded. This nearly level, deep, somewhat poorly drained soil is in swales on flood plains along large streams. It is subject to frequent flooding from January to April for brief periods. Individual areas are usually elongated. They range from 5 to 100 acres but are dominantly about 50 acres.

In a typical profile, the surface layer is dark brown silt loam about 7 inches thick. The subsoil is about 19 inches thick. The upper part is dark brown, mottled, firm silt loam; the middle part is grayish brown, mottled, firm silt loam; and the lower part is dark gray, mottled, firm silty clay loam. The substratum to a depth of 60 inches is dark gray silty clay loam. In places the soil has a darker surface layer.

Included with this soil in mapping are small, convex, higher lying areas of well drained Abscota, Chagrin, and Nolin soils. Also included are small areas of poorly drained Petrolia soils in depressions and swales. The included soils make up about 15 percent of the map unit.

Available water capacity is high in this Newark soil, and permeability is moderate. The organic matter content in the surface layer is moderately low. Surface runoff from cultivated areas is very slow. This soil has a seasonal high water table between a depth of 0.5 foot and 1.5 feet.

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

This soil is suited to corn and soybeans. Small grain is subject to severe damage during periods of flooding. Wetness and frequent flooding are the main management concerns. Artificial drainage is needed for maximum crop production. Excessive water can be removed by subsurface drains, surface drains, or a combination of these types of drainage. If drainage is installed and the soil is properly managed, this soil is suited to intensive row cropping. Frost damage and flood damage can be reduced if short-season varieties of adapted crops are planted. Planting crops later in the season helps to avoid damage or loss from flooding. The use of conservation tillage that leaves all or part of the crop residue on the surface, cover crops, and green manure crops helps to improve and maintain the tilth and organic matter content of this soil.

This soil is well suited to grasses and legumes for hay or pasture. Wetness restricts the use of most legumes. Water-tolerant species are best suited to this soil. Drainage is needed to obtain high yields of hay or pasture crops. Overgrazing and grazing when the soil is wet are other management concerns. Overgrazing reduces plant density and hardiness and causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Restricted use of equipment, the hazard of windthrow, and plant competition are the main management concerns. This soil generally is not suited to black walnut plantings. Frequent flooding and seasonal wetness hinder harvesting and logging operations and the planting of seedlings. Water-tolerant species are favored in timber stands. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include restricting livestock, harvesting trees at maturity, and saving desirable seed trees.

This soil is generally unsuited to building sites because of frequent flooding and wetness. An alternate site should be selected. This soil is severely limited for local roads and streets because of frequent flooding, low strength, and wetness. Constructing roads on raised, well compacted fill material and providing adequate side ditches and culverts help protect the roads from flood damage. The upper layer of the soil should be replaced or strengthened with more suitable base material. This soil is generally unsuited to septic tank absorption fields because of wetness and flooding.

This Newark soil is in capability subclass IIw and woodland suitability group 1w.

No—Nolin silt loam, frequently flooded. This nearly level, deep, well drained soil is on broad flood plains along large streams. It is subject to frequent flooding from February to May for brief periods. Individual areas are usually elongated. They range from 5 to 150 acres but are dominantly about 80 acres.

In a typical profile, the surface layer is dark brown silt loam about 10 inches thick. The subsoil to a depth of about 60 inches is dark yellowish brown, friable silty clay loam in the upper part and yellowish brown, firm silty clay loam in the lower part. In places the soil has a darker surface.

Included with this soil in mapping are small areas of well drained Abscota and Chagrin soils, which have more sand in the subsoil than Nolin soil. They are on slightly higher knolls and rises. Also included are small areas of somewhat poorly drained Newark soils and poorly drained Petrolia soils, which are in small depressions. The included soils make up about 20 percent of the map unit.

Available water capacity is very high in this Nolin soil, and permeability is moderate. The organic matter content in the surface layer is moderate. Surface runoff from cultivated areas is slow. This soil has a high water table at a depth of 3 to 6 feet during February and March.

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

This soil is suited to corn and soybeans. If it is properly managed, this soil is suited to intensive row cropping. Frequent flooding is the main management concern. Small grain is subject to severe damage during periods of flooding. Frost damage and flood damage can be reduced if short-season varieties of adapted crops are planted. The use of conservation tillage that leaves all or part of the crop residue on the surface, green manure crops, and cover crops helps to improve and maintain the tilth and organic matter content of this soil.

This soil is well suited to grasses and legumes for pasture or hay. Wetness prohibits the use of most legumes. Overgrazing and grazing when the soil is wet are the main management concerns. Overgrazing reduces plant density and hardiness and causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, or restricted use during wet periods helps to keep the pasture and the soil in good condition.

This soil is well suited to trees. Restricted use of equipment and plant competition are the main management concerns. This soil generally is not suited to black walnut plantings. Frequent flooding may hinder harvesting and logging operations and the planting of seedlings. Timber harvesting should be delayed until dry periods or until the soil is frozen. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include restricting livestock, harvesting trees at maturity, and saving desirable seed trees.

This soil is generally unsuited to building sites because of frequent flooding. An alternate site should be selected. This soil is severely limited for local roads and streets because of frequent flooding and low strength. The upper layer of the soil should be replaced or strengthened with more suitable base material. Constructing roads on raised, well compacted fill material and providing adequate side ditches and culverts help to protect the roads from flood damage. This soil is generally unsuited to septic tank absorption fields because of frequent flooding.

This Nolin soil is in capability subclass IIIw and woodland suitability group 1w.

PeB—Pekin silt loam, 2 to 6 percent slopes. This gently sloping, moderately well drained soil is on broad low terraces along narrow stream channels. It is moderately deep over a fragipan. Individual areas are usually narrow and irregular in shape. They range from 3 to 100 acres but are dominantly about 10 acres.

In a typical profile, the surface layer is brown silt loam about 12 inches thick. The subsoil to a depth of about 77 inches is yellowish brown, friable silt loam in the upper part; yellowish brown, mottled, friable silt loam in the next part; yellowish brown, mottled, firm or very firm and brittle silt loam in the fragipan; and strong brown, mottled, firm silt loam and silty clay loam in the lower part. The substratum to a depth of 80 inches is strong brown, mottled, stratified silt loam and silty clay loam. In some places the fragipan is within a depth of 24 inches. In other places the subsoil is less than 40 inches thick. In some small areas the upper part of the subsoil does not have gray mottles.

Included with this soil in mapping are small areas of somewhat poorly drained Bartle soils on flats or in depressions and small areas of well drained Elkinsville Variant soils on slightly higher rises. Also included are some areas of severely eroded soils on nose slopes and sharp slope breaks where the subsoil may be exposed. The included soils make up about 15 percent of the map unit.

Available water capacity is moderate in this Pekin soil. Permeability is moderate above the fragipan and very slow within the fragipan. The organic matter content in the surface layer is moderately low. Surface runoff from cultivated areas is medium. This soil has a seasonal high water table at a depth of 2 to 6 feet. The fragipan, which is at a depth of 24 to 36 inches, perches the water and restricts root penetration.

Many areas of this soil are used for cultivated crops, and some areas are used for hay or pasture. A few areas are in woodland.

This soil is well suited to corn, soybeans, and small grain. The hazard of erosion is the main management concern. The soil is wet and seepy in spring but may become droughty late in summer. The amount of water available to plants is mostly in the soil above the fragipan. The very slowly permeable fragipan restricts the downward movement of roots and water. Conservation practices, such as crop rotation, terraces, diversions, contour farming, grassed waterways, or grade stabilization structures, help to control erosion and surface runoff. The use of conservation tillage that leaves all or part of the crop residue on the surface, green manure crops, and cover crops also helps to control erosion and to improve and maintain the tilth and organic matter content of this soil.

This soil is well suited to grasses and legumes for hay or pasture. It is poorly suited to deep-rooted legumes because the fragipan restricts the downward movement of roots. The hazard of erosion is the main management concern. A permanent cover of vegetation helps to slow runoff and control erosion. Overgrazing and grazing when the soil is wet are other management concerns. Overgrazing reduces plant density and hardiness and causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, or restricted use during wet periods helps to keep the pasture and the soil in good condition.

This soil is well suited to trees. This soil generally is not suited to black walnut plantings because the fragipan layer limits the effective rooting depth. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include restricting livestock, harvesting trees at maturity, and saving desirable seed trees.

This soil is moderately limited for dwellings without basements because of wetness and severely limited for dwellings with basements because of wetness. The installation of subsurface drainage helps to lower the water table. Placement of buildings on raised, well compacted fill material helps to overcome the excessive wetness. This soil is severely limited for local roads and streets because of potential frost action and low strength. The upper layer of the soil should be replaced or strengthened with more suitable base material. Maintaining a crown on roads and streets, constructing roads and streets on raised, well compacted fill material, and providing adequate side ditches and culverts reduce the hazard of potential frost action. This soil is severely limited for septic tank absorption fields because of wetness and the very slowly permeable fragipan. Perimeter drains placed around the filter field help to remove excess water. Increasing the size of the filter helps to compensate for the restricted permeability of the fragipan. Installing the absorption field in suitable fill material also helps to overcome the restricted permeability.

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

PeC2—Pekin silt loam, 6 to 12 percent slopes, eroded. This moderately sloping, moderately well drained soil is on side slopes of low terraces along narrow stream channels. It is moderately deep over a fragipan. Individual areas are usually narrow and irregular in shape. They range from 3 to 50 acres but are dominantly about 10 acres.

In a typical profile, the surface layer is brown silt loam about 10 inches thick. The subsoil to a depth of 80 inches is yellowish brown, friable silt loam in the upper part; reddish yellow, mottled, friable silt loam in the next part; yellowish brown and strong brown, mottled, very firm and brittle silt loam in the fragipan; and strong brown, friable silt loam and silty clay loam in the lower part. In places the fragipan is within a depth of 24 inches, or the subsoil is less than 40 inches thick. In some small areas the upper part of the subsoil does not have gray mottles.

Included with this soil in mapping are small areas of well drained Elkinsville Variant soils. Also included are some areas of severely eroded soils on nose slopes and sharp slope breaks where the subsoil may be exposed. The included soils make up about 10 percent of the map unit.

Available water capacity is moderate in this Pekin soil. Permeability is moderate above the fragipan and very slow within the fragipan. The organic matter content in the surface layer is moderately low. Surface runoff from cultivated areas is medium. This soil has a seasonal high water table at a depth of 2 to 6 feet. The fragipan, which is at a depth of 24 to 36 inches, perches the water and restricts root penetration.

Many areas of this soil are used for hay or pasture, and some areas are in woodland. A few areas are used for cultivated crops.

This soil is suited to corn, soybeans, and small grain. The hazard of erosion is the main management concern. This soil is wet and seepy in spring but may be droughty late in summer. The amount of water available to plants is mostly in the soil material above the fragipan. The fragipan restricts the downward movement of roots and water. Conservation practices, such as crop rotation, terraces, diversions, contour farming, grassed waterways, or grade stabilization structures, help to control erosion and surface runoff. The use of conservation tillage that leaves all or part of the crop residue on the surface, green manure crops, and cover crops helps to control erosion and improve and maintain the tilth and organic matter content of the soil.

This soil is well suited to grasses and legumes for hay or pasture. It is poorly suited to deep-rooted legumes because very slow permeability in the fragipan restricts the downward movement of roots. The hazard of erosion is the main management concern. A permanent cover of vegetation helps to slow runoff and control erosion. Overgrazing and grazing when the soil is wet are other management concerns. Overgrazing reduces the plant density and hardiness and causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. It generally is not suitable for black walnut plantings because the fragipan layer limits the rooting depth. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include restricting livestock, harvesting trees at maturity, and saving desirable seed trees.

This soil is moderately limited for dwellings without basements because of wetness and slope and severely limited for dwellings with basements because of wetness. The installation of subsurface drainage helps to lower the water table. Placement of buildings on raised, well compacted fill material helps to overcome the excessive wetness. Buildings should be designed to complement the slope. This soil is severely limited for local roads and streets because of the potential for frost action and low strength. The upper layer of the soil should be replaced or strengthened with more suitable base material. Maintaining a crown on roads and streets, constructing roads and streets on raised, well compacted fill material, and providing adequate side ditches and culverts reduce the hazard of frost action. This soil is severely limited for septic tank absorption fields because of wetness and the very slowly permeable fragipan. Placing perimeter drains around the filter field helps to remove excess water. Increasing the size of the filter helps to compensate for the restricted permeability of the fragipan. Installing the absorption field in suitable fill material also helps to overcome the restricted permeability.

This Pekin soil is in capability subclass IIIe and woodland suitability group 3o.

Ph—Petrolia silty clay loam, frequently flooded. This nearly level, deep, poorly drained soil is in swales on flood plains along large streams. It is subject to frequent flooding from March to June for long periods. Individual areas are usually elongated. They range from 5 to 80 acres but are dominantly 20 acres.

In a typical profile, the surface layer is dark grayish brown, mottled silty clay loam about 9 inches thick. The substratum to a depth of 60 inches is dark gray and gray, mottled silty clay loam. Some areas have a silt loam or loam surface layer. Other small areas have a darker surface.

Included with this soil in mapping are small areas of well drained Abscota, Chagrin, and Nolin soils on higher lying positions than Petrolia soil. Also included are small areas of somewhat poorly drained Newark soils on slightly higher positions in swales. The included soils make up about 15 percent of the map unit.

Available water capacity is high in this Petrolia soil, and permeability is moderately slow. The organic content in the surface layer is moderate. Surface runoff from cultivated areas is very slow. This soil has a seasonal high water table within a depth of 3 feet.

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

This soil is suited to corn and soybeans. Small grain is subject to severe damage during periods of prolonged flooding. Wetness and frequent flooding are the main management concerns. Adequate drainage is needed for maximum crop production. Excessive water can be removed by open ditches, subsurface drains, surface drains, or a combination of these practices. Water moves slowly to the subsurface drains. If drainage is installed and the soil is properly managed, this soil is suited to intensive row cropping. Using short-season varieties of adapted crops and late plantings of crops helps to avoid damage or loss from flooding. Tilling the soil when it is wet results in the formation of large clods that become very firm when dry. Soil tilth is often improved by the freezing and thawing action of the soil during the winter. The use of conservation tillage that leaves all or part of the crop residue on the surface, green manure crops, and cover crops helps to improve and maintain the tilth and organic matter content of this soil.

This soil is well suited to grasses and legumes for hay or pasture. Because it generally is not adequately drained, water-tolerant species are best suited to this soil. Legumes are subject to severe damage during periods of prolonged wetness. Overgrazing and grazing when the soil is wet are other management concerns. Overgrazing reduces plant density and hardiness and causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, or restricted use during wet periods helps to keep the pasture and the soil in good condition.

This soil is suited to trees, but only a few areas are in woodland. Restricted use of equipment, seedling mortality, and plant competition are the main management concerns. This soil generally is not suited to black walnut plantings. Wetness hinders harvesting and logging operations and the planting of seedlings. Water-tolerant species are favored in timber stands. The restrictions for use of equipment can be decreased by delaying timber harvest until dry periods or until the soil is frozen. Seedling mortality can be reduced by planting additional seedlings and thinning to the desired stand density later. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include restricting livestock, harvesting trees at maturity, and saving desirable seed trees.

This soil is generally unsuited to building sites because of wetness and frequent flooding. An alternate site should be selected. This soil is severely limited for local roads and streets because of frequent flooding, wetness, and low strength. Constructing roads on raised, well compacted fill material and providing adequate side ditches and culverts help to prevent flood damage and wetness. The upper layer of the soil should be replaced or strengthened with more suitable base material. This soil is generally unsuited to septic tank absorption fields because of moderately slow permeability, wetness, and frequent flooding.

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

PnB—Princeton-Alvin complex, 2 to 6 percent slopes. This map unit consists of gently sloping, deep, well drained soils on broad terraces along large streams. These soils were water deposited. Individual areas are usually elongated but are variable in shape because of the size of the terrace. They range from 3 to 80 acres but are dominantly about 20 acres. Areas are about 65 percent Princeton soil and 25 percent Alvin soil. The Princeton and Alvin soils are so intricately mixed or so small that it is not practical to separate them in mapping.

In a typical profile of Princeton soil, the surface layer is dark brown sandy loam about 8 inches thick. The subsoil is about 44 inches thick. The upper part is dark brown, firm sandy clay loam, and the lower part is strong brown, friable sandy loam. The substratum to a depth of 80 inches is strong brown, stratified sandy loam, sandy clay loam, and loamy sand.

In a typical profile of Alvin soil, the surface layer is dark brown loamy sand about 10 inches thick. The subsoil is about 38 inches thick. The upper part is dark yellowish brown, friable loamy sand; the middle part is brown, friable sandy loam; and the lower part is brown, friable loamy sand. The substratum to a depth of 70 inches is strong brown loamy sand.

Included with these soils in mapping are small areas of somewhat excessively drained Bloomfield and Tyner soils. Also included are small areas of severely eroded soils on nose slopes and sharp slope breaks where the subsoil may be exposed. The included soils make up about 10 percent of the map unit.

Available water capacity and permeability are moderate in these Princeton and Alvin soils. The organic matter content in the surface layer is low in both soils. Surface runoff from cultivated areas is medium on the Princeton soil and slow on the Alvin soil.

Many areas of these soils are used for cultivated crops. A few areas are used for hay or pasture and woodland.

These soils are well suited to corn, soybeans, and small grain. The hazard of erosion is the main management concern. Conservation practices, such as crop rotation, contour farming, grassed waterways, or grade stabilization structures, help to control erosion and surface runoff. The use of conservation tillage that leaves all or part of the crop residue on the surface, green manure crops, and cover crops also helps to control erosion and to improve and maintain the tilth and organic matter content of these soils.

These soils are well suited to grasses and legumes for hay or pasture. The hazard of erosion is the main management concern. A permanent cover of vegetation helps to slow runoff and control erosion. These soils are suited to deep-rooted legumes, such as alfalfa. Overgrazing and grazing when the soils are wet are other management concerns. Overgrazing reduces the plant density and hardiness and causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, and restricted use during wet periods help to keep the pasture and the soil in good condition.

These soils are well suited to trees. They are suited to plantings of black locust for firewood and fencepost production. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include restricting livestock, harvesting trees at maturity, and saving desirable seed trees.

These soils are suitable for building sites. Disturbed areas should be revegetated as soon as possible after construction so that erosion can be held to a minimum. Topsoil should be stockpiled and spread over critical areas where vegetation may be difficult to establish. These soils are moderately limited for local roads and streets because of the potential for frost action. Maintaining a crown on roads and streets, constructing roads and streets on raised, well compacted fill material, and providing adequate side ditches and culverts reduce the hazard of frost damage. These soils are suitable for septic tank absorption fields.

This Princeton-Alvin complex is in capability subclass IIe. The Princeton soil is in woodland suitability group 1o, and the Alvin soil is in woodland suitability group 2o.

St—Stendal silt loam, clayey substratum, frequently flooded. This nearly level, deep, somewhat poorly drained soil is on broad flats and in depressions on flood plains along narrow stream channels. It is subject to frequent flooding from January to May for brief periods. Individual areas are usually variable in shape because of the size of the bottom. They range from 3 to 150 acres but are dominantly about 25 acres.

In a typical profile, the surface layer is brown silt loam about 8 inches thick. The subsoil is about 20 inches thick. It is yellowish brown, mottled, friable silt loam in the upper part and light brownish gray, mottled, friable silt loam in the lower part. The substratum to a depth of 70 inches is light brownish gray and gray, mottled silty clay loam in the upper part and yellowish brown, mottled silty clay in the lower part. In many places the soil is silt loam throughout. In some places the soil is gray throughout.

Included with this soil in mapping are small areas of well drained Haymond soils and moderately well drained Wilbur soils that are on slightly convex, higher lying areas. Also included are small areas of somewhat poorly drained McGary soils. These soils are in positions on the landscape similar to those of Stendal soil, but they have more clay in the subsoil. The included soils make up about 10 to 15 percent of the map unit.

Available water capacity is very high in this Stendal soil. Permeability is moderate in the solum and slow in the clayey substratum. The organic matter content in the surface layer is moderately low. Surface runoff from cultivated areas is very slow. This soil has a seasonal high water table at a depth of 1 foot to 3 feet.

Many areas of this soil are drained and are used for most cultivated crops. Some areas are used for hay, pasture, or woodland.

This soil is suited to corn and soybeans. Small grain is subject to severe damage during periods of flooding. Wetness and frequent flooding are the main management concerns. Adequate drainage is needed for maximum crop production. Excessive water can be removed by open ditches, subsurface drains, surface drains, or a combination of these practices. If drainage is installed and the soil is properly managed, this soil is suited to intensive row cropping. Using short-season varieties of adapted crops and late plantings of crops help to avoid damage or loss from flooding. The use of conservation tillage that leaves all or part of the crop residue on the surface, cover crops, and green manure crops helps to improve and maintain the tilth and organic matter content of the soil.

This soil is well suited to grasses and water-tolerant legumes for hay or pasture. It is poorly suited to deep-rooted legumes, such as alfalfa, because of flooding. Water-tolerant species are best suited to this soil. Water management practices, such as installing drainage and protecting the soil from flooding, are necessary to obtain high yields of hay or pasture. Overgrazing and grazing when the soil is wet are other management concerns. Overgrazing reduces plant density and hardiness and causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Restricted use of equipment and plant competition are the main management concerns. This soil generally is not suited to black walnut plantings. Wetness hinders harvesting and logging operations and delays the planting of seedlings; however, limitations for use of equipment can be reduced by delaying the timber harvest until dry periods or until the soil is frozen. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include restricting livestock, harvesting trees at maturity, and saving desirable seed trees.

This soil is generally unsuitable for building sites because of frequent flooding and wetness. An alternate site should be selected. This soil is severely limited for local roads and streets because of flooding, low strength, and potential frost action. The upper layer of the soil should be replaced or strengthened with more suitable base material. Maintaining a crown on roads and streets, constructing roads and streets on raised, well compacted fill material, and providing adequate side ditches and culverts reduce the hazards of frost action and flooding. This soil is generally unsuitable for septic tank absorption fields because of wetness, slow permeability, and flooding.

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

TyB—Tyner-Alvin loamy sands, 2 to 7 percent slopes. This map unit consists of gently sloping, deep, somewhat excessively drained and well drained soils on broad terraces along large streams. These soils were water deposited. Individual areas are generally elongated but are variable in shape because of the size of the terrace. They range from 3 to 80 acres but are dominantly about 20 acres. Areas are about 50 percent Tyner soil and 40 percent Alvin soil. The Alvin soil is generally on sharp slope breaks adjacent to the Tyner soil. The soils are intricately mixed or so small that it is not practical to separate them in mapping.

In a typical profile of Tyner soil, the surface soil is dark brown and dark yellowish brown loamy sand about 15 inches thick. The subsoil to a depth of 48 inches is brown, very friable loamy sand and sand. The substratum to a depth of 80 inches is dark yellowish brown sand. In places the substratum is loamy sand. In a few places slopes are more than 7 percent.

In a typical profile of Alvin soil, the surface layer is dark brown and yellowish brown loamy sand about 15 inches thick. The subsoil is about 36 inches thick. The upper part is dark yellowish brown, very friable loamy sand; the middle part is dark brown, friable sandy loam; and the lower part is dark brown, friable loamy sand. The substratum to a depth of 80 inches is dark brown, stratified loamy sand, sandy loam, and sand in the upper part and dark brown and strong brown sand in the lower part. In some places the substratum is stratified coarse sand and very fine gravel.

Included with these soils in mapping are small areas of somewhat excessively drained Bloomfield soils and well drained Princeton soils. These soils have more clay in the subsoil and are at higher elevations on ridge summits, side slopes, and terrace breaks than the Tyner and Alvin soils. Also included are small areas of severely eroded soils on nose slopes and sharp breaks where the subsoil may be exposed. The included soils make up about 10 percent of the map unit.

Available water capability is low in this Tyner soil and moderate in this Alvin soil. Permeability is rapid in the Tyner soil and moderate in the Alvin soil. The organic matter content in the surface layer is low in both soils. Surface runoff from cultivated areas is slow.

Many areas of these soils are used for cultivated crops. A few areas are used for hay or pasture and woodland.

These soils are suited to corn, soybeans, and small grain. Low available water capacity is the main management concern. If rainfall is less than normal or is poorly distributed, the soils become somewhat droughty, and crops are likely to be damaged. During these periods of drought, the hazard of wind erosion increases, and crops may be damaged by soil blowing. Conservation practices that help to control water loss and soil blowing in areas where cultivated crops are grown are crop rotation, conservation tillage that leaves all or part of the crop residue on the surface, and the installation of field windbreaks. The use of conservation tillage, green manure crops, and cover crops also helps to control erosion and to improve and maintain the tilth and organic matter content of the soils. Because these soils are along streams, management is generally the same as management on the surrounding soils on the bottom lands.

These soils are well suited to grasses and legumes for hay or pasture. Alfalfa is commonly grown. Rapid and moderate permeability and low available water capacity are the main limitations. These soils are droughty and are subject to wind erosion. A permanent cover of drought-resistant grasses and legumes helps to slow runoff and control erosion. Overgrazing is a major management concern. Overgrazing reduces plant density and hardiness, causes excessive runoff, and increases wind erosion. Proper stocking rates, pasture rotation, or restricted use during wet periods helps to keep the pasture and the soil in good condition.

The Tyner soil is suited to trees, and the Alvin soil is well suited to trees. Seedling mortality is the main management concern for the Tyner soil, and plant competition is the main management concern for the Alvin soil. The Tyner soil generally is not suited to black walnut plantings. The Alvin soil is suited to plantings of black locust for firewood and fencepost production. Seedling mortality can be reduced by selecting drought-tolerant species and by planting additional seedlings and thinning to the desired stand density later. Seedlings survive and grow best if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include restricting livestock, harvesting trees at maturity, and saving desirable seed trees.

These soils are suitable for building sites. Disturbed areas should be revegetated as soon as possible after construction so that erosion losses can be held to a minimum. Topsoil should be stockpiled and spread over critical areas where vegetation may be difficult to establish. Most areas of these soils are suitable for local roads and streets. Alvin soil is moderately limited for local roads and streets, however, because of potential frost action. Maintaining a crown on roads and streets, constructing the roads and streets on raised, well compacted fill material, and providing adequate side ditches and culverts reduce the hazard of frost action. Most areas of these soils are severely limited for septic tank absorption fields because of the poor filtering qualities of the soil. Because the absorption field may not adequately filter the effluent in these soils, ground water supplies in the area may become contaminated. Filling or mounding the absorption field site with suitable material increases the filtering capacity of the soil. Alvin soil is suitable for septic tank absorption fields.

These Tyner and Alvin soils are in capability subclass IIIs. The Tyner soil is in woodland suitability group 3s, and the Alvin soil is in woodland suitability group 2o.

Ua—Udorthents, loamy. This nearly level to moderately sloping, deep, well drained to somewhat poorly drained soil is on disturbed areas on uplands and flood plains. This soil is usually around highway interchanges, shopping centers, subdivisions, parking lots, and factories. In most places the soil has been cut, built up, mixed, or smoothed and is radically altered. In some places the original landscape shows deep cuts where soil material has been removed and transported to other areas. In places a smoother, more nearly level landscape that has a mixture of subsoil and substratum exposed has remained when the upper part of the soil material has been cut and removed. The removed soil material has been used to fill lower lying areas or to provide fill for highway grades, overpasses, and exit ramps. Individual areas are variable in shape. They range from 5 to 300 acres but are dominantly about 20 acres.

In a typical area, the soil material that has been built up is a mixture of surface soil, subsoil, substratum, and pieces of limestone, concrete, bricks, or asphalt. The soil is silt loam, silty clay loam, or clay and may have amounts of waste material mixed within it. In a typical area that has been deeply cut, the material remaining is a thin layer of subsoil or substratum overlying limestone, sandstone, siltstone, or shale bedrock.

Included with this soil in mapping are small areas of undisturbed soils. Slightly concave, lower lying areas that stay wet for long periods are in some places.

Available water capacity is moderate in this Udorthents soil, and permeability is moderate or moderately slow. The organic matter content in the surface layer is low. Surface runoff is slow to rapid. This soil has a high water table at a depth of 1.5 to below 6 feet. Reaction of the profile ranges from slightly acid to extremely acid.

This soil is generally unsuited to corn, soybeans, and small grain. Many areas are idle and are inaccessible.

The hazard of erosion and the presence of waste material mixed with the soil material are the main management concerns. Most areas of this soil are surrounded by heavily travelled highways, parking lots, shopping centers, factories, and houses. Many areas have small patches of native grasses or low growing shrubs. Some areas have been seeded to permanent grasses. This soil has fair to poor suitability for agricultural uses, building sites, and sanitary facilities because of the variability of the modifications made by man. An onsite investigation is needed for all potential uses.

This soil is poorly suited to grasses and legumes for hay or pasture. Special management practices are needed. An intensified fertility program that emphasizes the incorporation of organic residue or manure into the soil is needed if these areas are to be used for production. A permanent cover of vegetation helps to slow runoff and control erosion. Plowing on the contour and using conservation tillage helps to control erosion when the seedbed is prepared. Cover crops should be planted on exposed areas as soon as possible. Drainage of the nearly level areas may be needed.

This soil is poorly suited to trees. An onsite investigation is needed to determine those species that would be best suited.

An onsite investigation is needed if this soil is to be used for development purposes. Depth to the water table and its relation to the frost action potential should be considered. Engineering test data should be collected because the soil material is variable. The soil properties significant to the design of a structure vary from one area to another within this soil.

This Udorthents soil is not assigned to interpretative groupings.

WbF—Weikert-Berks-Gilpin complex, 25 to 75 percent slopes. This map unit consists of steep and very steep, shallow and moderately deep, well drained soils on side slopes of ridges along drainageways that deeply dissect the upland area. Individual areas are usually long and narrow. They range from 10 to 1,000 acres but are dominantly about 150 acres. Areas are about 40 percent Weikert soil, 25 percent Berks soil, and 25 percent Gilpin soil. The Weikert soil is generally on the lower part of the landform or in areas that have 35 to 75 percent slopes. The Berks soil is generally on the upper part of the landform or in areas that have 25 to 45 percent slopes. The Gilpin soil is dominantly on south-facing slopes of 25 to 45 percent. The soils are so intricately mixed or so small that it is not practical to separate them in mapping.

In a typical profile of Weikert soil, the surface layer is very dark grayish brown channery silt loam about 3 inches thick. The subsoil is yellowish brown, friable very channery silt loam about 13 inches thick. Weathered siltstone bedrock is at a depth of 16 inches. In places bedrock is within a depth of 10 inches. In some places the bedrock is rippable.

In a typical profile of Berks soil, the surface layer is very dark grayish brown silt loam about 2 inches thick. The subsurface layer is brown silt loam about 2 inches thick. The subsoil is about 22 inches thick. The upper part is yellowish brown, friable silt loam, and the lower part is yellowish brown, friable very channery silt loam. The substratum to a depth of 34 inches is yellowish brown very channery silt loam. Hard siltstone bedrock is at a depth of 34 inches. In places the subsoil has more clay. In some areas bedrock is within a depth of 20 inches, and in other areas the bedrock is rippable.

In a typical profile of Gilpin soil, the surface layer is dark grayish brown silt loam about 3 inches thick. The subsurface layer is light yellowish brown silt loam about 7 inches thick. The subsoil is about 16 inches thick. The upper part is yellowish brown, friable silt loam, and the lower part is strong brown, friable channery silt loam. The substratum to a depth of 31 inches is weathered sandstone bedrock. Hard siltstone bedrock is at a depth of 31 inches. In some areas the subsoil has less clay. In places bedrock is within a depth of 20 inches.

Included with these soils in mapping are small areas of well drained Caneyville soils and Wellston soils. Limestone bedrock is above a depth of 40 inches in Caneyville soils, and sandstone, siltstone, or shale bedrock is below a depth of 40 inches in Wellston soils. Some areas have a high amount of chert and geode fragments. Also included in mapping are areas of severely eroded soils on sharp slope breaks. In these areas the subsoil may be exposed. Most areas have outcrops of rock and a few abandoned quarries. The included soils make up about 5 to 10 percent of the map unit.

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

Most areas of these soils are in woodland. These soils are not suited to cultivation because of the very severe hazard of erosion and steepness of slope.

These soils are generally unsuited to grasses and legumes for hay and pasture.

These soils are suited to trees. The hazard of erosion, restricted use of equipment, seedling mortality, and the hazard of windthrow are the main management concerns of the Weikert soil. The hazard of erosion, restricted use of equipment, and seedling mortality are the main management concerns of the Berks and Gilpin soils. These soils generally are not suited to black walnut plantings. Seedling mortality can be reduced by planting additional seedlings and thinning to the desired stand density later. Logging roads and skid trails should be constructed on the contour. Steepness of slopes hinders the use of some kinds of logging equipment. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include excluding livestock, harvesting trees at maturity, and saving desirable seed trees.

These soils are generally unsuited to dwellings because of slope or slope and depth to bedrock. An alternate site should be selected. These soils are severely limited for local roads and streets because of slope. Placing roads on the contour helps to overcome the slope hazard. Cutting and filling is sometimes used to reduce the slope, but this practice may be limited by depth to bedrock. These soils are generally unsuited to septic tank absorption fields because of steep and very steep slopes and depth to bedrock.

This Weikert-Berks-Gilpin complex is in capability subclass VIIe. The Weikert soil is in woodland suitability group 4d, the Berks soil is in woodland suitability group 4f, and the Gilpin soil is in woodland suitability group 3r.

WeC2—Wellston silt loam, 6 to 12 percent slopes, eroded. This moderately sloping, deep, well drained soil is on narrow ridgetops and side slopes on uplands. Individual areas are usually long and irregular in shape. They range from 3 to 40 acres but are dominantly about 15 to 25 acres.

In a typical profile, the surface layer is brown silt loam about 7 inches thick. The subsoil is about 41 inches thick. The upper part is strong brown, friable and firm silt loam, and the lower part is yellowish brown, mottled, firm channery silt loam. Hard sandstone bedrock is at a depth of 48 inches. In places bedrock is below a depth of 72 inches. In places slopes are less than 6 percent.

Included with this soil in mapping are small areas of moderately well drained Ebal soils and well drained Berks, Gilpin, and Weikert soils, which are on steeper slopes. Sandstone, siltstone, or shale bedrock is within a depth of 40 inches in the Berks, Gilpin, and Weikert soils. Also included are small areas of moderately well drained Hosmer soils on slightly convex, higher lying ridgetops and some areas of severely eroded soils on nose slopes and sharp slope breaks. Short steep slopes, outcrops of rock, and bedrock escarpments are in places. The included areas make up about 5 to 20 percent of the map unit.

Available water capacity and permeability are moderate in this Wellston soil. The organic matter content in the surface layer is moderately low. Surface runoff from cultivated areas is medium.

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

This soil is suited to corn, soybeans, and small grain. The hazard of erosion is the main management concern. Conservation practices, such as crop rotation, diversions, contour farming, grassed waterways, grade stabilization structures, or terracing, help to control erosion and surface runoff. The use of conservation tillage that leaves all or part of the crop residue on the surface, green manure crops, and cover crops helps to improve and maintain the tilth and organic matter content of this soil.

This soil is well suited to grasses and legumes for hay or pasture. The hazard of erosion, overgrazing, and grazing when the soil is wet are the main concerns of management. A permanent cover of vegetation helps to slow runoff and control erosion. Overgrazing reduces plant density and hardiness and causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, or restricted use during wet periods helps to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is the main management concern. This soil is suited to plantings of black locust for firewood and fencepost production. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include restricting livestock, harvesting trees at maturity, and saving desirable seed trees.

This soil is moderately limited for dwellings without basements because of slope and moderately limited for dwellings with basements because of depth to rock and slope. Grading the area to modify the slope or designing the structure to complement the slope helps to overcome the slope hazard. Depth to rock should be considered when designing the building. Disturbed areas should be revegetated as soon as possible after construction so that erosion can be held to a minimum. Topsoil should be stockpiled and spread over critical areas where vegetation may be difficult to establish. This soil is severely limited for local roads and streets because of potential frost action. Maintaining a crown on roads and streets, constructing roads and streets on raised, well compacted fill material, and providing adequate side ditches and culverts help to reduce the hazard of frost action. This soil is moderately limited for septic tank absorption fields because of slope, depth to rock, and moderate permeability. Grading or land shaping to modify the slope and installing the absorption field on the contour help to overcome the slope hazard. Increasing the size of the filter field helps to compensate for the restricted permeability and installing the absorption field in suitable fill material helps to overcome the moderate permeability and provide more soil material over the bedrock.

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

WeD2—Wellston silt loam, 12 to 18 percent slopes, eroded. This strongly sloping, deep, well drained soil is on side slopes on uplands. Individual areas are usually long and irregular in shape. They range from 3 to 75 acres but are dominantly about 40 acres.

In a typical profile, the surface layer is dark yellowish brown silt loam about 4 inches thick. The subsoil is about 30 inches thick. The upper part is yellowish brown, friable silty clay loam, and the lower part is strong brown, friable channery silty clay loam. The substratum to a depth of 46 inches is yellowish brown, mottled, friable very channery silt loam. Hard sandstone bedrock is at a depth of 46 inches. In places slopes are more than 18 percent.

Included with this soil in mapping are small areas of moderately well drained Ebal soils and well drained Berks, Gilpin, and Weikert soils. Sandstone, siltstone, or shale bedrock is within a depth of 40 inches in these soils. Weikert soils are on steeper slopes. Also included are areas of severely eroded soils on nose slopes and sharp slope breaks. In these areas the subsoil may be exposed. Short steep slopes, outcrops of rock, and bedrock escarpments are in places. The included soils make up about 5 to 20 percent of the map unit.

Available water capacity and permeability are moderate in this Wellston soil. The organic matter content in the surface layer is moderately low. Surface runoff from cultivated areas is rapid.

Many areas of this soil are in woodland. Some areas are used for hay or pasture.

This soil is poorly suited to corn, soybeans, and small grain. The severe hazard of erosion and steepness of slope are the main management concerns. Conservation practices, such as crop rotation, contour farming, and grassed waterways, help to control erosion and surface runoff. The use of conservation tillage that leaves all or part of the crop residue on the surface, green manure crops, and cover crops helps to control erosion and to improve and maintain the tilth and organic matter content of the soil.

This soil is well suited to grasses and legumes for hay or pasture. Rapid runoff and the hazard of erosion are the main management concerns. A permanent vegetative cover helps to slow runoff and control erosion. The use of conservation tillage when preparing the seedbed helps to control erosion. Overgrazing and grazing when the soil is wet are other management concerns. Overgrazing reduces plant density and hardiness and causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, or restricted use during wet periods helps to keep the pasture and the soil in good condition.

This soil is well suited to trees. The hazard of erosion, restricted use of equipment, and plant competition are the main management concerns. This soil is suited to plantings of black locust for firewood and fencepost production. Logging roads and skid trails should be constructed on the contour. Using road ditches and culverts helps to control runoff from roads and skid trails. Steepness of slope hinders the use of some kinds of logging equipment. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting or girdling. Additional management practices include restricting livestock, harvesting trees at maturity, and saving desirable seed trees.

This soil is severely limited for building sites because of slope. The selection of an alternate site may be needed. Grading the area to modify the slope or designing the structure to complement the slope helps to overcome the slope hazard. Disturbed areas should be revegetated as soon as possible after construction so that erosion can be held to a minimum. Topsoil should be stockpiled and spread over critical areas where the vegetation may be difficult to establish. This soil is severely limited for local roads and streets because of slope and potential frost action. Roads should be placed on the contour if possible. Cutting and filling is sometimes used to reduce the slope, but this practice may be limited by depth to rock. Maintaining a crown on roads and streets, constructing roads and streets on raised, well compacted fill material, and providing adequate side ditches and culverts reduce the hazard of frost action. This soil is severely limited for septic tank absorption fields because of slope. Grading or landshaping to modify the slope and installing the absorption field on the contour help to overcome the slope hazard. Deep cutting may be limited by depth to rock.

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

WfD3—Wellston silt loam, gullied, 10 to 18 percent slopes. This moderately sloping and strongly sloping, deep, well drained soil is on sharp breaks that border the ridgetops and steeper side slopes on uplands. Slopes range from 100 to 500 feet long. This map unit is made up of gullies, areas that have very little vegetation, and areas that have 5 to 30 percent sandstone, siltstone, or shale fragments on the surface. As much as 36 to 90 inches of soil material has been removed by water in the gullies. Individual areas are usually elongated. They range from 3 to 30 acres but are dominantly about 10 acres.

In a typical profile, the subsoil is exposed. It is about 44 inches thick. The upper part is strong brown, friable silt loam; the next part is reddish brown, firm silty clay loam; below that is yellowish red, firm silty clay loam; and the lower part is strong brown, mottled, firm clay. The substratum to a depth of 54 inches is strong brown, mottled, weathered shale. It is underlain by hard sandstone bedrock. In some places bedrock is within a depth of 40 inches. In other places areas as much as 10 feet wide are uneroded and have a surface layer of brown or yellowish brown silt loam. In some places slope is less than 10 percent, and in other places it is more than 18 percent.

Included with this soil in mapping are small areas of moderately well drained Ebal soils and well drained Berks, Gilpin, and Weikert soils. In these soils sandstone, siltstone, or shale bedrock is within a depth of 40 inches. In places outcrops of rock are in the bottom of the gullies. The included soils make up about 10 to 15 percent of the map unit.

Available water capacity and permeability are moderate in this Wellston soil. The organic matter content in the surface layer is moderately low. Surface runoff from cultivated areas is very rapid.

Most areas of this soil are idle land. The soil has very limited vegetation or ground cover.

This soil is generally unsuited to corn, soybeans, and small grain and to hay and pasture. The very rapid runoff, very severe hazard of erosion, and steepness of slope are the main management concerns.

This soil is suited to trees. The hazard of erosion, restricted use of equipment, and plant competition are the main management concerns. This soil is suited to plantings of black locust for firewood and fencepost production. Where needed, black locust can provide erosion control and, like most legumes, produce nitrogen throughout a shallow but wide-spread root system. Logging roads and skid trails should be constructed on the contour. Using road ditches and culverts helps to control runoff from roads and skid trails. Steepness of slopes hinders the use of some kinds of logging equipment. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include excluding livestock, harvesting trees at maturity, and saving desirable seed trees.

This soil is severely limited for building sites because of slope. The selection of an alternate site may be needed. Grading the area to modify the slope or designing the structure to complement the slope helps to overcome the slope hazard. Disturbed areas should be revegetated as soon as possible after construction so that erosion can be held to a minimum. Topsoil should be stockpiled and spread over critical areas where the vegetation may be difficult to establish. This soil is severely limited for local roads and streets because of slope and potential frost action. Roads should be placed on the contour where possible. Cutting and filling operations are sometimes used to reduce the slope, but this practice may be restricted by depth to rock. Maintaining a crown on roads and streets, constructing roads and streets on raised, well compacted fill material, and providing adequate side ditches and culverts reduce the hazard of frost action. This soil is severely limited for septic tank absorption fields because of slope. Grading or landshaping to modify the slope and installing the absorption field on the contour help to overcome the slope hazard. Deep cuts may be restricted by depth to bedrock.

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

WgD2—Wellston-Gilpin silt loams, 12 to 18 percent slopes, eroded. This map unit consists of strongly sloping, deep and moderately deep, well drained soils on hillside bench areas, foot slopes, and narrow ridgetops on uplands. It is made up of many small benchlike breaks. Individual areas are usually long and narrow. They range from 10 to 100 acres but are dominantly about 25 acres. These areas are about 65 percent Wellston soil and 20 percent Gilpin soil. The Wellston soil and the Gilpin soil are so intricately mixed or so small that it is not practical to separate them in mapping.

In a typical profile of Wellston soil, the surface soil is dark brown silt loam about 9 inches thick. The subsoil to a depth of 46 inches is yellowish brown, friable silt loam in the upper part, and yellowish brown, mottled, firm silty clay loam in the lower part. It is underlain by hard sandstone bedrock. In places slopes are less than 12 percent.

In a typical profile of Gilpin soil, the surface layer is dark grayish brown silt loam about 3 inches thick, and the subsurface layer is yellowish brown silt loam about 3 inches thick. The subsoil is yellowish brown, friable silt loam about 17 inches thick. The substratum to a depth of 26 inches is yellowish brown, mottled very channery silt loam. It is underlain by sandstone bedrock. In places bedrock is within a depth of 20 inches. In some areas less clay is in the subsoil. In places slopes are less than 12 percent or more than 18 percent.

Included with these soils in mapping are small areas of moderately well drained Ebal soils that are on short benches. Also included are small areas of well drained Weikert soils which are on steeper, lower lying areas of side slopes. In these soils sandstone, siltstone, or shale bedrock is within a depth of 20 inches. Also included are some areas of severely eroded soils on nose slopes and sharp slope breaks. Many areas have outcrops of rock, bedrock escarpments, and short steep slopes. The included soils make up about 5 to 10 percent of the map unit.

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

Many areas of these soils are in woodland. Some areas are used for hay or pasture.

These soils are poorly suited to corn, soybeans, and small grain. The severe hazard of erosion, depth to bedrock, and steepness of slope are the main management concerns. Conservation practices, such as crop rotation, diversions, contour farming, and grassed waterways, help to control erosion and surface runoff. The use of conservation tillage that leaves all or part of the crop residue on the surface, green manure crops, and cover crops also helps to control erosion and to improve and maintain the tilth and organic matter content in the soils.

These soils are suited to grasses and legumes for hay or pasture. Rapid runoff and the hazard of erosion are the main management concerns. A permanent vegetative cover helps to slow runoff and control erosion. The use of conservation tillage when reestablishing stands helps to control erosion. Overgrazing and grazing when the soil is wet are other management concerns. Overgrazing reduces plant density and hardiness and causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, pasture rotation, or restricted use during wet periods helps to keep the pasture and the soil in good condition.

These soils are well suited to trees. Plant competition is the main management concern. These soils are suited to black walnut plantings. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include excluding livestock, harvesting trees at maturity, and saving desirable seed trees.

The Wellston soil is severely limited for dwellings because of slope. The selection of an alternate site may be needed. Grading the area to modify the slope or designing the structure to complement the slope helps to overcome the slope hazard. Depth to bedrock may hinder the construction of basements. Disturbed areas should be revegetated as soon as possible after construction so that erosion can be held to a minimum. Topsoil should be stockpiled and spread over critical areas where the vegetation may be difficult to establish. These soils are severely limited for local roads and streets because of slope or slope and potential frost action. Roads should be placed on the contour where possible. Maintaining a crown on roads and streets, constructing roads and streets on raised, well compacted fill material, and providing adequate side ditches and culverts reduce the hazard of frost action. These soils are severely limited for septic tank absorption fields because of slope or depth to rock and slope. Grading or landshaping to modify the slope and installing the absorption field on the contour help to overcome the slope hazard. Deep cuts may be limited by depth to rock.

These Wellston and Gilpin soils are in capability subclass IVe. The Wellston soil is in woodland suitability group 2o, and the Gilpin soil is in woodland suitability group 2r.

Wr—Wilbur silt loam, frequently flooded. This nearly level, deep, moderately well drained soil is on flood plains along narrow stream channels. It is subject to frequent flooding for brief periods from October to June. Individual areas are usually variable in shape because of the size of the bottom. They range from 4 to 25 acres but are dominantly about 10 acres.

In a typical profile, the surface layer is dark grayish brown silt loam about 7 inches thick. The substratum to a depth of 60 inches is dark brown silt loam in the upper part; dark yellowish brown and brown, mottled silt loam in the next part; dark grayish brown and grayish brown, mottled silt loam below that; and brown, stratified fine sand and silt in the lower part. In places this soil does not have gray mottles above a depth of 20 inches. In some areas the subsoil has more clay, and reaction is medium acid to very strongly acid throughout the profile.

Included with this soil in mapping are small areas of well drained Burnside soils that are on the upper end of drainageways; small, slightly concave, lower lying areas of poorly drained Bonnie soils; and somewhat poorly drained areas of McGary and Stendal soils. Also included are small areas of somewhat poorly drained Henshaw soils that are on higher lying terrace positions. The included soils make up about 10 to 15 percent of the map unit.

Available water capacity is very high in this Wilbur soil, and permeability is moderate. The organic matter content in the surface layer is moderately low. Surface runoff from cultivated areas is slow. This soil has a seasonal high water table at a depth of 1.5 to 3 feet.

Many areas of this soil are used for cultivated crops. Some areas are used for hay and pasture or are in woodland.

This soil is suited to corn and soybeans. It is suited to intensive row cropping if it is properly managed. Flooding is the main management concern. Small grain is subject to severe damage during periods of flooding. Using short-season varieties of adapted crops and late planting of crops help to avoid damage or loss from flooding. The use of conservation tillage that leaves all or part of the crop residue on the surface, green manure crops, and crop residue management helps to improve and maintain the tilth and organic matter content of the soil.

This soil is well suited to grasses and legumes for pasture or hay. This soil is poorly suited to legumes. Water-tolerant species are best suited to this soil. Overgrazing and grazing when the soil is wet are management concerns. Overgrazing reduces plant density and hardiness and causes surface compaction and poor tilth. Proper stocking rates, pasture rotation, or restricted use during wet periods helps to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is the main management concern. This soil is suited to plantings of black locust for firewood and fencepost production. Seedlings survive and grow well if competing vegetation is controlled. The control or removal of unwanted trees and shrubs can be accomplished by site preparation or by spraying, cutting, or girdling. Additional management practices include excluding livestock, harvesting trees at maturity, and saving desirable seed trees.

This soil is generally unsuited to building sites. It is severely limited for local roads and streets because of frequent flooding and potential frost action. Maintaining a crown on roads and streets, constructing roads and streets on raised, well compacted fill material, and providing adequate side ditches and culverts reduce the hazard of frost action and flood damage. This soil is generally unsuited to septic tank absorption fields because of wetness and frequent flooding.

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

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 providing the nation's short- and long-range needs for food and fiber. The acreage of high-quality farmland is limited, and the U.S. Department of Agriculture recognizes that government at local, state, and federal levels, as well as individuals, must encourage and facilitate the wise use of our nation's prime farmland.

Prime farmland soils, as defined by the U.S. Department of Agriculture, are soils that are best suited to producing food, feed, forage, fiber, and oilseed crops. Such soils have properties that are favorable for the economic production of sustained high yields of crops. The soils need only to be treated and managed using acceptable farming methods. The moisture supply, of course, must be adequate, and the growing season has to be sufficiently long. Prime farmland soils produce the highest yields with minimal inputs of energy and economic resources, and farming these soils results in the least damage to the environment.

Prime farmland soils may presently be in use as cropland, pasture, or woodland, or they may be in other uses. They either are used for producing food or fiber or are available for these uses. Urban or built-up land and water areas cannot be considered prime farmland.

Prime farmland soils usually get an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The acidity or alkalinity level of the soils is acceptable. The soils have few or no rocks and are permeable to water and air. They are not excessively erodible or saturated with water for long periods and are not flooded during the growing season. The slope ranges mainly from 0 to 6 percent. More information on the criteria for prime farmland soils can be obtained at the local office of the Soil Conservation Service.

About 46,621 acres, or nearly 16 percent of Lawrence County, meets the soil requirements for prime farmland. Areas are scattered throughout the county, mainly in map units 1, 4, and 8 of the general soil map. Nearly all of this prime farmland is used for corn and soybeans.

A recent trend in land use has been the conversion of 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 difficult to cultivate, and usually less productive than prime farmland soils.

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

Soils that have limitations, such as a high water table, flooding, or inadequate rainfall, may qualify as prime farmland if these limitations are overcome by such measures as drainage, flood control, or irrigation. In the following list, the measures used to overcome these limitations are shown in parentheses after the map unit name. Onsite evaluation is necessary to see if the limitations have been overcome by corrective measures.

The map units that meet the soil requirements for prime farmland follow.

Ba Bartle silt loam, rarely flooded (where drained)
BdB2 Bedford silt loam, 2 to 6 percent slopes, eroded
CrB Crider silt loam, 2 to 6 percent slopes
EkB2 Elkinsville Variant loam, 2 to 6 percent slopes, eroded
HrA Henshaw silt loam, rarely flooded, 1 to 3 percent slopes
Hs Hoosierville silt loam (where drained)
HxB2 Hosmer silt loam, 1 to 6 percent slopes, eroded
MdB2 Markland silty clay loam, 2 to 6 percent slopes, eroded
MhA McGary silty clay loam, frequently flooded, 0 to 2 percent slopes (where drained and protected from flooding)
MuA Muren silt loam, 1 to 3 percent slopes
PeB Pekin silt loam, 2 to 6 percent slopes
PnB Princeton-Alvin complex, 2 to 6 percent slopes

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 and 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

Jerry Lish, district conservationist, Soil Conservation Service, assisted in the preparation of 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.

More than 141,091 acres in the survey area was used for crops and pasture in 1967, according to the Conservation Needs Inventory. Of this total, 47,891 acres was used for permanent pasture; 39,771 acres for row crops, mainly corn and soybeans; 4,000 acres for close grown crops, mainly wheat and oats; and 24,722 acres for rotation hay and pasture. The rest was idle cropland and was used for conservation purposes (*4*).

The potential of the soils in Lawrence County for increased production of food is fair. About 11,297 acres of potentially good cropland is currently used as woodland, and about 8,897 acres is used as pasture (*4*). In addition to the reserve productive capacity represented by this land, food production could also be increased considerably by extending the latest crop production technology to all cropland in the county. This soil survey can greatly facilitate the application of such technology.

Acreage in crops and pasture has been gradually decreasing as more and more land is used for urban development. In 1967 there was about 35,253 acres of urban and built-up land in the county (*4*). This figure has been increasing at the rate of about 110 acres per year (*9*). The use of this soil survey to help make land use decisions that will influence the future role of farming in the county is discussed in the section "General Soil Map Units."

Soil drainage is the major management need on about 15 percent of the cropland and pasture in Lawrence County. Some soils are naturally so wet that the production of crops common to the area generally is not possible. The poorly drained Bonnie (fig. 5), Hoosierville, and Petrolia soils are examples. However, most areas of these soils can be economically drained. Most areas are in depressions, and drainage ditches flowing to a suitable outlet would have to be deepened and extended for great distances, if a suitable outlet is available. In some cases no suitable outlet exists.

Figure 5.—Crayfish castles are an indication of wetness on this Bonnie silt loam, frequently flooded.

Some soils are so wet that crops are damaged during most years unless artificially drained. The somewhat poorly drained Bartle, Henshaw, McGary, Newark, and Stendal soils are examples. These soils are farmed annually. Because many are not adequately drained, however, they produce much lower yields than if drainage were adequate.

The Bedford, Caneyville, Ebal, Frederick, Gilpin, Hosmer, Markland, Muren, and Pekin soils have good natural drainage most of the year but tend to dry out slowly after rains. Small areas of the wetter soils along drainageways and in swales are commonly included in areas of the well drained and moderately well drained Abscota, Alvin, Burnside, Chagrin, Crider, Elkinsville Variant, Haymond, Nolin, Princeton, and Wilbur soils, especially in those soils that have slopes of 2 to 6 percent. Artificial drainage is needed in some of these wetter areas.

The design of both surface and subsurface drainage systems varies with the kind of soil. A combination of surface drainage and subsurface drainage is needed in most areas of the poorly drained and very poorly drained soils used for intensive row cropping. Drains need to be more closely spaced in soils that are slowly permeable than in soils that are more permeable. Subsurface drainage is very slow in Henshaw, McGary, Petrolia, and Stendal soils. Finding adequate outlets for subsurface drainage in these soils is often difficult.

Soil erosion is the major soil problem on about 68 percent of the cropland and pasture in Lawrence County (*4*). If the slope is more than 2 percent, erosion is a hazard (fig. 6). Hosmer soils, for example, have slopes of 1 to 6 percent in addition to a problem of wetness.

Loss of the surface layer through erosion is damaging for two reasons. First, productivity is reduced as the

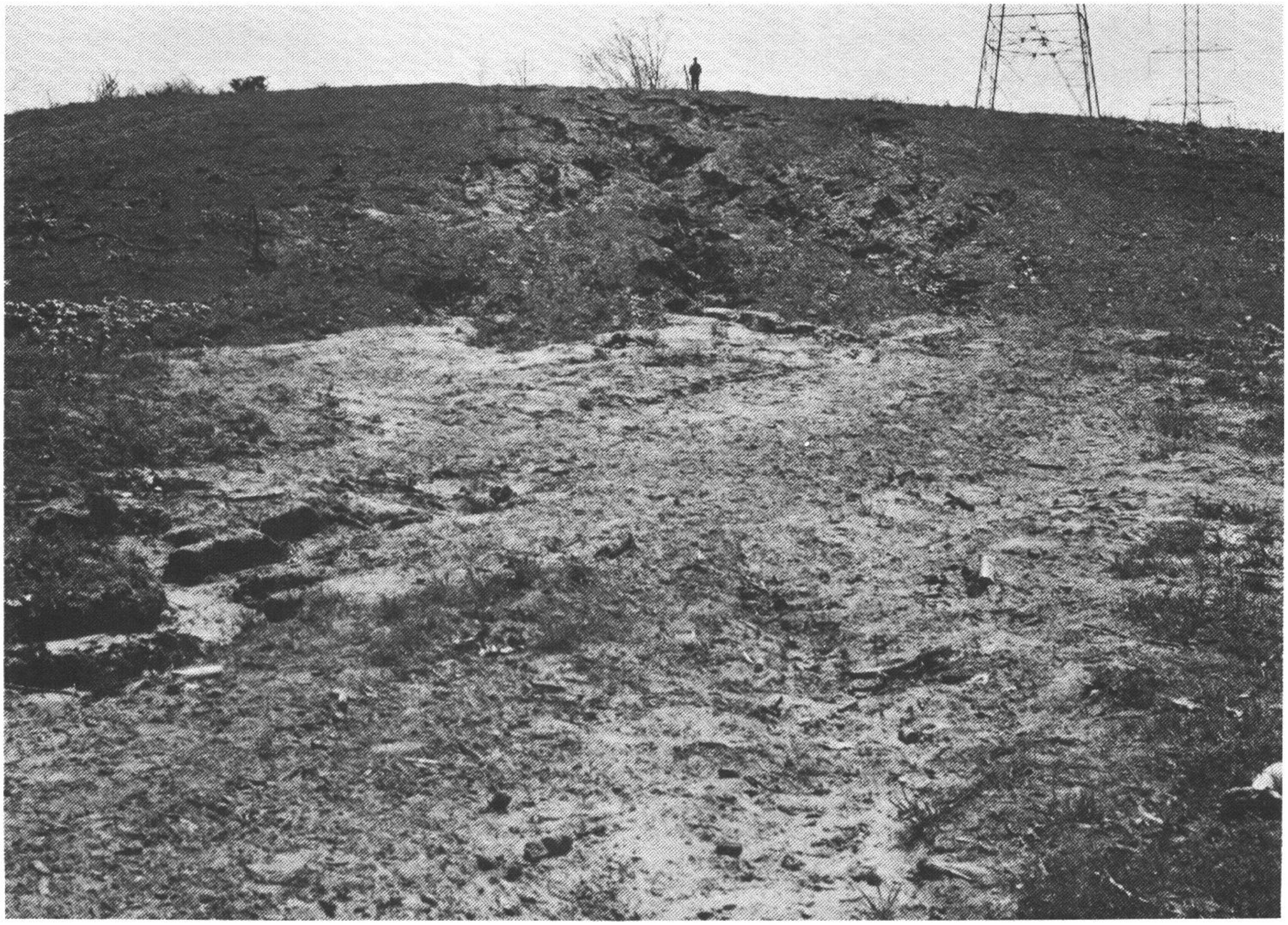


Figure 6.—Erosion on Alvin sandy loam, 12 to 22 percent slopes. This area was cleared.

surface layer is lost and part of the subsoil is incorporated into the plow layer. Loss of the surface layer is especially damaging on soils that have a clayey subsoil, Caneyville, Ebal, Frederick, Markland, and McGary soils, and on soils that have a layer in or below the subsoil that limits the depth of the root zone. Such layers include fragipans, as in Bartle, Bedford, Hosmer, and Pekin soils or bedrock, as in Berks, Burnside, Caneyville, Gilpin, Weikert, and Wellston soils. In addition, erosion reduces productivity on soils that tend to be droughty, such as Alvin, Bloomfield, and Tyner soils. Second, soil erosion on farmland results in sediment entering streams. Control of erosion minimizes the pollution of streams by sediment and improves the quality of water for municipal use, for recreation, and for fish and wildlife.

In many sloping fields, preparing a good seedbed and tilling are difficult on clayey or hardpan spots because the original, friable surface has been eroded away. Such spots are common in areas of moderately eroded Caneyville, Crider, and Frederick soils.

Erosion control practices provide protective surface cover, reduce runoff, and increase infiltration. A cropping system that keeps vegetative cover on the soil for extended periods can hold soil erosion losses to amounts that will not reduce the productive capacity of the soils (fig. 7). On livestock farms, which require pasture and hay, the legume and grass forage crops in the cropping system reduce erosion on sloping land and, in addition, provide nitrogen and improve tilth for the following crop.

Because slopes are so short and irregular in shape, contour tillage or terracing is not practical in most areas

Figure 7.—Establishing a grass cover on Alvin sandy loam, 12 to 22 percent slopes. The area has been reshaped, mulched, and reseeded.

of the sloping Alvin, Bloomfield, Caneyville, Ebal, Frederick, Gilpin, and Tyner soils. On these soils, cropping systems that provide substantial vegetative cover are required to control erosion unless conservation tillage is practiced. Minimizing tillage and leaving crop residue on the surface help to increase infiltration and reduce the hazards of runoff and erosion (fig. 8). These practices can be adapted to most soils in the survey area but are more difficult to use successfully on the severely eroded Caneyville and Frederick soils. These soils have a higher clay content in their surface layer. No tillage for corn (fig. 9), is a practice which is increasing in use. It is effective in reducing erosion on sloping land and can be adapted to most well drained and moderately well drained soils in the survey area. No tillage is more difficult to practice successfully, however, on soils that have a clayey surface layer.

Diversions and terraces that have parallel tile outlets are used to shorten the length of slope and are effective in reducing sheet, rill, and gully erosion. They are most practical on deep, well drained soils that are highly susceptible to erosion.

Some of the Crider and Wellston soils are suitable for terraces. Other soils are less suitable for terracing and diversions because of irregular slopes, excessive wetness in the terrace channels, a clayey subsoil which would be exposed in terrace channels, or bedrock at a depth of less than 40 inches. The benefits of terracing include reduction in soil loss and the associated loss of fertilizer elements; reduction in the amount of sediment, which results in crop damage and damage to water courses; and reduction in the need for grassed waterways, which take land that could be used for row crops out of production. In addition, farming on the contour is easier if terraces and diversions are used. Contour farming reduces the amount of fuel needed for tractors and lessens the amount of pesticides entering water courses.

Grassed waterways are needed in many areas that have sloping soils, such as Crider and Frederick soils. In addition, many areas of Bedford and Muren soils need waterways because a large watershed drains across these soils. Tile drainage usually needs to be installed below the waterways in the Bedford and Muren soils because seeps occur along the drainageways.

Contouring and contour stripcropping are sometimes used for erosion control in the survey area. These practices are best adapted to soils that have smooth uniform slopes, including most areas of the sloping Alvin, Bartle, Bedford, Bloomfield, Crider, Ebal, Elkinsville Variant, Frederick, Hosmer, Pekin, Princeton, and Tyner soils.

Soil blowing is a hazard on the sandy Alvin, Bloomfield, Princeton, and Tyner soils. Soil blowing can damage these soils in a few hours if winds are strong and the soils are dry and bare of vegetative cover or surface mulch. Maintaining vegetative cover, using surface mulch, or roughing the surface of the soil by proper tillage methods minimizes soil blowing. Windbreaks of adapted shrubs are effective in reducing wind erosion on these soils. Soil blowing takes place on barren soils; soils that are plowed in the fall are very susceptible to wind erosion the following spring.

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

Figure 8.—No-till corn planted in sod on Crider silt loam, 6 to 12 percent slopes, eroded.

Figure 9.—No-till corn planted in corn stubble on Crider silt loam, 6 to 12 percent slopes, eroded.

Soil fertility is naturally low in most soils of the uplands and terraces in the survey area. Most of these soils are naturally acid. Exceptions are the Abscota, Haymond, Henshaw, Markland, McGary, and Wilbur soils, which are on flood plains and range from slightly acid to mildly alkaline. They are naturally higher in plant nutrients than most of the soils on uplands and terraces. Poorly drained and very poorly drained soils in slight depressions, such as the Bonnie and Petrolia soils, receive runoff from the adjacent soils on uplands.

Most of the soils on uplands and terraces are naturally medium acid to very strongly acid. They usually need applications of ground limestone to raise the pH level sufficiently for good growth of alfalfa and other crops that grow well on nearly neutral soils. Available phosphorus and potash levels are naturally low in most of these soils. On all soils additions of lime and fertilizer should be based on the results of soil tests, on the need of the crop, and on the expected level of yields. All crops respond well to applications of lime and fertilizer if they are applied according to soil tests and plant needs. The Cooperative Extension Service can help in determining the kinds and amounts of fertilizer and lime to apply.

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

Many of the soils used for crops in the survey area have a silt loam surface layer that is light in color and low in content of organic matter. The structure of such soils is generally moderate to weak, and intense rainfall causes the formation of crust on the surface. In some areas this crust becomes hard when dry and is impervious to water. Once a crust forms, infiltration is reduced and runoff is increased. Regular additions of crop residue, manure, and other organic material help to improve the soil structure and reduce crust formation.

Fall plowing generally is not a good practice on the light colored soils that have a silt loam surface layer because a crust forms during the winter and spring. Many of the soils are nearly as dense and hard at planting time as they were before fall plowing. In addition, about 68 percent of the soils used for cropland are sloping. These soils are subject to damaging erosion if they are plowed in the fall (*4*).

Tilth is a problem for the light colored Henshaw, Hoosierville, Markland, and McGary soils because these soils often stay wet until late in spring. If plowed when wet, these soils tend to become very cloddy when dry, and good seedbeds are difficult to prepare. Fall plowing generally results in good tilth in the spring.

Field crops suited to the soils and climate of the survey area include many that are not now commonly grown. Corn and soybeans are the main row crops. Wheat and oats are the common close growing crops. Rye and barley could be grown, and grass and legume seed could be produced from alfalfa, bluegrass, fescue, lespedeza, orchardgrass, red clover, sudangrass, and timothy.

Specialty crops are of limited commercial importance in the survey area. Only a small acreage is used for small fruits and grapes. Deep soils that have good natural drainage and that warm up early in spring are especially well suited to many specialty crops. The Alvin, Bloomfield, Crider, Princeton, and Tyner soils on slopes of less than 12 percent are examples. The Alvin, Bloomfield, and Tyner soils, however, would need to be irrigated for optimum production. Crops can generally be planted and harvested earlier on all of these soils than on the other soils in the survey area.

Most of the well drained soils in the survey area are suitable for orchards. Where frost is frequent and air drainage is poor, however, these soils generally are poorly suited to early vegetables, small fruits, and orchards. The latest information and suggestions for growing specialty crops can be obtained from local offices of the Cooperative Extension Service and the Soil Conservation Service.

Yields Per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 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 yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that insures the smallest possible loss.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

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. These levels are defined in the following paragraphs.

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

Class I soils have 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, or s* 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); and *s* shows that the soil is limited mainly because it is shallow, droughty, or stony.

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."

Woodland Mangement and Productivity

Mitchell G. Hassler, forester, Soil Conservation Service, assisted in the preparation of this section.

Hardwood forest originally covered most of Lawrence County. In 1967 about 117,416 acres was woodland (*4*). Much of the present forest cover is on strongly sloping to very steep soils on uplands and on nearly level, somewhat poorly drained to very poorly drained soils on terraces and bottom lands. Soils vary widely in their suitability for trees. Productivity is affected by available water capacity, depth of the rooting zone, thickness of the surface layer, texture, consistence, aeration, natural fertility, and depth to the water table.

Upland oak, yellow-poplar, black walnut, and pin oak are the principal trees used for woodland crops in Lawrence County. Upland oaks are dominant on the well drained soils on the uplands. Yellow-poplar generally grow on the lower parts of steep slopes, on cool aspects (north and northeast slopes), and in coves. Black walnut trees are sensitive to soil conditions. They grow best on deep, well drained, nearly neutral soils that are moist and fertile. They favor sites along narrow streams, on north and northeast slopes, and in coves. Pin oaks grow on poorly drained and very poorly drained soils on uplands, terraces, and bottom lands.

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 (woodland suitability) symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *t*, toxic substances in the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: x, w, t, d, c, s, f, and r.

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

Ratings of the *erosion hazard* indicate the risk of loss of soil in well managed woodland. The risk is *slight* if the expected soil loss is small, *moderate* if measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Ratings of *windthrow hazard* are based on soil characteristics that affect the development of tree roots and the ability of the soil to hold trees firmly. A rating of *slight* indicates that few trees may be blown down by strong winds; *moderate*, that some trees will be blown down during periods of excessive soil wetness and strong winds; and *severe*, that many trees are blown down during periods of excessive soil wetness and moderate or strong winds.

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

Trees to plant are those that are suited to the soils and to commercial wood production.

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 insure 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 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

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, orchardgrass, 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, ragweed, pokeweed, crabgrass, and dandelion.

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

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

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, pondweed, wild millet, algae, duckweed, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, pheasant, meadowlark, field sparrow, kill deer, cottontail, red fox, and woodchuck.

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

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, rails, kingfishers, muskrat, mink, and beaver.

Engineering

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

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

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

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

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

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

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

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

Building Site Development

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

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

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

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

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

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

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

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

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

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

Soil Properties

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

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

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

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

Engineering Index Properties

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

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

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter (fig. 10). "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 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, SP-SM.

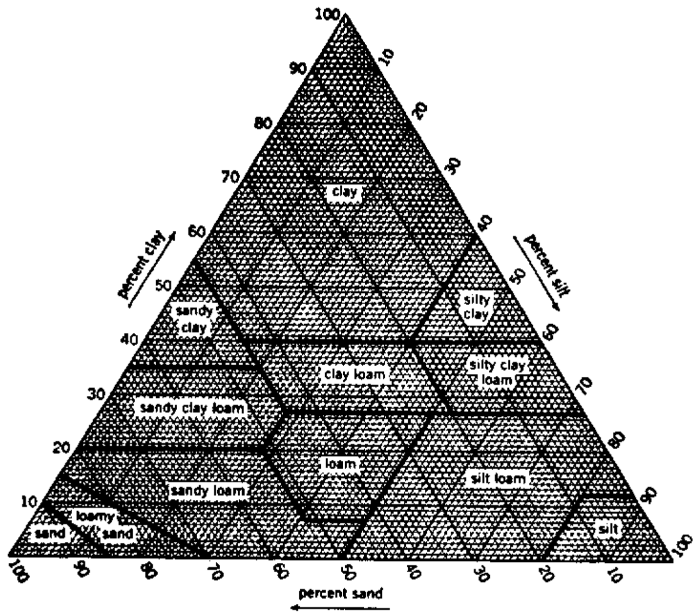


Figure 10.—Percentage of clay, silt, and sand in the basic USDA textural classes.

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.

Physical and Chemical Properties

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

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

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

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

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

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

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

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

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

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

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

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

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion and the amount of soil lost. Soils are grouped according to the following distinctions:

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

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

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

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.

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

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

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.

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, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs, on 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.

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

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are 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 Udalfs (*Ud*, meaning humid, plus *alf*, from Alfisol).

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

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

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-silty, 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* (*8*). 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."

Abscota Series

The Abscota series consists of deep, well drained, rapidly permeable soils on flood plains along large streams. These soils formed in sandy alluvium. Slopes range from 0 to 2 percent.

Abscota soils are commonly adjacent to Chagrin, Newark, Nolin, and Petrolia soils. Chagrin, Newark, Nolin, and Petrolia soils have more clay and less sand in the control section than Abscota soils. Newark and Petrolia soils have low chroma mottles within a depth of 20 inches and are usually in small depressions.

Typical pedon of Abscota sand, frequently flooded, in a cultivated field, 800 feet west and 2,480 feet north of the southeast corner of sec. 29, T. 5 N., R. 1 W.

Ap—0 to 6 inches; yellowish brown (10YR 5/4) sand, pale brown (10YR 6/3) dry; single grain; loose; many fine roots; slight effervescence; mildly alkaline; abrupt smooth boundary.
Bw—6 to 12 inches; brown (10YR 4/3) loamy sand, weak medium subangular blocky structure; very friable; many fine roots; slight effervescence; mildly alkaline; abrupt smooth boundary.
C1—12 to 36 inches; yellowish brown (10YR 5/6) sand; single grain; loose; friable; few fine roots; neutral; clear wavy boundary.
C2—36 to 48 inches; yellowish brown (10YR 5/6) sand; single grain; loose; friable; neutral; clear wavy boundary.
C3—48 to 60 inches; dark yellowish brown (10YR 4/4) loamy sand; weak medium subangular blocky structure; very friable; neutral.

This soil is neutral or mildly alkaline throughout.

The Ap horizon and Bw horizon have hue of 10YR, value of 3 to 5, and chroma of 3 or 4. The Ap horizon is sand, loamy sand, or sandy loam. The Bw horizon is loamy sand or sand. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 4 to 6. It is sand or loamy sand.

Alvin Series

The Alvin series consists of deep, well drained soils on terraces along large streams. Permeability is moderately rapid. These soils formed in loamy and sandy material. Slopes range from 2 to 22 percent.

Alvin soils are similar to Princeton soils and are commonly adjacent to Bloomfield and Tyner soils. Princeton soils have more clay in the subsoil than Alvin soils. Bloomfield soils have loamy sand or sand in the upper 20 inches of the solum and have thin bands of soil material that have more clay. They are less than 8 inches in combined thickness. Tyner soils are sandy throughout.

Typical pedon of Alvin sandy loam, 12 to 22 percent slopes, in pasture; 1,300 feet north and 1,540 feet east of the southwest corner of sec. 20, T. 4 N., R. 2 E.

Ap1—0 to 3 inches; very dark grayish brown (10YR 3/2) sandy loam, brown (10YR 5/3) dry; weak fine granular structure; very friable; many fine roots; neutral; abrupt smooth boundary.
Ap2—3 to 13 inches; dark brown (10YR 3/3) sandy loam; weak coarse subangular blocky structure; very friable; common fine roots; slightly acid; clear smooth boundary.
BE—13 to 25 inches; dark yellowish brown (10YR 4/4) sandy loam; weak fine subangular blocky structure; firm; few fine roots; slightly acid; clear wavy boundary.
Bt1—25 to 36 inches; dark brown (7.5YR 4/4) sandy loam; weak coarse subangular blocky structure; firm; thin patchy dark yellowish brown (10YR 4/4) clay films on faces of peds and sand grains; slightly acid; clear wavy boundary.
Bt2—36 to 51 inches; dark yellowish brown (10YR 4/4) sandy loam; few medium faint yellowish brown (10YR 5/4) mottles; weak coarse prismatic structure parting to weak medium subangular blocky; friable; thin patchy dark yellowish brown (10YR 4/4) clay films on faces of peds and sand grains; few small pockets of sand; slightly acid; gradual irregular boundary.
BC—51 to 59 inches; yellowish brown (10YR 5/4) loamy sand; massive; friable; with few thin discontinuous bands of sand; slightly acid; clear wavy boundary.
C—59 to 80 inches; yellowish brown (10YR 5/6) sand; massive; loose; few strata of dark yellowish brown (10YR 4/4) loamy sand 1/4 inch to 1 1/2 inches thick; slightly acid.

The thickness of the solum ranges from 40 to 60 inches. The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2 to 4. It is loamy sand or sandy loam. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is sandy loam, loamy sand, or sandy clay loam. The C horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is sand, loamy sand, sandy loam, or stratified loamy sand, sandy loam, and sand.

The Alvin soil in map unit TyB, Tyner-Alvin loamy sands, 2 to 7 percent slopes, has more sand in the surface and subsurface layers than is defined for the series. This difference does not alter the usefulness or behavior of the soil.

Bartle Series

The Bartle series consists of somewhat poorly drained soils on broad terraces that are moderately deep over a fragipan. These soils are moderately permeable above the fragipan and very slowly permeable within the fragipan. They formed in silty material of mixed origin. Slopes range from 0 to 2 percent.

Bartle soils are commonly adjacent to Elkinsville Variant and Pekin soils. Elkinsville Variant and Pekin soils do not have low chroma mottles in the upper part of the subsoil, and they are on steeper slopes than Bartle soils. In addition, Elkinsville Variant soils do not have a fragipan.

Typical pedon of Bartle silt loam, rarely flooded, in a cultivated field; 2,500 feet north and 2,200 feet west of the southeast corner of sec. 18, T. 6 N., R. 2 E.

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; neutral; abrupt smooth boundary.

E—9 to 16 inches; light brownish gray (10YR 6/2) silt loam; many medium distinct yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; friable; many fine roots; few fine black (10YR 2/1) iron and manganese oxide concretions; neutral; clear wavy boundary.

Btg—16 to 24 inches; light brownish gray (10YR 6/2) silt loam; many medium and coarse distinct yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; friable; common fine roots; thin discontinuous light yellowish brown (10YR 6/4) clay films on faces of peds; strongly acid; clear wavy boundary.

Btx1—24 to 42 inches; yellowish brown (10YR 5/4) silt loam; many medium and coarse distinct light brownish gray (10YR 6/2) mottles; strong very coarse prismatic structure; very firm and brittle; many continuous distinct thin brown (10YR 5/3) clay films on faces of peds; many continuous distinct thick light brownish gray (10YR 6/2) silt coatings; strongly acid; clear wavy boundary.

Btx2—42 to 67 inches; yellowish brown (10YR 5/4) silt loam; many medium and coarse distinct light brownish gray (10YR 6/2) mottles; strong very coarse prismatic structure; very firm and brittle; many continuous distinct thin brown (10YR 5/3) clay films on faces of peds; many continuous distinct thick light brownish gray (10YR 6/2) silt coatings; very strongly acid; clear wavy boundary.

BC—67 to 80 inches; yellowish brown (10YR 5/4) silty clay loam; many medium distinct light brownish gray (10YR 6/2) and strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; firm; many continuous distinct thick light brownish gray (10YR 6/2) silt coatings; strongly acid.

The thickness of the solum ranges from 40 to more than 80 inches. The fragipan is at a depth of 24 to 36 inches and is 18 to 45 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3. The Btg horizon has hue of 10YR, value of 5 or 6, and chroma of 1 to 4 and is mottled. It is silt loam or silty clay loam. Reaction is strongly acid to extremely acid. The Btx horizon has hue of 10YR, value of 5 or 6, and chroma of 1 to 4 and is mottled.

Bedford Series

The Bedford series consists of moderately well drained soils that are moderately deep over a fragipan. These soils are on loess-covered uplands. They are moderately permeable above the fragipan and very slowly permeable within the fragipan. These soils formed in loess and underlying residuum from limestone. Slopes range from 2 to 6 percent.

These Bedford soils have a higher base saturation than is definitive for the Bedford series. This difference does not alter the usefulness or behavior of the soil.

Bedford soils are similar to Hosmer soils and are commonly adjacent to Crider, Frederick, Hoosierville, and Muren soils. Hosmer and Muren soils generally formed in more than 5 feet of loess. Crider, Frederick, Hoosierville, and Muren soils do not have a fragipan. Crider and Frederick soils are on steeper slopes than Bedford soils. In addition, Hoosierville soils have low chroma mottles in the upper part of the subsoil and have a thicker capping of loess.

Typical pedon of Bedford silt loam, 2 to 6 percent slopes, eroded, in pasture; 1,700 feet west and 200 feet south of the northeast corner of sec. 30, T. 6 N., R. 1 W.

Ap—0 to 7 inches; yellowish brown (10YR 5/4) silt loam, light yellowish brown (10YR 6/4) dry; moderate medium granular structure; friable; many fine roots; medium acid; abrupt smooth boundary.

Bt1—7 to 13 inches; yellowish brown (10YR 5/6) silt loam; moderate medium subangular blocky structure; friable; many fine roots; thin discontinuous strong brown (7.5YR 5/6) clay films on faces of peds; strongly acid; clear wavy boundary.

Bt2—13 to 21 inches; yellowish brown (10YR 5/6) silty clay loam; strong medium subangular blocky structure; friable; thin discontinuous yellowish brown (10YR 5/4) and strong brown (7.5YR 5/6) clay films on faces of peds; very strongly acid; clear wavy boundary.

Btx1—21 to 27 inches; yellowish brown (10YR 5/6) silty clay loam; common medium distinct light brownish gray (10YR 6/2) and pale brown (10YR 6/3) mottles; strong coarse prismatic structure; firm; thin discontinuous strong brown (7.5YR 5/6) and yellowish red (5YR 5/6) clay films on faces of prisms; very strongly acid; clear wavy boundary.

Btx2—27 to 39 inches; strong brown (7.5YR 5/6) silty clay loam; common medium distinct light brownish gray (10YR 6/2) mottles; strong very coarse prismatic structure; very firm and brittle; thick continuous brown (7.5YR 5/4) clay films on faces of prisms; very strongly acid; clear wavy boundary.

2Bt—39 to 80 inches; strong brown (7.5YR 5/6) clay; common medium distinct red (2.5YR 4/8) mottles; strong medium angular blocky structure; firm; 8 percent chert fragments; very strongly acid.

The solum ranges from 60 to more than 80 inches in thickness. The fragipan, which is at a depth of 20 to 36 inches, ranges from 12 to more than 50 inches in thickness. The loess mantle ranges from 20 to 40 inches in thickness.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The Bt horizon has hue of 10YR, value of 5, and chroma of 4 to 6. It is silt loam or silty clay loam. Reaction is strongly acid to extremely acid. The Btx horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6 and is mottled. It is silt loam or silty clay loam. Reaction is very strongly acid or extremely acid. The 2Bt horizon has hue of 7.5YR or 5YR, value of 4 to 6, and chroma of 4 or 5. It is silty clay or clay.

Berks Series

The Berks series consists of moderately deep, well drained soils on uplands. Permeability is moderately rapid. These soils formed in material weathered from sandstone, siltstone, and shale. Slopes range from 25 to 45 percent.

Berks soils are similar to Gilpin soils and are commonly adjacent to Wellston and Weikert soils. Gilpin and Wellston soils have more clay in the subsoil than Berks soils, and they are generally on less sloping areas. Sandstone, siltstone, or shale bedrock is within a depth of 20 inches in Weikert soils, and they are on steeper slopes than Berks soils.

Typical pedon of Berks silt loam, from an area of Weikert-Berks-Gilpin complex, 25 to 75 percent slopes, in woodland; 500 feet east and 500 feet north of the southwest corner of sec. 2, T. 6 N., R. 1 E.

A—0 to 2 inches; very dark grayish brown (10YR 3/2) silt loam, very dark grayish brown (10YR 3/2) dry; moderate medium granular structure; friable; many medium and coarse roots; 10 percent siltstone fragments; very strongly acid; abrupt wavy boundary.

E—2 to 4 inches; brown (10YR 5/3) silt loam; weak thin platy structure; friable; many fine roots; 5 percent siltstone fragments; very strongly acid; clear wavy boundary.

Bw1—4 to 16 inches; yellowish brown (10YR 5/4) silt loam; moderate medium subangular blocky structure; friable; common fine roots; 10 percent siltstone fragments; very strongly acid; clear wavy boundary.

Bw2—16 to 26 inches; yellowish brown (10YR 5/6) very channery silt loam; moderate medium subangular blocky structure; friable; few fine roots; 40 percent siltstone fragments; very strongly acid; clear wavy boundary.

C—26 to 34 inches; yellowish brown (10YR 5/6) extremely channery silt loam; friable; few fine roots; soil material is mainly between bedding planes; 80 percent coarse fragments; very strongly acid; clear wavy boundary.

R—34 inches; hard siltstone.

The thickness of the solum ranges from 18 to 36 inches, and depth to bedrock ranges from 20 to 40 inches. Coarse fragments of sandstone, siltstone, or shale are throughout the profile.

The A horizon has hue of 10YR, value of 3 to 5, and chroma of 2 to 4. It is silt loam or channery silt loam and has 0 to 30 percent coarse fragments. The Bw horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 4 to 8. It is silt loam, channery silt loam, or very channery silt loam and has 10 to 40 percent coarse fragments. The C horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 6. It has 60 to 80 percent coarse fragments.

Bloomfield Series

The Bloomfield series consists of deep, somewhat excessively drained soils on ridge summits, side slopes, and terrace breaks along large streams. Permeability is rapid or moderately rapid. These soils formed in wind deposited sand. Slopes range from 3 to 10 percent.

These Bloomfield soils have less clay than is definitive for the Bloomfield series. This difference does not alter the usefulness of behavior of the soil.

Bloomfield soils are similar to Tyner soils and are commonly adjacent to Alvin and Princeton soils. Tyner soils do not have an argillic horizon. Alvin and Princeton soils have a thicker subsoil than Bloomfield soils. Princeton soils are on lower outwash terraces.

Typical pedon of Bloomfield loamy sand, 3 to 10 percent slopes, in pasture; 1,160 feet east and 2,440 feet north of the southwest corner of sec. 20, T. 4 N., R. 2 E.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) loamy sand, brown (10YR 4/3) dry; weak fine granular structure; loose; many fine roots; slightly acid; smooth boundary.

E1—7 to 14 inches; brown (10YR 4/3) sand; very weak medium subangular blocky structure; loose; common fine roots; few dark grayish brown (10YR 4/2) streaks in root channels; neutral; abrupt smooth boundary.

E2—14 to 26 inches; dark yellowish brown (10YR 4/4) sand; single grain; loose; few fine roots; neutral; clear wavy boundary.

E&Bt1—26 to 31 inches; yellowish brown (10YR 5/4) sand (E part); single grain; loose; few fine roots; few dark yellowish brown (10YR 4/4) wavy and discontinuous 1/8-inch thick loamy sand (Bt part); lamellae 1/4 inch thick; neutral; clear wavy boundary.

E&Bt2—31 to 42 inches; yellowish brown (10YR 5/4) loamy sand (E part); weak fine subangular blocky structure; friable; lamellae bands of dark yellowish brown (10YR 4/4) loamy sand (Bt part); weak fine subangular blocky structure; friable; wavy and discontinuous 1/8-inch to 1/2-inch lamellae increasing in thickness as depth increases to 50 percent of volume in lower part of horizon; few fine roots; neutral; clear wavy boundary.

Bt&E—42 to 74 inches; dark yellowish brown (10YR 4/4) loamy sand (Bt part) in nearly continuous bands 1/8 to 3 inches thick; weak medium subangular blocky structure; friable; yellowish brown (10YR 5/4) sand (E part) as interbands; weak fine subangular blocky structure; friable; wavy and discontinuous; lamellae (Bt part) decrease in thickness as depth increases; neutral; gradual wavy boundary.

C—74 to 80 inches; yellowish brown (10YR 5/4) sand; single grain; loose; strong effervescence; mildly alkaline.

The thickness of the solum ranges from 54 to 80 inches. Lamellae are typically at depths of 30 inches or more. Combined thickness of lamellae above 40 inches is less than 3 inches.

The Ap horizon has hue of 10YR, value of 3 to 5, and chroma of 2 to 4. The E part of the E&Bt horizon has hue of 10YR, value of 5 or 6, and chroma of 3 to 6. Many lamellae are discontinuous and wavy, joining and separating across a single pedon. The Bt part of the E&Bt horizon and Bt&E horizon is made up of lamellae and bands that become thicker with depth. Most lamellae are 1/4 inch to 2 inches thick but some range to as much as 10 inches in thickness in the lower part of the Bt&E horizon. The lamellae and bands have hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 4 to 6. Reaction ranges from neutral to strongly acid.

Bonnie Series

The Bonnie series consists of deep, poorly drained soils on flood plains. Permeability is moderately slow. These soils formed in acid alluvium. Slopes range from 0 to 2 percent.

These Bonnie soils have less clay than is definitive for the Bonnie series. This difference does not alter the usefulness or behavior of this soil.

Bonnie soils are similar to Stendal soils and are commonly adjacent to McGary and Wilbur soils. Stendal soils are not so gray in the upper part of the subsoil as Bonnie soils. McGary soils have a layer in the upper 30 inches of the subsoil that is not dominantly gray. They have more clay and are on higher lying positions than Bonnie soils. Steff and Wilbur soils have higher chroma in the subsoil, have a higher base saturation, and are on higher lying positions.

Typical pedon of Bonnie silt loam, frequently flooded, in a cultivated field; 1,000 feet east and 1,200 feet south of the northwest corner of sec. 3, T. 6 N., R. 1 W.

Ap—0 to 9 inches; light gray (10YR 6/1) silt loam, light gray (10YR 7/2) dry; many medium distinct brown (10YR 5/3) mottles; weak medium granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

Cg1—9 to 20 inches; light brownish gray (10YR 6/2) silt loam; common medium distinct yellowish brown (10YR 5/4) mottles; weak medium granular structure; friable; common fine roots; strongly acid; clear wavy boundary.

Cg2—20 to 36 inches; light gray (10YR 7/1) silt loam; common coarse distinct yellowish brown (10YR 5/6) mottles; weak medium granular structure; friable; few fine roots; strongly acid; clear wavy boundary.

Cg3—36 to 48 inches; light gray (5Y 7/1) silt loam; many medium distinct yellowish brown (10YR 5/6) and common medium faint gray (5Y 6/1) mottles; massive; friable; strongly acid; clear wavy boundary.

Cg4—48 to 60 inches; gray (5Y 6/1) silt loam; common coarse distinct yellowish brown (10YR 5/6) and gray (10YR 6/1) mottles; massive; friable; strongly acid.

The Ap horizon has hue of 10YR, value of 4 to 6, and chroma of 1 to 3 and is mottled. The Cg horizon has hue of 10YR, 2.5Y, or 5Y, value of 5 to 7, and chroma of 1 or 2 and is mottled. Reaction is strongly acid or very strongly acid.

Burnside Series

The Burnside series consists of deep, well drained, moderately permeable soils. These soils formed in alluvium on flood plains. They have sandstone fragments throughout. Slopes range from 0 to 2 percent.

Burnside soils are commonly adjacent to Haymond soils. Haymond soils have very few coarse fragments in the upper part of the solum. They have less sand throughout than Burnside soils, and are on broader areas.

Typical pedon of Burnside silt loam, frequently flooded, in a cultivated field; 2,600 feet south and 130 feet east of the northwest corner of sec. 16, T. 6 N., R. 2 E.

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

Bw1—9 to 16 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium subangular blocky structure; firm; many fine roots; 10 percent sandstone fragments; strongly acid; clear wavy boundary.

Bw2—16 to 24 inches; dark yellowish brown (10YR 4/4) channery silt loam; moderate medium subangular blocky structure; firm; thin discontinuous yellowish brown (10YR 5/6) and strong brown (7.5YR 4/6) pressure faces on peds; common fine roots; 30 percent sandstone fragments; strongly acid; clear wavy boundary.

2Bw3—24 to 42 inches; dark yellowish brown (10YR 4/4) extremely channery loam; moderate medium

granular structure; friable; 75 percent sandstone fragments; strongly acid.
2R—42 inches; sandstone.

The thickness of the solum ranges from 20 to 43 inches, and the depth to bedrock ranges from 40 to 65 inches. Sandstone fragments range from 2 to 35 percent in the upper part of the solum and from 35 to 80 percent in the lower part.

The Ap horizon and Bw horizons have hue of 10YR, value of 4 or 5, and chroma of 3 or 4. The A horizon and Bw horizons are silt loam, loam, gravelly silt loam, channery silt loam, or channery loam. The 2B horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is gravelly, very gravelly, extremely gravelly, channery, very channery, extremely channery, flaggy, very flaggy, or extremely flaggy analogues of silt loam or loam. Reaction is strongly acid or very strongly acid. The C horizon, where present, is sand, gravel, or gravelly, very gravelly, extremely gravelly, channery, very channery, extremely channery, flaggy, very flaggy, or extremely flaggy analogues of silt loam, loam, or sandy loam. Reaction is strongly acid or very strongly acid.

Caneyville Series

The Caneyville series consists of moderately deep, well drained soils on uplands. Permeability is moderately slow. These soils formed in residuum from limestone. Slopes range from 6 to 75 percent.

Caneyville soils are similar to Gilpin soils and are commonly adjacent to Crider and Frederick soils. Gilpin soils formed in material weathered from siltstone, sandstone, and shale. Crider and Frederick soils are more than 40 inches deep to limestone bedrock. In addition, Crider soils have more silt and less clay than Caneyville soils.

Typical pedon of Caneyville silt loam, 12 to 20 percent slopes, eroded, in pasture; 300 feet south and 100 feet west of the northeast corner of sec. 20, T. 6 N., R. 1 W.

Ap—0 to 8 inches; brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; moderate medium granular structure; friable; about 10 percent yellowish brown (10YR 5/4) material; many fine roots; neutral; abrupt smooth boundary.
Bt1—8 to 14 inches; dark yellowish brown (10YR 4/4) silt loam; common medium distinct yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; friable; few fine roots; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; neutral; clear wavy boundary.
Bt2—14 to 33 inches; yellowish red (5YR 4/6) silty clay; strong coarse angular blocky structure; firm; thin discontinuous yellowish red (5YR 4/8) clay films on faces of peds; thin layer of dark yellowish brown (10YR 4/4) clay at a depth of 32 inches; strongly acid; abrupt smooth boundary.
R—33 inches; hard limestone.

The thickness of the solum and depth to bedrock ranges from 20 to 40 inches. Coarse fragments of limestone, chert, or sandstone range from 0 to 10 percent.

The Ap horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 2 to 4. In uncultivated areas the A horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 2 or 3. The upper part of the Bt horizon has hue of 10YR, 7.5YR, or 5YR; value of 4 to 6; and chroma of 4 to 6 and is silt loam or silty clay loam. The lower part of the Bt horizon has hue of 10YR, 7.5YR, 5YR, or 2.5YR; value of 4 or 5; and chroma of 4 to 8. It is silty clay loam, silty clay, or clay. Reaction of the Bt horizon is neutral to very strongly acid. Some pedons have a BC or C horizon that is slightly acid to neutral.

Chagrin Series

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

These Chagrin soils have less clay than is definitive for the Chagrin series. This difference does not alter the usefulness or behavior of the soil.

Chagrin soils are commonly adjacent to Abscota, Newark, and Petrolia soils. Abscota soils have sand or loamy sand to a depth of 40 inches or more. Newark and Petrolia soils have less sand and more clay in the upper part of the solum than Chagrin soils. In addition, Newark and Petrolia soils have low chroma mottles within a depth of 24 inches. They are usually in small depressions.

Typical pedon of Chagrin loam, frequently flooded, in a cultivated field; 1,800 feet west and 1,300 feet north of the southeast corner of sec. 29, T. 5 N., R. 1 W.

Ap—0 to 10 inches; dark brown (10YR 3/3) loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.
Bw1—10 to 24 inches; dark brown (10YR 3/3) sandy loam, pale brown (10YR 6/3) dry; moderate medium subangular blocky structure; friable; common fine roots; neutral; clear wavy boundary.
Bw2—24 to 32 inches; dark yellowish brown (10YR 4/4) sandy loam; moderate medium subangular blocky structure; friable; few fine roots; neutral; clear wavy boundary.
Bw3—32 to 42 inches; dark brown (10YR 4/3) sandy loam; moderate medium subangular blocky structure; friable; neutral; clear wavy boundary.
C—42 to 60 inches; dark yellowish brown (10YR 4/4) sandy loam; weak medium subangular blocky structure; friable; neutral.

The thickness of the solum ranges from 30 to 48 inches. Reaction throughout the soil ranges from medium acid to neutral. The content of coarse fragments ranges from 0 to 15 percent in the C horizon.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 3. It is loam or silt loam. The Bw horizon has hue of 10YR, value of 3 or 4, and chroma of 3 or 4. It is sandy loam or loam. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is silt loam, sandy loam, fine sandy loam, or stratified layers of these textures.

Crider Series

The Crider series consists of deep, well drained, moderately permeable soils on loess-covered uplands. These soils formed in loess and the underlying residuum from limestone. Slopes range from 2 to 20 percent.

Crider soils are similar to Frederick and Wellston soils and are commonly adjacent to Bedford, Caneyville, Hoosierville, and Muren soils. Caneyville and Frederick soils formed in less than 20 inches of loess and underlying residuum from limestone. Bedrock is above a depth of 40 inches in Caneyville soils, and it is on steeper slopes than Crider soils. Wellston soils formed in less than 40 inches of loess and underlying residuum from sandstone, siltstone, and shale. Bedford soils have a fragipan and are on broader areas. Hoosierville and Muren soils have low chroma mottles in the upper part of the subsoil and are on broader areas or in slight depressions.

Typical pedon of Crider silt loam, 6 to 12 percent slopes, eroded, in a cultivated field; 2,100 feet east and 550 feet south of the northwest corner of sec. 16, T. 5 N., R. 1 E.

Ap—0 to 7 inches; dark brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; moderate medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

Bt1—7 to 14 inches; dark yellowish brown (10YR 4/4) silt loam; moderate medium subangular blocky structure; friable; common fine roots; thin discontinuous brown (10YR 4/3) clay films on faces of peds; neutral; clear wavy boundary.

Bt2—14 to 21 inches; strong brown (7.5YR 5/6) silty clay loam; strong medium subangular blocky structure; friable; few fine roots; thin discontinuous brown (7.5YR 4/4) clay films on faces of peds; neutral; clear wavy boundary.

Bt3—21 to 32 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium angular blocky structure; firm; thin continuous brown (7.5YR 5/4) clay films on faces of peds; medium acid; clear wavy boundary.

2Bt4—32 to 42 inches; red (2.5YR 5/6) silty clay; strong medium angular blocky structure; firm; thick continuous reddish brown (2.5YR 4/4) clay films on faces of peds; few medium black (10YR 2/1) iron and manganese oxide accumulations; 2 percent chert fragments; strongly acid; clear wavy boundary.

2Bt5—42 to 75 inches; red (2.5YR 5/6) silty clay; strong medium angular blocky structure; firm; thick continuous reddish brown (2.5YR 4/4) clay films on faces of peds; few medium black (10YR 2/1) iron and manganese oxide accumulations; medium acid; gradual wavy boundary.

2Bt6—75 to 80 inches; strong brown (7.5YR 5/6) clay; many medium distinct yellowish red (5YR 5/6) mottles; strong coarse angular blocky structure; firm; thick continuous yellowish red (5YR 5/6) clay films on faces of peds; medium acid.

The thickness of the solum ranges from 60 to 100 inches, and the depth to limestone bedrock ranges from 60 to 140 inches. The thickness of the loess mantle ranges from 20 to 45 inches. Reaction ranges from neutral to strongly acid in the upper 40 inches and from medium acid to very strongly acid below a depth of 40 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The upper part of the Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6, and the lower part has hue of 7.5YR or 5YR, value of 4 or 5, and chroma of 4 to 6. It is silt loam or silty clay loam. The 2Bt horizon has hue of 10YR, 7.5YR, 5YR, or 2.5YR; value of 3 to 5; and chroma of 4 to 6. It is silty clay loam, silty clay, or clay or their channery analogues.

Ebal Series

The Ebal series consists of deep, moderately well drained soils on uplands. These soils are moderately permeable in the upper part and very slowly permeable in the lower part. They formed in loess or colluvium and the underlying residuum from interbedded shale and thin layers of sandstone. Slopes range from 6 to 24 percent.

Ebal soils are commonly adjacent to Gilpin, Hosmer, and Wellston soils. Gilpin, Hosmer, and Wellston soils do not have a clayey subsoil. Sandstone, siltstone, or shale bedrock is at a depth of 20 to 40 inches in Gilpin soils. Hosmer soils formed in more than 5 feet of loess, and they have a fragipan. Wellston soils have less clay in the subsoil than Ebal soils, and sandstone, siltstone, or shale bedrock is at a depth of 40 to 72 inches.

Typical pedon of Ebal silt loam, from an area of Ebal-Wellston silt loams, 12 to 24 percent slopes, in woodland; 80 feet east and 2,563 feet north of the southwest corner of sec. 2, T. 6 N., R. 2 W.

A—0 to 3 inches; very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) dry; moderate medium granular structure; friable; many fine, medium, and coarse roots; 5 percent sandstone fragments; neutral; clear smooth boundary.

BE—3 to 6 inches; brown (10YR 5/3) channery silt loam; weak medium subangular blocky structure; friable; many fine, medium, and coarse roots; 15 percent sandstone fragments; very strongly acid; clear wavy boundary.

Bt1—6 to 14 inches; pale brown (10YR 6/3) channery loam; moderate medium subangular blocky structure; friable; common fine and medium roots; thin discontinuous yellowish brown (10YR 5/4) clay films on faces of peds; 35 percent sandstone fragments; very strongly acid; clear wavy boundary.

2Bt2—14 to 27 inches; strong brown (7.5YR 5/6) channery silty clay; many medium distinct yellowish brown (10YR 5/4) and pale brown (10YR 6/3) mottles; moderate medium subangular blocky structure; friable; common fine and medium roots; thick continuous yellowish brown (10YR 5/6) clay films on faces of peds; 15 percent sandstone fragments; very strongly acid; clear wavy boundary.

2Bt3—27 to 36 inches; reddish brown (5YR 5/4) clay; many coarse prominent light grayish brown (10YR 6/2) and yellowish brown (10YR 5/6) mottles; strong medium angular blocky structure; firm; few fine and medium roots; thick continuous yellowish brown (10YR 5/6) clay films on faces of peds; 3 percent sandstone fragments; very strongly acid; clear wavy boundary.

2Bt4—36 to 47 inches; light reddish brown (5YR 6/4) clay; many coarse prominent yellowish brown (10YR 5/4) mottles; strong medium angular blocky structure; firm; few fine and medium roots; thick continuous light reddish brown (5YR 6/4) clay films on faces of peds; 8 percent sandstone fragments; very strongly acid; clear wavy boudnary.

2BC—47 to 56 inches; gray (10YR 5/1) clay; many medium distinct yellowish brown (10YR 5/4) and brownish yellow (10YR 6/8) mottles; strong medium angular blocky structure; firm; strongly acid; clear wavy boundary.

2Cr—56 to 80 inches; gray (10YR 5/1) weathered shale; clay soil material between bedding planes containing many medium distinct yellowish brown (10YR 5/4) and brownish yellow (10YR 6/8) mottles; about 75 percent weathered shale; strongly acid.

The thickness of the solum and depth to a paralithic contact ranges from 50 to more than 80 inches. Depth to hard bedrock ranges from 80 to more than 100 inches. Reaction of the solum is medium acid to very strongly acid unless limed. Coarse fragments range from 15 to 35 percent in the Bt horizon and from 0 to 8 percent in the 2Bt horizon. The thickness of the loess capping ranges from 10 to 30 inches.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 to 4. The Bt horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 3 to 6. It is channery loam, channery silt loam, or channery silty clay loam. The 2Bt horizon has hue of 10YR, 7.5YR, 5YR, or 2.5YR; value of 4 to 6; and chroma of 3 to 8 and is mottled.

Elkinsville Variant

The Elkinsville Variant consists of deep, well drained, moderately permeable soils on terraces. These soils formed in acid, loamy alluvium. Slopes range from 2 to 6 percent.

Elkinsville Variant soils are commonly adjacent to Bartle, Haymond, and Pekin soils. Bartle and Pekin soils have low chroma mottles in the upper part of the profile. In addition, these soils have a fragipan and are lower on the landscape than Elkinsville Variant soils. Haymond soils have less clay in the subsoil and are on surrounding bottom lands.

Typical pedon of Elkinsville Variant loam, 2 to 6 percent slopes, eroded, in pasture; 2,820 feet south and 1,880 feet west of the northeast corner of sec. 4, T. 6 N., R. 2 W.

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

Bt1—8 to 15 inches; yellowish brown (10YR 5/8) clay loam; moderate medium subangular blocky structure; friable; common fine roots; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; slightly acid; clear wavy boundary.

Bt2—15 to 22 inches; strong brown (7.5YR 5/6) loam; moderate medium subangular blocky structure; friable; few fine roots; thin continuous yellowish red (5YR 5/6) clay films on faces of peds; medium acid; clear wavy boundary.

Bt3—22 to 29 inches; strong brown (7.5YR 5/6) loam; moderate medium subangular blocky structure; friable; thin discontinuous strong brown (7.5YR 5/6) clay films on faces of peds; strongly acid; clear wavy boundary.

Bt4—29 to 60 inches; strong brown (7.5YR 5/6) loam; common medium distinct yellowish red (5YR 5/8) and light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; friable; thin discontinuous strong brown (7.5YR 5/6) clay films on faces of peds; strongly acid; clear wavy boundary.

Bt5—60 to 71 inches; yellowish brown (10YR 5/4) loam; many medium and coarse distinct light brownish gray (10YR 6/2) and yellowish red (5YR 5/8) mottles; moderate medium subangular blocky structure; friable; thin continuous light brownish gray

(10YR 6/2) clay films on faces of peds; very strongly acid; clear wavy boundary.

2C—71 to 80 inches; red (10R 4/6) gravelly silt loam; many coarse distinct light brownish gray (10YR 6/2) and strong brown (7.5YR 5/8) mottles; massive; friable; 15 percent sandstone fragments; very strongly acid.

The thickness of the solum ranges from 40 to 72 inches. Depth to bedrock is more than 60 inches.

The Ap horizon has hue of 10YR, value of 4, and chroma of 3 or 4. Some pedons have an E or AB horizon. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 8, and low chroma mottles occur in the lower part of the horizon. It is silt loam, loam, or clay loam. Reaction is very strongly acid to slightly acid. Some pedons have a BC horizon. The 2C horizon has hue of 10R, 7.5YR, or 10YR; value of 3 to 6; and chroma of 4 to 8. It is silt loam, gravelly silt loam, or loam or is stratified.

Frederick Series

The Frederick series consists of deep, well drained, moderately permeable soils on uplands. These soils formed in loess and residuum from limestone. Slopes range from 2 to 20 percent.

Frederick soils are similar to Crider and Wellston soils and are commonly adjacent to Bedford, Caneyville, Hoosierville, and Muren soils. Crider soils formed in thicker loess deposits than Frederick soils. Wellston soils formed in residuum from shale, sandstone, or siltstone. Hoosierville and Muren soils have low chroma mottles in the upper part of the subsoil and have a thicker loess capping than Frederick soils. Bedford soils have a fragipan and are usually on less sloping areas. Caneyville soils are shallower to bedrock and are on steeper slopes.

Typical pedon of Frederick silt loam, 12 to 18 percent slopes, in woodland; 800 feet west and 2,700 feet south of the northeast corner of sec. 30, T. 6 N., R. 1 W.

A—0 to 1 inches; very dark grayish brown (10YR 3/2) silt loam, brown (10YR 4/3) dry; moderate medium granular structure; friable; many fine and medium roots; very strongly acid; abrupt smooth boundary.

E—1 to 7 inches; yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure parting to moderate medium granular; friable; many fine roots; very strongly acid; clear wavy boundary.

BE—7 to 14 inches; yellowish brown (10YR 5/6) silt loam; moderate medium subangular blocky structure; friable; thin discontinuous yellowish brown (10YR 5/6) clay films on faces of peds; common medium roots; very strongly acid; clear wavy boundary.

2Bt1—14 to 19 inches; yellowish red (5YR 5/6) silty clay loam; moderate medium subangular blocky structure; friable; thin continuous yellowish red (5YR 5/6) clay films on faces of peds; 3 percent chert fragments; very strongly acid; clear wavy boundary.

2Bt2—19 to 54 inches; red (2.5YR 5/6) clay; common medium distinct strong brown (7.5YR 5/6) mottles; strong medium angular blocky structure; firm; thick continuous red (2.5YR 5/6) and yellowish red (5YR 5/6) clay films on faces of peds; 3 percent chert fragments; very strongly acid; clear wavy boundary.

2Bt3—54 to 80 inches; red (2.5YR 5/6) clay; common medium distinct red (10YR 4/6) mottles; strong medium angular blocky structure; firm; thick continuous yellowish red (5YR 5/6) and light reddish brown (5YR 6/4) slickensides; very strongly acid.

The thickness of the solum ranges from 60 to 80 inches. The thickness of the loess mantle ranges from 5 to 20 inches. Reaction of the solum is medium acid to very strongly acid unless limed.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 1 to 4. The E horizon has hue of 10YR, value of 5 to 7, and chroma of 3 to 8. In some pedons the Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 8. It is silt loam or silty clay loam. The BE horizon and 2Bt horizon have hue of 2.5YR to 10YR, value of 4 or 5, and chroma of 4 or 8. The 2Bt horizon is silty clay loam, silty clay, or clay, or the cherty analogues of these textures.

Gilpin Series

The Gilpin series consists of moderately deep, well drained, moderately permeable soils on uplands. These soils formed in residuum from siltstone, sandstone, and shale. Slopes range from 6 to 50 percent.

Gilpin soils are similar to Berks and Caneyville soils and are commonly adjacent to Ebal, Hosmer, Wellston, and Weikert soils. Berks and Weikert soils have less clay in the subsoil than Gilpin soils, and they are on steeper slopes. Limestone bedrock is within a depth of 20 to 40 inches in Caneyville soils. Ebal soils have clayey shale in the subsoil. Hosmer soils formed in more than 5 feet of silty loess and have a fragipan. Wellston soils are 40 to 72 inches to sandstone, siltstone, or shale bedrock.

Typical pedon of Gilpin silt loam, from an area of Gilpin-Crider silt loams, 6 to 20 percent slopes, in woodland; 300 feet west and 2,580 feet north of the southeast corner of sec. 6, T. 6 N., R. 2 E.

A—0 to 6 inches; yellowish brown (10YR 5/4) silt loam; light yellowish brown (10YR 6/4) dry; moderate medium granular structure; friable; many fine roots; medium acid; abrupt wavy boundary.

E—6 to 9 inches; light yellowish brown (10YR 6/4) silt loam; common medium distinct yellowish brown (10YR 5/8) mottles; moderate thin platy structure;

friable; many fine roots; 3 percent sandstone fragments; strongly acid; clear wavy boundary.
Bt1—9 to 18 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; friable; common fine roots; thin discontinuous yellowish brown (10YR 5/4) clay films on faces of peds; 8 percent sandstone fragments; very strongly acid; clear wavy boundary.
Bt2—18 to 26 inches; yellowish brown (10YR 5/6) channery silt loam; common medium distinct brownish yellow (10YR 6/6) mottles; moderate medium subangular blocky structure; friable; thin discontinuous yellowish brown (10YR 5/6) clay films on faces of peds; 20 percent sandstone fragments; very strongly acid; abrupt wavy boundary.
Cr—26 to 34 inches; strong brown (7.5YR 5/6) and pale brown (10YR 6/3) interbedded sandstone; rock structure.
R—34 inches; sandstone.

The thickness of the solum ranges from 20 to 36 inches. Depth to bedrock ranges from 20 to 40 inches. Coarse fragments of sandstone, siltstone, or shale are 0 to 2 percent in the A horizon and range from 5 to 55 percent in the Bt horizon and C horizon.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. Some undisturbed pedons have a thin dark A horizon. The A horizon is silt loam, loam, or the channery analogues of these textures. The Bt horizons have hue of 10YR or 7.5YR, value of 5, and chroma of 4 to 8. They are loam, silt loam, or silty clay loam, or the channery analogues of these textures. Reaction is strongly acid to extremely acid. Some pedons have a C horizon.

Haymond Series

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

Haymond soils are similar to Wilbur soils and are commonly adjacent to Burnside, Elkinsville Variant, Henshaw, and Stendal soils. Wilbur soils have low chroma mottles within a depth of 20 inches. Burnside soils have more sandstone, siltstone, or shale fragments throughout and are on the upper end of drainageways. Elkinsville Variant soils and Henshaw soils have more clay in the subsoil and are on higher lying terrace areas than Haymond soils. Henshaw soils also have low chroma mottles in the upper part of the subsoil. Stendal soils have low chroma mottles above a depth of 24 inches. Stendal soils have lower base saturation than Haymond soils and are on lower lying positions.

Typical pedon of Haymond silt loam, frequently flooded, in a cultivated field; 1,500 feet east and 150 feet north of the southwest corner of sec. 11, T. 6 N., R. 1 E.

Ap—0 to 12 inches; brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; moderate medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.
Bw1—12 to 31 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium subangular blocky structure parting to moderate medium granular; friable; common fine roots; neutral; clear wavy boundary.
Bw2—31 to 42 inches; dark yellowish brown (10YR 4/4) silt loam; few fine faint yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure parting to moderate medium granular; friable; few fine roots; slightly acid; clear wavy boundary.
C1—42 to 54 inches; yellowish brown (10YR 5/4) silt loam; weak medium granular structure; friable; neutral; gradual wavy boundary.
C2—54 to 69 inches; yellowish brown (10YR 5/4) silt loam that has pockets of coarse sand; many medium distinct light brownish gray (10YR 6/2) mottles; weak medium granular structure; friable; slightly acid.

The thickness of the solum ranges from 40 to 60 inches. Reaction throughout the soil ranges from medium acid to neutral.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The Bw horizon has hue of 10YR, value of 4 to 6, and chroma of 3 or 4. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4.

Henshaw Series

The Henshaw series consists of deep, somewhat poorly drained soils on broad terraces along large streams. Permeability is moderately slow. These soils formed in calcareous, lacustrine deposits. Slopes range from 1 to 3 percent.

Henshaw soils are similar to McGary soils and are commonly adjacent to Haymond, Markland, and Wilbur soils. McGary and Markland soils have more clay in the subsoil than Henshaw soils. In addition, Markland soils do not have low chroma mottles in the upper part of the subsoil, and they are on higher lying positions. Haymond soils have less clay in the subsoil than Henshaw soils, and they have low chroma mottles above a depth of 20 inches. Wilbur soils have less clay in the subsoil and are on flood plains.

Typical pedon of Henshaw silt loam, rarely flooded, 1 to 3 percent slopes, in a cultivated field; 1,440 feet east and 1,320 feet north of the southwest corner of sec. 3, T. 4 N., R. 1 E.

Ap—0 to 8 inches; brown (10YR 5/3) silt loam, light yellowish brown (10YR 6/4) dry; common medium distinct light brownish gray (10YR 6/2), pale brown (10YR 6/3), and yellowish brown (10YR 5/8) mottles; moderate medium granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

Bt1—8 to 15 inches; yellowish brown (10YR 5/6) silty clay loam; many medium distinct light brownish gray (10YR 6/2) and many medium faint yellowish brown (10YR 5/8) mottles; moderate medium angular blocky structure; friable; common fine roots; thin discontinuous light brownish gray (10YR 6/2) clay films on faces of peds; slightly acid; clear wavy boundary.

Bt2—15 to 20 inches; yellowish brown (10YR 5/6) silty clay loam; common medium distinct light gray (10YR 6/1) mottles; strong medium angular blocky structure; friable; few fine roots; thin discontinuous yellowish brown (10YR 5/4) clay films on faces of peds; slightly acid; clear wavy boundary.

Bt3—20 to 27 inches; light olive brown (2.5Y 5/4) silty clay loam; many medium distinct yellowish brown (10YR 5/4) and light brownish gray (10YR 6/2) mottles; strong medium angular blocky structure; firm; few fine roots; thin patchy yellowish brown (10YR 5/4) clay films on faces of peds; neutral; clear wavy boundary.

Bt4—27 to 30 inches; light olive brown (2.5Y 5/4) silty clay loam; many medium distinct light gray (10YR 6/1) and yellowish brown (10YR 5/4) mottles; strong medium angular blocky structure; firm; thin patchy brown (10YR 5/3) clay films on faces of peds; common dark brown (10YR 3/3) iron and manganese oxide accumulations; slight effervescence; mildly alkaline; gradual wavy boundary.

Cg1—30 to 35 inches; grayish brown (2.5Y 5/2) silty clay loam; many medium distinct light olive brown (2.5Y 5/4) and yellowish brown (10YR 5/4) mottles; massive; firm; common nodules of secondary lime; violent effervescence; moderately alkaline; clear wavy boundary.

C1—35 to 45 inches; yellowish brown (10YR 5/4) silty clay loam; many medium distinct grayish brown (10YR 5/2) mottles; massive; firm; many nodules of secondary lime; strong effervescence; moderately alkaline; clear wavy boundary.

C2—45 to 60 inches; yellowish brown (10YR 5/4) silty clay loam; common medium gray (10YR 5/1) mottles; massive; firm; common nodules of secondary lime; violent effervescence; moderately alkaline; clear wavy boundary.

The thickness of solum ranges from 25 to 40 inches. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. The Bt horizon has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 2 to 6 and is mottled. The C horizon has hue of 2.5Y or 10YR, value of 5 or 6, and chroma of 2 to 6 and is mottled. The C horizon is silt loam, silty clay loam, or stratified silty clay loam and silt loam.

Hoosierville Series

The Hoosierville series consists of deep, poorly drained soils on loess-covered uplands. Permeability is moderately slow. These soils formed in loess. Slopes range from 0 to 2 percent.

Hoosierville soils are commonly adjacent to Bedford, Crider, and Frederick soils. Bedford, Crider, and Frederick soils have browner subsoil than Hoosierville soils, and they are on steeper slopes. In addition, Bedford soils have a fragipan.

Typical pedon of Hoosierville silt loam, in a cultivated field; 560 feet south and 1,280 feet west of the northeast corner of sec. 23, T. 6 N., R. 2 W.

Ap—0 to 10 inches; grayish brown (10YR 5/2) silt loam, pale brown (10YR 6/3) dry; common medium distinct light gray (10YR 7/2) mottles; moderate medium granular structure; friable; many fine and medium roots; neutral; abrupt wavy boundary.

BEg—10 to 17 inches; light brownish gray (10YR 6/2) silt loam; many coarse distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; friable; common fine roots; medium continuous brown (10YR 5/3) silt coats on faces of peds; very strongly acid; clear wavy boundary.

Btg—17 to 31 inches; light brownish gray (10YR 6/2) silt loam; many coarse distinct yellowish brown (10YR 5/6) and strong brown (7.5YR 5/8) mottles; strong coarse angular blocky structure; friable; few fine roots; thin continuous gray (10YR 5/1) and light brownish gray (10YR 6/2) silt coats and clay films on faces of peds; very strongly acid; clear wavy boundary.

Bt1—31 to 48 inches; strong brown (10YR 5/6) silt loam; many coarse distinct light gray (10YR 7/2) and light brownish gray (10YR 6/2) mottles; moderate coarse prismatic structure parting to moderate medium angular blocky; firm and brittle; thick continuous gray (10YR 5/1) silt coats and clay films on faces of peds; strongly acid; clear wavy boundary.

Bt2—48 to 60 inches; yellowish brown (10YR 5/6) silt loam; many coarse distinct light brownish gray (10YR 6/2) and strong brown (7.5YR 5/6) mottles; strong coarse angular blocky structure; firm; thin continuous pale brown (10YR 6/3) silt coats and clay films on faces of peds; strongly acid; clear wavy boundary.

Bt3—60 to 75 inches; yellowish brown (10YR 5/6) silt loam; many coarse distinct light brownish gray (10YR 6/2) mottles; strong coarse angular blocky structure; firm; thin continuous pale brown (10YR

6/3) silt coats and clay films on faces of peds; strongly acid; clear wavy boundary.

C—75 to 80 inches; brown (7.5YR 5/4) silt loam; many coarse distinct light brownish gray (10YR 6/2) mottles; massive; firm; slightly acid.

The thickness of the solum ranges from 55 to 75 inches. The thickness of the loess is more than 48 inches.

The Ap has hue of 10YR, value of 4 or 5, chroma of 2 and is mottled. Reaction ranges from medium acid to neutral, depending on liming practices. The Bt horizon has hue of 10YR, value of 5 to 7, and chroma of 2 or less in the upper part of the solum and chroma of 1 to 6 in the lower part and is mottled. It is silt loam or silty clay loam. Reaction is slightly acid to very strongly acid and is less acid in the lower part. The C horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 3 to 6 and is mottled. Reaction is medium acid or slightly acid.

Hosmer Series

The Hosmer series consists of moderately well drained soils that are moderately deep over a fragipan. These soils are on loess-covered uplands. They are moderately permeable above the fragipan and very slowly permeable within the fragipan. These soils formed in loess. Slopes range from 1 to 6 percent.

Hosmer soils are similar to Bedford soils and are commonly adjacent to Ebal, Gilpin, and Wellston soils. Bedford soils formed in less than 5 feet of loess and the underlying residuum from limestone. Ebal, Gilpin, and Wellston soils do not have a fragipan and are generally on steeper slopes. In addition, Ebal soils also have weathered shale in the subsoil. Bedrock is above a depth of 40 inches in the Gilpin soils and above a depth of 72 inches in the Wellston soils.

Typical pedon of Hosmer silt loam, 1 to 6 percent slopes, eroded, in pasture; 860 feet east and 820 feet north of the southwest corner of sec. 10, T. 6 N., R. 2 W.

Ap—0 to 7 inches; brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; moderate medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

BA—7 to 13 inches; dark yellowish brown (10YR 4/4) silt loam; common medium distinct brown (10YR 5/3) mottles; weak medium subangular blocky structure; friable; common fine roots; medium acid; clear wavy boundary.

Bt1—13 to 23 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium subangular blocky structure; friable; common fine roots; thin discontinuous yellowish brown (10YR 5/4) clay films on faces of peds; strongly acid; clear wavy boundary.

Bt2—23 to 28 inches; yellowish brown (10YR 5/6) silty clay loam; few medium distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; friable; common fine roots; thin discontinuous yellowish brown (10YR 5/4) clay films on faces of peds; strongly acid; clear wavy boundary.

Btx1—28 to 42 inches; yellowish brown (10YR 5/6) silty clay loam; many medium distinct light brownish gray (10YR 6/2) and yellowish brown (10YR 5/6) mottles; strong coarse prismatic structure; firm and brittle; thin discontinuous light brownish gray (10YR 6/2) silt coatings; strongly acid; clear wavy boundary.

Btx2—42 to 54 inches; yellowish brown (10YR 5/4) silty clay loam; many medium distinct gray (10YR 6/1) mottles; strong very coarse prismatic structure; very firm and brittle; thick continuous gray (10YR 6/1) silt coatings; very strongly acid; clear wavy boundary.

BC—54 to 64 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct light brownish gray (10YR 6/2) mottles; massive; friable; very strongly acid; clear wavy boundary.

2C—64 to 80 inches; yellowish brown (10YR 5/6) clay; common medium prominent gray mottles; massive; firm; 10 percent sandstone fragments; very strongly acid.

The thickness of the solum ranges from 50 to 80 inches. The depth to sandstone, siltstone, or shale bedrock is more than 60 inches. Depth to the fragipan ranges from 20 to 40 inches, and it is 24 to 50 inches thick. The loess mantle is more than 60 inches thick. Reaction throughout the solum is strongly acid or very strongly acid unless limed.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The Bt horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 3 to 6. It is silt loam or silty clay loam. Some pedons do not have low chroma mottles in the lower part. The Bx horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 3 to 6. It is silt loam or silty clay loam. The 2C horizon has hue of 10YR or 7.5YR, value of 5, and chroma of 3 to 6. It is silt loam, clay loam, silty clay loam, or clay. Sandstone fragments range from 0 to 10 percent.

Markland Series

The Markland series consists of deep, moderately well drained and well drained, slowly permeable soils on broad terraces along large streams. These soils formed in calcareous, lacustrine deposits. Slopes range from 2 to 6 percent.

Markland soils are commonly adjacent to Henshaw and McGary soils. Henshaw and McGary soils have low chroma mottles in the upper part of the subsoil, and they are on lower lying positions than Markland soils. In addition, Henshaw soils have less clay throughout.

Typical pedon of Markland silty clay loam, 2 to 6 percent slopes, eroded, in a cultivated field; 600 feet east and 2,260 feet south of the northwest corner of sec. 29, T. 5 N., R. 1 W.

Ap—0 to 7 inches; dark yellowish brown (10YR 4/4) silty clay loam, light yellowish brown (10YR 6/4) dry; moderate fine subangular blocky structure; friable; many fine and medium roots; neutral; abrupt smooth boundary.

Bt1—7 to 10 inches; strong brown (7.5YR 4/6) silty clay; common medium distinct yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; friable; common fine roots; thin continuous brown (7.5YR 4/4) clay films on faces of peds; slightly acid; abrupt smooth boundary.

Bt2—10 to 16 inches; strong brown (7.5YR 5/6) silty clay; strong medium angular blocky structure; firm; common fine roots; thin continuous yellowish brown (10YR 5/4) clay films on faces of peds; neutral; clear wavy boundary.

Bt3—16 to 21 inches; brown (7.5YR 4/4) silty clay; strong coarse angular blocky structure; firm; few fine roots; thin continuous brown (10YR 5/3) clay films on faces of peds; neutral; clear wavy boundary.

Bt4—21 to 28 inches; yellowish brown (10YR 5/6) silty clay; strong very coarse angular blocky structure; firm; few fine roots; thin continuous brown (10YR 5/3) clay films on faces of peds; neutral; clear wavy boundary.

C1—28 to 36 inches; yellowish brown (10YR 5/4) silty clay loam; massive; very firm; few fine roots; many nodules of secondary lime; violent effervescence; mildly alkaline; clear wavy boundary.

C2—36 to 43 inches; yellowish brown (10YR 5/4) silt loam; many medium distinct yellowish brown (10YR 5/8) mottles; massive; firm; many nodules of secondary lime; violent effervescence; moderately alkaline; clear wavy boundary.

C3—43 to 60 inches; yellowish brown (10YR 5/4) stratified silt loam and clay; many medium faint yellowish brown (10YR 5/6) and many medium distinct strong brown (7.5YR 5/8) mottles; massive; firm; common nodules of secondary lime; violent effervescence; moderately alkaline; clear wavy boundary.

The thickness of the solum and depth to free carbonates range from 20 to 40 inches. Thickness of the loess mantle ranges from 0 to 20 inches.

The Ap horizon has hue of 10YR, value of 4, and chroma of 2 to 4. Reaction is medium acid to neutral. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. Some pedons have low chroma mottles in the lower part. Reaction is strongly acid to neutral. The C horizon is stratified silty clay loam, silty clay, and silt loam.

McGary Series

The McGary series consists of deep, somewhat poorly drained, slowly permeable soils on nearly level flood plains. These soils formed in lacustrine deposits. Slopes range from 0 to 2 percent.

These McGary soils do not have free carbonates and they have higher chroma in the Bt horizon and less clay than is definitive for the McGary series. These differences do not alter the usefulness or behavior of the soil.

McGary soils are similar to Henshaw soils and are commonly adjacent to the Bonnie, Markland, Stendal, and Wilbur soils. Henshaw soils have less clay in the subsoil than McGary soils. Henshaw and Markland soils are on higher lying terrace areas. In addition, Markland soils do not have low chroma mottles in the upper part of the subsoil. Bonnie soils are gray throughout and are in depressions. Stendal and Wilbur soils have less clay in the subsoil. Wilbur soils have higher chroma in the subsoil and are generally on higher lying positions.

Typical pedon of McGary silty clay loam, 0 to 2 percent slopes, frequently flooded, in a cultivated field; 1,100 feet east and 1,500 feet south of the northwest corner of sec. 14, T. 6 N., R. 1 W.

Ap—0 to 8 inches; dark brown (10YR 4/3) silty clay loam, very pale brown (10YR 7/3) dry; moderate medium granular structure; friable; many fine and medium roots; neutral; abrupt smooth boundary.

Bt—8 to 25 inches; yellowish brown (10YR 5/8) silty clay loam; many medium distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; friable; many fine roots; thin discontinuous pale brown (10YR 6/3) clay films on faces of peds; strongly acid; clear wavy boundary.

Btg1—25 to 40 inches; gray (10YR 6/1) silty clay loam; many medium distinct strong brown (7.5YR 5/8) and pale brown (10YR 6/3) mottles; moderate medium subangular blocky structure; firm; few fine roots; thin discontinuous gray (10YR 6/1) clay films on faces of peds; few fine black (10YR 2/1) iron and manganese oxide accumulations; strongly acid; clear wavy boundary.

Btg2—40 to 53 inches; gray (10YR 6/1) silty clay loam; many medium distinct strong brown (7.5YR 5/8) and pale brown (10YR 6/3) mottles; strong medium subangular blocky structure; firm; thin discontinuous gray (10YR 6/1) clay films on faces of peds; common fine black (10YR 2/1) iron and manganese oxide accumulations; slightly acid; clear wavy boundary.

Btg3—53 to 72 inches; gray (10YR 6/1) silty clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; strong medium subangular blocky structure; firm; thin discontinuous gray (10YR 6/1) clay films on faces of peds; common fine black (10YR 2/1) iron and manganese oxide accumulations; neutral; clear wavy boundary.

BCg—72 to 80 inches; light brownish gray (10YR 6/2) silt loam; many medium distinct yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; firm; common fine black (10YR 2/1) iron and manganese oxide accumulations; neutral.

The thickness of the solum ranges from 35 to 80 inches. Thickness of the loess mantle ranges from 0 to 12 inches.

The Ap horizon has hue of 10YR, value of 4 to 6, and chroma of 1 to 3. It is silt loam or silty clay loam. The Bt horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma 1 to 8 and is mottled. It is silty clay loam or silty clay. Reaction ranges from strongly acid to neutral. The C horizon, where present, has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 3 and is mottled. It is stratified clay, silty clay, silty clay loam, silt loam, and silt.

Muren Series

The Muren series consists of deep, moderately well drained soils on loess-covered uplands. Permeability is moderately slow. These soils formed in loess. Slopes range from 1 to 3 percent.

These Muren soils are more acid and have lower base saturation than is definitive for the Muren series. These differences do not alter the usefulness or behavior of the soil.

Muren soils are commonly adjacent to Bedford, Crider, and Frederick soils. Bedford, Crider, and Frederick soils do not have low chroma mottles in the upper part of the subsoil, and they are on steeper slopes than Muren soils. In addition, Bedford soils have a fragipan.

Typical pedon of Muren silt loam, 1 to 3 percent slopes, in a cultivated field; 600 feet south and 280 feet east of the northwest corner of sec. 12, T. 6 N., R. 2 W.

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; many fine roots; few medium red (2.5YR 4/6) iron and manganese oxide stains; neutral; abrupt smooth boundary.

Bt1—10 to 19 inches; yellowish brown (10YR 5/4) silt loam; many medium and coarse distinct light brownish gray (10YR 6/2) and strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; friable; common fine roots; thin discontinuous yellowish brown (10YR 5/4) clay films on faces of peds; neutral; clear wavy boundary.

Bt2—19 to 40 inches; yellowish brown (10YR 5/4) silt loam; many medium distinct grayish brown (10YR 5/2) mottles; moderate coarse prismatic structure parting to moderate medium subangular blocky; firm; thick continuous yellowish brown (10YR 5/4) clay films on faces of peds; very strongly acid; clear wavy boundary.

Bt3—40 to 69 inches; yellowish brown (10YR 5/4) silt loam; many medium and coarse distinct light brownish gray (10YR 6/2) mottles; moderate coarse prismatic structure parting to moderate medium subangular blocky; firm; thick continuous yellowish brown (10YR 5/4) clay films on faces of peds; many medium black (10YR 2/1) iron and manganese oxide stains; very strongly acid; clear wavy boundary.

BC—69 to 80 inches; yellowish brown (10YR 5/4) silt loam; few medium distinct strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; firm; common medium black (10YR 2/1) iron and manganese oxide stains; very strongly acid.

The thickness of the solum ranges from 60 to 80 inches. The loess mantle is 6 to 8 feet thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The Bt horizon has hue of 10YR, value of 5 or 6, and chroma of 3 to 6 and is mottled. It is silt loam or silty clay loam. The BC horizon has hue of 10YR, value of 5 or 6, and chroma of 4 to 8.

Newark Series

The Newark series consists of deep, somewhat poorly drained, moderately permeable soils on flood plains along large streams. These soils formed in silty alluvium. Slopes range from 0 to 2 percent.

Newark soils are similar to Petrolia soils and are commonly adjacent to Abscota, Chagrin, and Nolin soils. Petrolia soils are grayer throughout and are in depressions. Abscota, Chagrin, and Nolin soils have higher chroma in the subsoil than Newark soils and are on higher lying positions. Abscota soils have sand and loamy sand that is 40 or more inches thick. In addition, Chagrin soils have more sand and less clay in the upper part of the subsoil.

Typical pedon of Newark silt loam, frequently flooded, in a cultivated field; 500 feet east and 680 feet north of the southwest corner of sec. 1, T. 4 N., R. 1 W.

Ap—0 to 7 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

Bw—7 to 13 inches; dark brown (10YR 4/3) silt loam; common medium distinct grayish brown (10YR 5/2) and yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; few fine roots; neutral; clear wavy boundary.

Bg1—13 to 17 inches; grayish brown (10YR 5/2) silt loam; many medium distinct dark yellowish brown

(10YR 4/4) and strong brown (7.5YR 4/6) mottles; weak medium subangular blocky structure; firm; neutral; clear wavy boundary.

Bg2—17 to 26 inches; dark gray (10YR 4/1) silty clay loam; few medium distinct strong brown (7.5YR 4/6) mottles; weak medium subangular blocky structure; firm; slightly acid; clear wavy boundary.

Cg—26 to 60 inches; dark gray (10YR 4/1) silty clay loam; many medium faint dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2) mottles; massive; firm; slightly acid.

The solum ranges from 20 to 40 inches thick. Reaction is medium acid to mildly alkaline.

The Ap horizon has hue of 10YR, value of 4, and chroma of 2 to 4. It is silt loam or silty clay loam. The Bw horizon has hue of 10YR, value of 4 or 5, and chroma of 1 to 4 and is mottled. It is silt loam or silty clay loam. The C horizon has hue of 10YR, value of 4 to 6, and chroma of 1 to 4. It is silt loam, silty clay loam, or silty clay.

Nolin Series

The Nolin series consists of deep, well drained, moderately permeable soils on flood plains along large streams. These soils formed in silty alluvium. Slopes range from 0 to 2 percent.

Nolin soils are commonly adjacent to Abscota, Chagrin, Newark, and Petrolia soils. Abscota and Chagrin soils have more sand in the upper part of the subsoil than Nolin soils. Newark and Petrolia soils have low chroma mottles above a depth of 24 inches and are usually in small depressions.

Typical pedon of Nolin silt loam, frequently flooded, in a cultivated field; 2,300 feet west and 2,400 feet north of the southeast corner of sec. 32, T. 5 N., R. 1 W.

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

Bw1—10 to 28 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium subangular blocky structure; friable; few fine roots; neutral; clear wavy boundary.

Bw2—28 to 60 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; firm; neutral.

The thickness of the solum is more than 40 inches. Reaction throughout the soil ranges from medium acid to neutral.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 3. It is silt loam or silty clay loam. The Bw horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is silt loam or silty clay loam. The C horizon, where present, has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It is silt loam, loam, fine sandy loam, or stratified layers of these textures.

Pekin Series

The Pekin series consists of moderately well drained soils on broad terraces that are moderately deep over a fragipan. These soils are moderately permeable above the fragipan and very slowly permeable within the fragipan. They formed in silty material of mixed origin. Slopes range from 2 to 12 percent.

These Pekin soils have redder hue in the lower part of the subsoil, and they have a thicker solum and lower base saturation than is definitive for the Pekin series. These differences do not alter the usefulness or behavior of the soil.

Pekin soils are commonly adjacent to Bartle and Elkinsville Variant soils. Bartle soils have more gray in the upper part of the subsoil than Pekin soils, and they are on flat or depressional areas. In addition, Elkinsville Variant soils do not have a fragipan.

Typical pedon of Pekin silt loam, 2 to 6 percent slopes, in a pasture; 100 feet east and 60 feet south of the northwest corner of sec. 23, T. 6 N., R. 2 W.

Ap—0 to 12 inches; brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; moderate medium granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

BA—12 to 18 inches; yellowish brown (10YR 5/4) silt loam; common medium distinct brown (10YR 4/3) mottles; weak medium subangular blocky structure; friable; many fine roots; slightly acid; clear wavy boundary.

Bt1—18 to 24 inches; yellowish brown (10YR 5/6) silt loam; moderate medium subangular blocky structure; friable; common fine roots; thin discontinuous yellowish brown (10YR 5/4) clay films on faces of peds; strongly acid; clear wavy boundary.

Bt2—24 to 31 inches; yellowish brown (10YR 5/6) silt loam; common medium distinct light brownish gray (10YR 6/2) and yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; friable; thin discontinuous yellowish brown (10YR 5/4) clay films on faces of peds; few medium black (10YR 2/1) iron and manganese oxide accumulations; strongly acid; clear wavy boundary.

Btx1—31 to 43 inches; yellowish brown (10YR 5/6) silt loam; common medium distinct light brownish gray (10YR 6/2) and yellowish brown (10YR 5/8) mottles; strong coarse prismatic structure; firm and brittle; thin discontinuous yellowish brown (10YR 5/4) clay films on faces of peds; few medium black (10YR 2/1) iron and manganese oxide accumulations; strongly acid; clear wavy boundary.

Btx2—43 to 53 inches; yellowish brown (10YR 5/6) silt loam; common medium distinct yellowish brown (10YR 5/4) mottles; strong very coarse prismatic structure; very firm and brittle; thin discontinuous yellowish brown (10YR 5/4) clay films on faces of peds; thick continuous light brownish gray (10YR 6/2) silt flows; few medium black (10YR 2/1) iron and manganese oxide accumulations; strongly acid; clear wavy boundary.
B't1—53 to 65 inches; strong brown (7.5YR 5/6) silt loam; common coarse distinct light brownish gray (10YR 6/2) and yellowish red (5YR 5/6) mottles; strong coarse subangular blocky structure; firm; thin discontinuous yellowish brown (10YR 5/4) clay films on faces of peds; strongly acid; clear wavy boundary.
B't2—65 to 77 inches; strong brown (7.5YR 5/6) silty clay loam; common coarse distinct yellowish brown (10YR 5/4) mottles; strong coarse subangular blocky structure; firm; thin discontinuous gray (10YR 6/1) clay films on faces of peds; few medium black (10YR 2/1) iron and manganese oxide accumulations; strongly acid; clear wavy boundary.
C—77 to 80 inches; strong brown (7.5YR 5/6) stratified silt loam and silty clay loam; common coarse distinct gray (10YR 6/1) mottles; massive; firm; common medium light red (2.5YR 6/8) iron and manganese oxide accumulations; strongly acid.

The thickness of the solum ranges from 50 to 80 inches. The fragipan, which is at a depth of 24 to 36 inches, ranges from 14 to 30 inches in thickness.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The BA horizon has hue of 10YR, value of 5, and chroma of 4 to 6. The Bt and B't horizons have hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 3 to 6 and are mottled. They are silt loam or silty clay loam. Reaction is strongly acid or very strongly acid. The Btx horizon has hue of 10YR, value of 5 or 6, and chroma of 2 to 8 and is mottled. It is silt loam or silty clay loam. Reaction is strongly acid or very strongly acid. The C horizon has hue of 10YR, 7.5YR, or 5YR; value of 5 or 6; and chroma of 2 to 6. It is stratified with thick layers of loam, sandy loam, silt loam, or clay loam.

Petrolia Series

The Petrolia series consists of deep, poorly drained soils on flood plains along large streams. Permeability is moderately slow. These soils formed in silty alluvium. Slopes range from 0 to 2 percent.

Petrolia soils are similar to Newark soils and are commonly adjacent to Abscota, Chagrin, and Nolin soils. Newark soils are not so gray in the upper part of the subsoil as Petrolia soils. Abscota, Chagrin, and Nolin soils have higher chroma in the subsoil and are on higher lying positions. In addition, Abscota soils have sand and loamy sand to a depth of 40 inches or more, and Chagrin soils have more sand and less clay in the control section.

Typical pedon of Petrolia silty clay loam, frequently flooded, in a cultivated field; 2,100 feet north and 2,320 feet east of the southwest corner of sec. 1, T. 4 N., R. 1 W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silty clay loam, pale brown (10YR 6/3) dry; many medium distinct dark gray (10YR 4/1) and dark yellowish brown (10YR 3/4) mottles; weak medium granular structure; firm; common fine roots; neutral; abrupt smooth boundary.
Cg1—9 to 18 inches; dark gray (10YR 4/1) silty clay loam; many medium distinct dark yellowish brown (10YR 4/4) and many medium faint dark grayish brown (10YR 4/2) mottles; weak medium subangular blocky structure; firm; few fine roots; neutral; clear wavy boundary.
Cg2—18 to 23 inches; dark gray (10YR 4/1) silty clay loam; many medium faint dark grayish brown (10YR 4/2) and common medium distinct dark yellowish brown (10YR 3/4) mottles; massive; firm; neutral; clear wavy boundary.
Cg3—23 to 33 inches; gray (10YR 5/1) silty clay loam; many medium distinct dark yellowish brown (10YR 3/4) and light gray (10YR 6/1) mottles; massive; firm; neutral; clear wavy boundary.
Cg4—33 to 50 inches; dark gray (10YR 4/1) silty clay loam; many medium distinct dark yellowish brown (10YR 3/4) mottles; massive; firm; slightly acid; clear wavy boundary.
Cg5—50 to 60 inches; dark gray (10YR 4/1) silty clay loam; many medium distinct dark yellowish brown (10YR 3/4) mottles; massive; firm; many red (2.5YR 4/6) iron and manganese oxide stains and accumulations; medium acid.

This soil is slightly acid to neutral above a depth of 40 inches and strongly acid to neutral below.

The Ap horizon is dark gray (10YR 4/1) or dark grayish brown (10YR 4/2). The Cg horizons have hue of 10YR, value of 4 to 6, and chroma of 1 or 2 and are mottled.

Princeton Series

The Princeton series consists of deep, well drained, moderately permeable soils on terraces along large streams. These soils formed in stratified, loamy and sandy materials. Slopes range from 2 to 6 percent.

Princeton soils are similar to Alvin soils and are commonly adjacent to Bloomfield and Tyner soils. Alvin, Bloomfield, and Tyner soils have less clay in the control section than Princeton soils. In addition, Bloomfield soils have loamy sand or sand in the upper 20 inches of the solum and do not have Bt horizons that are vertically continuous for 8 inches or more. Tyner soils have loamy sand or sand in the upper 40 inches of the profile and do not have an argillic horizon.

Typical pedon of Princeton sandy loam, from an area of Princeton-Alvin complex, 2 to 6 percent slopes, in pasture; 1,020 feet west and 1,480 feet south of the northeast corner of sec. 32, T. 5 N., R. 1 W.

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

Bt1—8 to 16 inches; dark brown (7.5YR 4/4) sandy clay loam; strong medium subangular blocky structure; firm; many fine and medium roots; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; slightly acid; gradual wavy boundary.

Bt2—16 to 30 inches; dark brown (7.5YR 4/4) sandy clay loam; strong medium subangular blocky structure; firm; common fine and medium roots; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; medium acid; gradual wavy boundary.

Bt3—30 to 40 inches; dark brown (7.5YR 4/4) sandy clay loam; moderate medium subangular blocky structure; firm; common fine and medium roots; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; medium acid; gradual wavy boundary.

BC—40 to 52 inches; strong brown (7.5YR 4/6) sandy loam; weak medium subangular blocky structure; friable; common fine roots; strongly acid; gradual wavy boundary.

C1—52 to 70 inches; strong brown (7.5YR 5/6) stratified sandy loam and loamy sand; massive; friable; few roots; strongly acid; clear wavy boundary.

C2—70 to 80 inches; strong brown (7.5YR 4/6) stratified sandy loam, sandy clay loam, and loamy sand; massive; friable; strongly acid.

The thickness of the solum ranges from 40 to 60 inches. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The Bt horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6. It is sandy loam, clay loam, loam, or sandy clay loam. The C horizon is stratified layers of sandy clay loam, sandy loam, loamy sand, and sand.

Stendal Series

The Stendal series consists of deep, somewhat poorly drained soils on flood plains. These soils are moderately permeable in the solum and slowly permeable in the substratum. They formed in acid, silty alluvium. Slopes range from 0 to 2 percent.

These Stendal soils are less acid than is definitive for the Stendal series. This difference does not alter the usefulness or behavior of the soil.

Stendal soils are similar to Bonnie soils and are commonly adjacent to Haymond, McGary, and Wilbur soils. Bonnie soils have low chroma throughout. Haymond and Wilbur soils do not have low chroma mottles within depths of 20 inches. They are on higher lying positions than Stendal soils. Haymond and Wilbur soils have higher base saturation and have less clay in the control section. McGary soils have more clay in the subsoil.

Typical pedon of Stendal silt loam, clayey substratum, frequently flooded, in a cultivated field; 1,100 feet east and 50 feet north of the southwest corner of sec. 11, T. 6 N., R. 1 W.

Ap—0 to 8 inches; brown (10YR 5/3) silt loam, light gray (10YR 7/2) dry; moderate medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

Bw—8 to 15 inches; yellowish brown (10YR 5/4) silt loam; few fine distinct light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure parting to moderate medium granular; friable; many fine roots; neutral; abrupt smooth boundary.

Bg—15 to 28 inches; light brownish gray (10YR 6/2) silt loam; many medium distinct strong brown (7.5YR 5/8) and yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; friable; common fine roots; medium acid; clear wavy boundary.

Cg1—28 to 56 inches; light brownish gray (10YR 6/2) silty clay loam; many medium distinct strong brown (7.5YR 5/8) and yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; firm; few fine roots; medium acid; clear wavy boundary.

2Cg2—56 to 64 inches; gray (10YR 6/1) silty clay loam; many medium distinct strong brown (7.5YR 5/8) and yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; firm; many medium black (10YR 2/1) iron and manganese oxide accumulations; medium acid; clear wavy boundary.

2Cg3—64 to 70 inches; yellowish brown (10YR 5/4) silty clay; many coarse distinct gray (10YR 6/1) and strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; firm; slightly acid.

Reaction throughout the soil ranges from neutral to strongly acid unless limed. The Ap horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 4. The B horizon has hue of 10YR, value of 5 or 6, and chroma of 2 to 4 and is mottled. The Cg horizon has hue of 10YR, value of 5 to 7, and chroma of 1 to 8 and is mottled.

Tyner Series

The Tyner series consists of deep, somewhat excessively drained, rapidly permeable soils on terrace breaks along large streams. These soils formed in loamy sand and sand. Slopes range from 2 to 7 percent.

Tyner soils are commonly adjacent to Alvin, Bloomfield, and Princeton soils. Alvin and Princeton soils have more clay in the control section than Tyner soils, and they have an argillic horizon. Bloomfield soils have an argillic horizon and are on ridge summits, side slopes, and terrace breaks on higher lying positions.

Typical pedon of Tyner loamy sand, from an area of Tyner-Alvin loamy sands, 2 to 7 percent slopes, in pasture; 1,600 feet east and 440 feet south of the northwest corner of sec. 8, T. 4 N., R. 1 E.

Ap—0 to 9 inches; dark brown (10YR 4/3) loamy sand, brown (10YR 5/3) dry; weak medium granular structure; very friable; many fine roots; slightly acid; abrupt smooth boundary.

AB—9 to 15 inches; dark yellowish brown (10YR 4/4) loamy sand; weak medium granular structure; very friable; common fine roots; medium acid; clear smooth boundary.

Bw1—15 to 24 inches; brown (7.5YR 4/4) loamy sand; weak medium granular structure; very friable; few fine roots; medium acid; gradual wavy boundary.

Bw2—24 to 36 inches; brown (7.5YR 4/4) loamy sand; weak medium granular structure; very friable; slightly acid; gradual wavy boundary.

Bw3—36 to 48 inches; brown (7.5YR 4/4) sand; weak medium subangular blocky structure; very friable; slightly acid; gradual wavy boundary.

C1—48 to 71 inches; dark yellowish brown (10YR 4/4) sand; single grain; loose; slightly acid; gradual wavy boundary.

C2—71 to 80 inches; dark yellowish brown (10YR 4/4) sand; single grain; loose; violent effervescence; moderately alkaline.

The thickness of the solum ranges from 36 to 60 inches. The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 3 or 4. Value is lower than 5.5 when the soil is dry. The Bw horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. The C horizon has hue of 10YR, value of 4 to 6, and chroma of 4 to 6.

Weikert Series

The Weikert series consists of shallow, well drained soils on uplands. Permeability is moderately rapid. These soils formed in material weathered from sandstone, siltstone, and shale. Slopes range from 25 to 75 percent.

Weikert soils are commonly adjacent to Berks, Gilpin, and Wellston soils. Berks, Gilpin, and Wellston soils have thicker sola than Weikert soils. Sandstone, siltstone, or shale bedrock is at a depth of 20 to 40 inches in Berks and Gilpin soils and at a depth of 40 to 72 inches in Wellston soils. Gilpin and Wellston soils have an argillic horizon.

Typical pedon of Weikert silt loam, from an area of Weikert-Berks-Gilpin complex, 25 to 75 percent slopes, in woodland; 925 feet west and 1,480 feet south of the northeast corner of sec. 7, T. 6 N., R. 1 E.

A—0 to 3 inches; very dark grayish brown (10YR 3/2) channery silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; many medium and coarse roots; 15 percent sandstone fragments; medium acid; abrupt wavy boundary.

Bw—3 to 16 inches; yellowish brown (10YR 5/4) very channery silt loam; weak medium subangular blocky structure; friable; many medium and coarse roots; 40 percent sandstone fragments; very strongly acid; clear wavy boundary.

R—16 inches; yellowish brown (10YR 5/4) weathered siltstone.

The thickness of the solum and depth to bedrock range from 10 to 20 inches. Reaction of the profile ranges from medium acid to very strongly acid.

The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. It has 15 to 30 percent sandstone, siltstone, or shale fragments. The Bw horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It has 35 to 55 percent sandstone, siltstone, or shale fragments.

Wellston Series

The Wellston series consists of deep, well drained, moderately permeable soils on loess-covered uplands. These soils formed in loess deposits and underlying residuum from sandstone, siltstone, or shale. Slopes range from 6 to 35 percent.

Wellston soils are similar to Crider and Frederick soils and are commonly adjacent to Berks, Ebal, Gilpin, and Weikert soils. Crider and Frederick soils formed in silty loess and underlying residuum from limestone. In addition, the loess mantle is less than 20 inches thick in Frederick soils. Berks and Weikert soils do not have argillic horizons and are generally on steeper slopes than Wellston soils. The depth to sandstone, siltstone, or shale bedrock is 20 to 40 inches in Berks and Gilpin soils, and it is 10 to 20 inches in Weikert soils. Ebal soils have more clay in the subsoil than Wellston soils.

Typical pedon of Wellston silt loam, from an area of Wellston-Gilpin silt loams, 12 to 18 percent slopes, eroded, in pasture; 1,220 feet south and 1,540 feet east of the northwest corner of sec. 28, T. 4 N., R. 2 W.

Ap1—0 to 3 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; many fine roots; slightly acid; abrupt smooth boundary.

Ap2—3 to 9 inches; dark brown (10YR 4/3) silt loam; few medium distinct yellowish brown (10YR 5/4) mottles; mdoerate medium subangular blocky structure; friable; common fine roots; slightly acid; clear wavy boundary.

Bt1—9 to 12 inches; yellowish brown (10YR 5/4) silt loam; moderate medium subangular blocky structure; friable; few fine roots; thin discontinuous yellowish brown (10YR 5/4) clay films on faces of peds; medium acid; clear wavy boundary.

2Bt2—12 to 32 inches; yellowish brown (10YR 5/6) silt loam; common medium distinct yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; friable; thin discontinuous yellowish brown (10YR 5/6) clay films on faces of peds; 5 percent sandstone fragments; strongly acid; clear wavy boundary.

2Bt3—32 to 38 inches; yellowish brown (10YR 5/6) silt loam; moderate medium subangular blocky structure; friable; thin discontinuous yellowish brown (10YR 5/6) clay films on faces of peds; 5 percent sandstone fragments; strongly acid; clear wavy boundary.

2Bt4—38 to 46 inches; yellowish brown (10YR 5/6) silty clay loam; common medium distinct light brownish gray (10YR 6/2) mottles; moderate medium subangular blocky structure; firm; thin discontinuous yellowish brown (10YR 5/8) clay films on faces of peds; 10 percent sandstone fragments; strongly acid; abrupt wavy boundary.

R—46 inches; yellowish brown (10YR 5/4) sandstone.

The thickness of the solum ranges from 32 to 50 inches, and depth to bedrock ranges from 40 to 72 inches. The loess mantle ranges from 10 to 40 inches in thickness. The solum is strongly acid or very strongly acid unless limed. Coarse fragments of sandstone, siltstone, or shale are in the lower part of the solum.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. In uncultivated areas the A horizon has hue of 10YR, value of 3 or 4, and chroma of 2. The E horizon, where present, has hue of 10YR, value of 4 to 6, and chroma of 3 or 4. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 8. It is silt loam or silty clay loam. The upper part of the Bt horizon has less than 5 percent coarse fragments, and the lower part has 5 to 25 percent. In some pedons a BC horizon or a C horizon is present.

Wilbur Series

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

Wilbur soils are similar to Haymond soils and are commonly adjacent to Bonnie, Henshaw, McGary, and Stendal soils. Haymond soils do not have low chroma mottles within a depth of 20 inches. Bonnie and Stendal soils have lower base saturation than Wilbur soils and have more clay in the control section. In addition, Bonnie soils are gray throughout and are in depressions. Stendal soils are grayer than Wilbur soils in the upper part of the subsoil, and they are on lower lying positions. Henshaw and McGary soils have argillic horizons. They have a layer in the upper part of the subsoil that is not dominantly gray. Henshaw soils are on higher lying positions on terraces.

Typical pedon of Wilbur silt loam, frequently flooded, in a cultivated field; 1,720 feet west and 700 feet north of the southeast corner of sec. 26, T. 5 N., R. 1 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, light yellowish brown (10YR 6/4) dry; moderate medium granular structure; friable; common fine roots; neutral; abrupt smooth boundary.

C1—7 to 13 inches; dark brown (10YR 4/3) silt loam; few medium distinct dark yellowish brown (10YR 4/4) mottles; weak medium subangular blocky structure; friable; few fine roots; thin discontinuous dark grayish brown (10YR 4/2) coatings on faces of peds; neutral; clear wavy boundary.

C2—13 to 20 inches; dark yellowish brown (10YR 4/4) silt loam; few medium distinct yellowish brown (10YR 5/6) and dark grayish brown (10YR 4/2) mottles; moderate medium subangular blocky structure; friable; thin discontinuous brown (10YR 4/3) coatings on faces of peds; few fine black (10YR 2/1) iron and manganese oxide stains on faces of peds; neutral; clear wavy boundary.

C3—20 to 33 inches; brown (10YR 4/3) silt loam; common medium faint dark grayish brown (10YR 4/2) and dark yellowish brown (10YR 4/4) mottles; strong medium subangular blocky structure; friable; 2 percent chert fragments; slightly acid; clear wavy boundary.

Cg1—33 to 47 inches; dark grayish brown (10YR 4/2) silt loam; many medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure parting to strong medium granular structure; friable; common fine black (10YR 2/1) iron and manganese oxide accumulations; neutral; clear wavy boundary.

Cg2—47 to 59 inches; grayish brown (10YR 5/2) silt loam; many medium distinct yellowish brown (10YR 5/6) mottles; massive; friable; common fine black (10YR 2/1) iron and manganese accumulations; neutral; clear wavy boundary.

Cg3—59 to 60 inches; brown (10YR 5/3) stratified fine sand and silt; many medium distinct yellowish brown (10YR 5/8) and common medium faint grayish brown (10YR 5/2) mottles; massive; friable; neutral; clear wavy boundary.

Reaction throughout the soil ranges from medium acid to neutral. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The upper part of the C horizon has hue of 10YR, value of 4 to 6, and chroma of 3 to 6 and has few to common low chroma mottles within a depth of 24 inches. The lower part of the C horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 6 and is mottled. It is silt loam or strata of fine sand and silt. Some pedons are silt loam and have thin strata of silt.

Formation of the Soils

In this section the major factors of soil formation and their degree of importance in the formation of the soils in Lawrence County are described.

Factors of Soil Formation

Soil is produced by soil-forming processes acting on materials deposited or accumulated by geologic agencies. The characteristics of the soil at any given point are determined by (1) the physical and mineralogical composition of the parent material, (2) the climate under which the soil material has accumulated and existed since accumulation, (3) the plant and animal life on and in the soil, (4) the relief, or lay of the land, and (5) the length of time 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 to a natural body that has genetically related horizons. The effects of climate and plant and animal life are conditioned by relief. The parent material also affects the kind of soil profile that is formed, and, in extreme cases, determines it almost entirely. Finally, time is needed for changing the parent material into a soil profile. It may be much or little, but some time is always required for differentiation of soil horizons. Usually a long time is required for the development of distinct 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. Many of the processes of soil development are unknown.

Parent Material

Parent material is the unconsolidated mass from which a soil is formed. Parent material determines the limits of the chemical and mineralogical composition of the soil. The parent material from which many of the soils of Lawrence County are derived was weathered from limestone, sandstone, shale, and siltstone. All of these rocks are Mississippian (approximately 250 million years) in age except for some of the capping sandstone in the western part of the county which is Pennsylvanian (approximately 230 million years) in age. The parent material of the rest of the soils consists of deposits of Illinoian age glacial outwash and lacustrine materials and of deposits of loess and alluvium. The parent materials of the soils that are of glacial origin were deposited by melt water from the glaciers. Some of these materials are reworked and redeposited by subsequent actions of water and wind. These glaciers were present from about 10,000 to 12,000 years ago. Although parent materials are of common glacial origin, their properties vary greatly, sometimes within short distances, depending upon the way in which the materials were deposited.

Outwash materials are deposited by running water from melting glaciers. The size of the particles that make up the outwash material varies according to speed of the stream of water that carried them. When the water slows down, the coarser particles are deposited. Finer particles, such as very fine sand, silt, and clay, can be carried by slower moving water. Outwash deposits generally consist of layers of particles of similar size, such as sandy loam, sand, gravel, and other coarse particles. The Princeton soils, for example, formed in deposits of outwash material.

Lacustrine materials are deposited from still or ponded glacial melt water. Because the coarser fragments drop out of moving water as outwash, only the finer particles, such as very fine sand, silt, and clay, remain to settle out in still water. Lacustrine deposits are silty or clayey in texture. The Markland soils, for example, formed in lacustrine materials.

Alluvial material is deposited by floodwaters of streams in recent time. This material ranges in texture, depending on the speed of the water from which it was deposited. The alluvial material deposited along a swift stream, such as the White River, is therefore coarser textured than that deposited along a slow, sluggish stream, such as Salt Creek. The Abscota and Haymond soils are examples of alluvial soils.

Plant and Animal Life

Plants have been the principal organism influencing the soils in Lawrence County; however, bacteria, fungi, earthworms, and the activities of man have also been important. The chief contribution of plants and animal life is the addition of organic matter and nitrogen to the soil. The kind of organic material on and in the soil depends on the kind of plants that grew in the soil. The remains of these plants accumulate on the surface, decay, and eventually become organic matter. Roots of plants provide channels for downward movement of water through the soil and also add organic matter as they decay. Bacteria in the soil help to break down the organic matter so that it can be used by growing plants.

The vegetation in Lawrence County was mainly deciduous forest. Differences in natural soil drainage and small changes in parent material have affected the composition of the forest species.

In general, the well drained soils on the uplands, such as Crider and Ebal soils, were mainly covered with sugar maple, beech, poplar, and oak trees. Weikert soils were covered with scrub oak. Wet soils were covered with pin oak.

Climate

Climate is important in the formation of soils. It determines the kind of plant and animal life on and in the soil. It determines the amount of water available for the weathering of minerals and the transporting of soil material. Climate, through its influence on temperatures within the soil, determines the rate of chemical reaction that occurs in the soil. These influences are important, but they affect large areas rather than a relatively small area, such as a county.

The climate in Lawrence County, which is cool and humid, is probably similar to that which existed when the soils were formed. Soils in Lawrence County differ from soils that formed in a dry, warm climate or in a hot, moist climate. Climate is uniform throughout the county, although its effect is modified locally by the cooling effect of the hills and by runoff. Therefore, differences in the soils, to a minor extent, are the result of differences in the climate. For more detailed information about the climate of Lawrence County, see the section "General Nature of the Survey Area."

Relief

Relief or topography has a marked influence on the soils of Lawrence County through its influence on natural drainage, erosion, plant cover, and soil temperature. In Lawrence County, slopes range from 0 to 100 percent. Natural soil drainage ranges from somewhat excessively drained on the ridgetops to poorly drained in the depressions.

Relief influences the formation of soils by affecting runoff and drainage. Drainage, by affecting the aeration of the soil, determines the color of the soil. Runoff is greatest on the steeper slopes. In low areas, water is temporarily ponded. Water and air move freely through soils that are well drained but slowly through soils that are very poorly drained. Most well aerated soils that have iron and aluminum compounds are brightly colored and oxidized. Poorly aerated soils are dull gray and mottled. Bloomfield soils are an example of a somewhat excessively drained, well aerated soil. Petrolia soils are an example of a poorly aerated, poorly drained soil.

Between the poorly drained and somewhat excessively drained soils are the somewhat poorly drained, moderately well drained, and well drained soils.

Time

Time, usually a long time, is required by the agents of soil formation to form distinct horizons in a soil. The difference in length of time that the parent materials have been in place is commonly reflected in the degree of development of the soil profile. Some soils develop rapidly, and other soils develop slowly.

The soils in Lawrence County range from young to mature. The glacial deposits from which many of the soils formed have been exposed to soil-forming factors long enough to allow distinct horizons to develop within the soil profile. Some soils, however, formed in recent alluvial sediments. These soils have not been in place long enough for distinct horizons to develop.

Haymond soil is an example of a young soil that formed in alluvial material. Crider and Frederick soils are examples of the effect of time on leaching lime from the soil. The solum of Princeton soils at one time had about the same amount of lime as the C horizon has today. McGary soils were above the glacial lake water and subject to leaching. The difference in length of time of leaching is reflected in some soils that are leached of lime to a depth of 100 inches. On the other hand, Henshaw soils are limy or calcareous at a depth of 30 inches.

Processes of Soil Formation

Several processes have contributed to the formation of soils in Lawrence County. These processes are the accumulation of organic matter; the solution, transfer, and removal of calcium carbonate and bases; and the liberation and translocation of silicate clay minerals. In most soils, more than one of these processes have been active in horizon differentiation.

Some organic matter has accumulated in the surface layer in all soils in the county. The organic matter content of some soils is low, but that of others is high. Generally, the soils that contain the most organic matter have a thick, dark brown surface horizon. Petrolia soils are an example.

Carbonates and bases have been leached from the upper horizons of nearly all soils in Lawrence County. Leaching is generally believed to precede 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 the high water tables or because water moves slowly through such soils.

Clay accumulates in pores and other voids and forms films on the surfaces along which water moves. Leaching of bases and translocation of silicate clays are among the more important processes in horizon differentiation in the soils of this county. Muren soils are examples of soils in which translocated silicate clays have accumulated in the Bt horizon in the form of clay films.

The reduction and transfer of iron, or gleying, has occurred in all of the poorly drained and somewhat poorly drained soils. In naturally wet soils, this process has been significant in horizon differentiation. Grayness in the subsoil indicates the reduction of iron oxides. The reduction is commonly accompanied by some transfer of iron, either from upper horizons to lower horizons or out of the profile. Mottles indicate segregation of iron.

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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.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	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.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on the contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bottom land. The normal flood plain of a stream, subject to flooding.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a channer.

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 slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation tillage. A form of noninversion tillage that retains protective amounts of residue mulch on the surface throughout the year. These forms include no-tillage, stubble mulching, and other types of noninversion.

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.

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, subsurface. Removal of excess ground water through buried drains installed within the soil profile. The drains collect the water and convey it to a gravity or pump outlet.

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.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

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.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, and clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial melt water.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits (geology). Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial melt water. Many deposits are interbedded or laminated.

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.

Graded stripcropping. Growing crops in strips that grade toward a protected waterway.

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 as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

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) prismatic, granular, 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 below the soil.

R layer.—Hard, consolidated bedrock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

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.

Karst (topography). The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

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.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash, glacial. Stratified sand and gravel produced by glaciers and carried, sorted, and deposited by glacial melt water.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

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.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Sinkhole. A depression in the landscape where limestone has been dissolved.

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.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

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 insure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded and 6 to 15 inches (15 to 38 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Breaking up a compact subsoil by pulling a special chisel through the soil.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons. Includes all subdivisions of these horizons.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Till plain. An extensive flat to undulating area underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, are in soils in extremely small amounts. They are essential to plant growth.

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 melt water. 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.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve. A sedimentary layer or a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by melt water streams, in a glacial lake or other body of still water in front of a glacier.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1951-74 at Bedford, Indiana]

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average daily	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----	41.5	23.1	32.3	67	-9	0	2.85	1.59	3.96	7	4.5
February---	46.5	26.0	36.2	71	-1	6	2.75	1.37	3.94	6	3.5
March------	53.7	31.9	42.8	79	7	65	4.19	2.00	6.07	8	1.1
April------	69.8	45.4	57.7	86	22	237	4.13	2.06	5.92	8	.1
May--------	77.6	53.3	65.5	92	32	481	3.55	2.20	4.75	7	.0
June-------	84.2	60.5	72.4	97	42	672	4.27	2.37	5.94	7	.0
July-------	87.5	64.3	75.9	99	49	803	3.53	2.20	4.72	6	.0
August-----	86.3	62.0	74.2	98	46	750	3.46	1.59	5.05	6	.0
September--	80.1	55.1	67.6	96	35	528	3.29	1.38	4.91	6	.0
October----	70.1	44.3	57.2	90	22	246	2.03	.96	2.93	5	.0
November---	54.4	34.3	44.4	80	13	25	3.31	2.02	4.45	7	1.1
December---	44.1	26.7	35.4	70	-4	20	3.54	2.02	4.88	7	3.2
Yearly:											
Average--	66.3	43.9	55.1	---	---	---	---	---	---	---	---
Extreme--	---	---	---	103	-10	---	---	---	---	---	---
Total----	---	---	---	---	---	3,833	40.90	36.30	46.57	80	13.5

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50° F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

[Recorded in the period 1951-74 at Bedford, 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--	April 12	April 19	May 10
2 years in 10 later than--	April 6	April 15	May 4
5 years in 10 later than--	March 26	April 7	April 22
First freezing temperature in fall:			
1 year in 10 earlier than--	October 24	October 10	October 3
2 years in 10 earlier than--	October 28	October 15	October 8
5 years in 10 earlier than--	November 6	October 25	October 16

TABLE 3.--GROWING SEASON

[Recorded in the period 1951-74 at Bedford, Indiana]

Probability	Length of the growing season if daily minimum temperature is--		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	202	184	153
8 years in 10	210	190	161
5 years in 10	224	200	176
2 years in 10	239	210	192
1 year in 10	247	216	200

TABLE 4.--POTENTIAL AND LIMITATIONS OF MAP UNITS ON THE GENERAL SOIL MAP

Map Unit	Extent of area	Cultivated farm crops	Woodland	Urban uses	Intensive recreation areas
	Pct				
1. Crider-Frederick-Bedford	32	Fair: slope.	Good	Fair: slope, permeability.	Fair: wetness, slope.
2. Wellston-Gilpin	14	Poor: slope.	Fair: slope.	Poor: slope, depth to rock.	Poor: slope.
3. Crider-Frederick	13	Fair: slope.	Good	Poor: slope, sinkholes.	Fair: slope.
4. Ebal-Hosmer-Crider	12	Poor: slope.	Good	Poor: slope, wetness, rooting depth.	Poor: slope.
5. Gilpin-Weikert-Berks	12	Poor: slope, depth to rock.	Fair: slope, depth to rock.	Poor: slope, depth to rock.	Poor: slope.
6. Caneyville-Haymond-Stendal	9	Fair: slope, depth to rock, flooding.	Fair: slope, flooding.	Poor: slope, flooding.	Fair: slope, flooding.
7. Nolin-Alvin-Bloomfield	5	Fair: slope, flooding.	Fair: slope, flooding.	Poor: slope, flooding, poor filter.	Fair: flooding, slope.
8. Hoosierville-Bedford	3	Fair: wetness.	Fair: wetness.	Poor: wetness.	Fair: wetness.

TABLE 5.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
Ab	Abscota sand, frequently flooded	801	0.3
AnD	Alvin sandy loam, 12 to 22 percent slopes	2,563	0.9
Ba	Bartle silt loam, rarely flooded	2,462	0.8
BdB2	Bedford silt loam, 2 to 6 percent slopes, eroded	16,070	5.5
BmC	Bloomfield loamy sand, 3 to 10 percent slopes	2,607	0.9
Bo	Bonnie silt loam, frequently flooded	958	0.3
Bu	Burnside silt loam, frequently flooded	6,652	2.3
CcC2	Caneyville silt loam, 6 to 12 percent slopes, eroded	3,472	1.2
CcD2	Caneyville silt loam, 12 to 20 percent slopes, eroded	13,536	4.6
CfF	Caneyville-Gilpin-Rock outcrop complex, 25 to 75 percent slopes	12,543	4.3
Cg	Chagrin loam, frequently flooded	1,779	0.6
CrB	Crider silt loam, 2 to 6 percent slopes	10,062	3.4
CrC2	Crider silt loam, 6 to 12 percent slopes, eroded	32,699	11.0
CrD2	Crider silt loam, 12 to 18 percent slopes, eroded	1,932	0.7
CsD2	Crider-Caneyville silt loams, 12 to 18 percent slopes, eroded	10,064	3.4
CwD2	Crider-Frederick silt loams, karst, 6 to 20 percent slopes, eroded	27,365	9.3
Dp	Dumps-Pits-Udorthents complex	2,046	0.7
EbC2	Ebal silt loam, 6 to 12 percent slopes, eroded	3,974	1.4
EdD	Ebal-Wellston silt loams, 12 to 24 percent slopes	13,467	4.6
EkB2	Elkinsville Variant loam, 2 to 6 percent slopes, eroded	551	0.2
FrC2	Frederick silt loam, 6 to 12 percent slopes, eroded	4,330	1.5
FrD	Frederick silt loam, 12 to 18 percent slopes	8,293	2.8
FtD3	Frederick silty clay loam, gullied, 10 to 18 percent slopes	2,173	0.7
FwC2	Frederick-Crider silt loams, karst, 2 to 12 percent slopes, eroded	11,041	3.8
GrC	Gilpin-Crider silt loams, 6 to 20 percent slopes	4,310	1.5
GwF	Gilpin-Weikert-Wellston complex, 18 to 50 percent slopes	12,186	4.1
Ho	Haymond silt loam, frequently flooded	7,703	2.6
HrA	Henshaw silt loam, rarely flooded, 1 to 3 percent slopes	1,048	0.4
Hs	Hoosierville silt loam	3,842	1.3
HxB2	Hosmer silt loam, 1 to 6 percent slopes, eroded	5,265	1.8
MdB2	Markland silty clay loam, 2 to 6 percent slopes, eroded	1,068	0.4
MhA	McGary silty clay loam, frequently flooded, 0 to 2 percent slopes	1,542	0.5
MuA	Muren silt loam, 1 to 3 percent slopes	2,424	0.8
Ne	Newark silt loam, frequently flooded	613	0.2
No	Nolin silt loam, frequently flooded	4,442	1.5
PeB	Pekin silt loam, 2 to 6 percent slopes	1,290	0.4
PeC2	Pekin silt loam, 6 to 12 percent slopes, eroded	923	0.3
Ph	Petrolia silty clay loam, frequently flooded	727	0.2
PnB	Princeton-Alvin complex, 2 to 6 percent slopes	997	0.3
St	Stendal silt loam, clayey substratum, frequently flooded	2,532	0.9
TyB	Tyner-Alvin loamy sands, 2 to 7 percent slopes	821	0.3
Ua	Udorthents, loamy	1,684	0.6
WbF	Weikert-Berks-Gilpin complex, 25 to 75 percent slopes	26,637	9.1
WeC2	Wellston silt loam, 6 to 12 percent slopes, eroded	4,667	1.6
WeD2	Wellston silt loam, 12 to 18 percent slopes, eroded	5,857	2.0
WfD3	Wellston silt loam, gullied, 10 to 18 percent slopes	1,761	0.6
WgD2	Wellston-Gilpin silt loams, 12 to 18 percent slopes, eroded	5,839	2.0
Wr	Wilbur silt loam, frequently flooded	1,986	0.7
	Water	2,156	0.7
	Total	293,760	100.0

TABLE 6.--CAPABILITY 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 figure 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	Capability class or subclass	Corn	Soybeans	Winter wheat	Grass-legume hay	Tall fescue
		Bu	Bu	Bu	Ton	AUM*
Ab------------- Abscota	IVs	70	25	28	2.5	5.0
AnD------------- Alvin	VIe	---	---	---	---	---
Ba------------- Bartle	IIw	110	38	50	3.6	7.2
BdB2------------- Bedford	IIe	90	30	38	2.8	5.6
BmC------------- Bloomfield	IVs	75	29	39	3.0	6.0
Bo------------- Bonnie	IIIw	113	37	46	4.0	8.0
Bu------------- Burnside	IIs	90	31	39	3.2	6.4
CcC2------------- Caneyville	IVe	70	21	28	3.5	7.0
CcD2------------- Caneyville	VIe	---	---	---	---	---
CfF------------- Caneyville-Gilpin-Rock outcrop	VIIe	---	---	---	---	---
Cg------------- Chagrin	IIw	115	35	46	4.5	9.0
CrB------------- Crider	IIe	120	45	48	5.0	10.0
CrC2------------- Crider	IIIe	100	35	40	3.3	6.6
CrD2------------- Crider	IVe	95	33	38	3.1	6.2
CsD2------------- Crider-Caneyville	IVe	---	---	---	---	---
CwD2------------- Crider-Frederick	IVe	---	---	---	3.1	6.2
Dp**. Dumps-Pits-Udorthents						
EbC2------------- Ebal	IIIe	100	36	36	3.3	6.6
EdD------------- Ebal-Wellston	VIe	---	---	---	---	---
EkB2------------- Elkinsville Variant	IIe	115	40	46	3.5	7.0

See footnotes at end of table.

TABLE 6.--CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Capability class or subclass	Corn	Soybeans	Winter wheat	Grass-legume hay	Tall fescue
		Bu	Bu	Bu	Ton	AUM*
FrC2------------ Frederick	IIIe	100	35	40	3.3	6.6
FrD------------- Frederick	IVe	95	33	38	3.1	6.2
FtD3------------ Frederick	VIe	---	---	---	---	---
FwC2------------ Frederick-Crider	IIIe	120	42	48	4.0	8.0
GrC------------- Gilpin-Crider	IIIe	85	30	34	2.8	5.6
GwF------------- Gilpin-Weikert-Wellston	VIIe	---	---	---	---	---
Ho-------------- Haymond	IIw	110	39	42	3.7	8.0
HrA------------- Henshaw	IIw	110	39	44	3.6	7.2
Hs-------------- Hoosierville	IIIw	145	50	58	4.8	9.6
HxB2------------ Hosmer	IIe	95	33	43	3.1	6.2
MdB2------------ Markland	IIIe	80	28	36	2.6	5.2
MhA------------- McGary	IIw	100	35	45	2.3	4.6
MuA------------- Muren	I	125	44	50	4.1	8.2
Ne-------------- Newark	IIw	100	35	---	3.3	6.6
No-------------- Nolin	IIIw	90	32	34	3.0	6.0
PeB------------- Pekin	IIe	105	37	47	3.4	6.8
PeC2------------ Pekin	IIIe	85	30	38	2.8	5.6
Ph-------------- Petrolia	IIIw	110	38	45	4.2	8.4
PnB------------- Princeton-Alvin	IIe	95	33	43	3.1	6.2
St-------------- Stendal	IIw	110	40	45	3.4	7.8
TyB------------- Tyner-Alvin	IIIs	70	25	35	2.3	4.6
Ua**. Udorthents						

See footnotes at end of table.

TABLE 6.--CAPABILITY AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Capability class or subclass	Corn	Soybeans	Winter wheat	Grass-legume hay	Tall fescue
		Bu	Bu	Bu	Ton	AUM*
WbF------------- Weikert-Berks-Gilpin	VIIe	---	---	---	---	---
WeC2------------ Wellston	IIIe	100	35	40	4.0	8.0
WeD2------------ Wellston	IVe	95	33	35	3.5	7.0
WfD3------------ Wellston	VIe	---	---	---	---	---
WgD2------------ Wellston-Gilpin	IVe	95	33	35	3.5	7.0
Wr-------------- Wilbur	IIw	125	44	50	4.1	8.2

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

** 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)
		Acres	Acres	Acres
I	2,424	---	---	---
II	60,552	34,235	19,665	6,652
III	69,492	58,702	9,969	821
IV	70,540	67,132	---	3,408
V	---	---	---	---
VI	70,540	70,540	---	---
VII	51,366	51,366	---	---
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	Ordi-nation symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortal-ity	Management concerns: Wind-throw hazard	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
Ab----------------- Abscota	1s	Slight	Slight	Moderate	Slight	Moderate	Northern red oak---- White ash----------- Silver maple-------- Eastern cottonwood-- American sycamore---	83 80 --- --- ---	Eastern white pine, yellow-poplar, Virginia pine, white ash, black oak.
AnD---------------- Alvin	2r	Moderate	Moderate	Slight	Slight	Moderate	White oak----------- Northern red oak---- Black walnut-------- Yellow-poplar-------	80 80 --- 90	Green ash, black walnut, yellow-poplar, white oak, eastern white pine, American sycamore, red pine, black cherry.
Ba----------------- Bartle	3o	Slight	Slight	Slight	Slight	Slight	White oak----------- Pin oak------------- Yellow-poplar------- Sweetgum------------	75 85 85 80	Eastern white pine, baldcypress, white ash, red maple, yellow-poplar, American sycamore.
BdB2--------------- Bedford	3o	Slight	Slight	Slight	Slight	Slight	White oak----------- Northern red oak---- Yellow-poplar------- Virginia pine------- Sugar maple---------	70 75 90 75 75	Eastern white pine, red pine, yellow-poplar, white ash.
BmC---------------- Bloomfield	3s	Slight	Slight	Moderate	Slight	Slight	Black oak----------- White oak----------- Scarlet oak--------- Shagbark hickory----	70 --- --- ---	Eastern white pine, red pine, black oak, yellow-poplar.
Bo----------------- Bonnie	2w	Slight	Severe	Severe	Severe	Severe	Pin oak------------- Eastern cottonwood-- Sweetgum------------ Cherrybark oak------ American sycamore---	90 100 --- --- ---	Eastern cottonwood, red maple, American sycamore, sweetgum, baldcypress, pin oak, cherrybark oak.
Bu----------------- Burnside	1o	Slight	Slight	Slight	Slight	Moderate	Eastern cottonwood-- Yellow-poplar------- American sycamore--- Cherrybark oak------ Sweetgum------------	105 95 --- --- ---	Black walnut, American sycamore, pin oak, red maple, yellow-poplar, green ash.
CcC2--------------- Caneyville	3c	Slight	Moderate	Moderate	Slight	Slight	Northern red oak---- Yellow-poplar------- Eastern redcedar----	69 80 45	Virginia pine, eastern white pine.

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	Plant competition	Common trees	Site index	
CcD2 Caneyville	3c	Severe	Severe	Moderate	Slight	Slight	Scarlet oak Eastern redcedar	69 45	Virginia pine, eastern white pine.
CfF*:									
Caneyville	3c	Severe	Severe	Moderate	Slight	Slight	Scarlet oak Eastern redcedar	69 45	Virginia pine, eastern white pine.
Gilpin	3r	Severe	Severe	Moderate	Slight	Moderate	Northern red oak Yellow-poplar	70 90	Northern red oak, Virginia pine, eastern white pine, yellow-poplar, red pine.
Rock outcrop.									
Cg Chagrin	1o	Slight	Slight	Slight	Slight	Severe	Northern red oak Yellow-poplar Sugar maple White oak Black cherry White ash Black walnut	86 96 86 --- --- --- ---	Eastern white pine, black walnut, yellow-poplar, white ash.
CrB, CrC2 Crider	1o	Slight	Slight	Slight	Slight	------------	Northern red oak Yellow-poplar Virginia pine	88 97 78	Eastern white pine, yellow-poplar, black walnut, white ash, white oak, northern red oak.
CrD2 Crider	1r	Moderate	Moderate	Slight	Slight	------------	Northern red oak Yellow-poplar Virginia pine	88 97 78	Eastern white pine, yellow-poplar, black walnut, white ash, white oak, northern red oak.
CsD2*:									
Crider	1r	Moderate	Moderate	Slight	Slight	------------	Northern red oak Yellow-poplar Virginia pine	88 97 78	Eastern white pine, yellow-poplar, black walnut, white ash, white oak, northern red oak.
Caneyville	3c	Severe	Severe	Moderate	Slight	Slight	Scarlet oak Eastern redcedar	69 45	Virginia pine, eastern white pine.

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	Plant competition	Common trees	Site index	
CwD2*: Crider	1r	Moderate	Moderate	Slight	Slight	-----	White oak Black oak	60 65	Eastern white pine, black walnut, green ash, yellow-poplar, white oak, northern red oak.
Frederick	2r	Moderate	Severe	Slight	Slight	-----	Northern red oak Yellow-poplar White oak Black walnut	76 86 --- ---	Eastern white pine, yellow-poplar, green ash, pin oak, black oak.
EbC2 Ebal	2c	Slight	Slight	Moderate	Moderate	Moderate	Black oak Northern red oak Yellow-poplar	80 --- ---	Yellow-poplar, eastern cottonwood, American sycamore, pin oak, Austrian pine, green ash, red maple, black oak.
EdD*: Ebal	2c	Slight	Slight	Moderate	Moderate	Moderate	Black oak Northern red oak Yellow-poplar	80 --- ---	Yellow-poplar, eastern cottonwood, American sycamore, pin oak, Austrian pine, green ash, red maple, black oak.
Wellston	2r	Moderate	Moderate	Slight	Slight	Severe	Northern red oak Yellow-poplar Virginia pine White oak Black walnut Black cherry Sugar maple White ash	71 90 70 --- --- --- --- ---	Eastern white pine, black walnut, yellow-poplar, white oak, northern red oak, white ash, red pine, green ash, black cherry, American sycamore.
EkB2 Elkinsville Variant	1o	Slight	Slight	Slight	Slight	Moderate	White oak Yellow-poplar Sweetgum	90 98 76	Black walnut, white oak, yellow-poplar, northern red oak, white ash, green ash, eastern white pine, red pine, black cherry, American sycamore, eastern cottonwood.
FrC2 Frederick	2c	Slight	Moderate	Slight	Slight	-----	Northern red oak Yellow-poplar White oak Black walnut	76 86 ---	Eastern white pine, yellow-poplar, green ash, pin oak, black 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	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
FrD, FtD3----------- Frederick	2c	Moderate	Moderate	Slight	Slight	------------	Northern red oak---- Yellow-poplar------- White oak----------- Black walnut--------	76 86 --- ---	Eastern white pine, yellow-poplar, green ash, pin oak, black oak.
FwC2*: Frederick----------	2c	Slight	Moderate	Slight	Slight	------------	Northern red oak---- Yellow-poplar------- White oak----------- Black walnut--------	76 86 --- ---	Eastern white pine, yellow-poplar, green ash, pin oak, black oak.
Crider-------------	4o	Slight	Slight	Slight	Slight	------------	White oak----------- Black oak-----------	60 65	Eastern white pine, black walnut, green ash, white oak, northern red oak.
GrC*: Gilpin-------------	2o	Slight	Slight	Slight	Slight	Moderate	Northern red oak---- Yellow-poplar-------	80 95	Northern red oak, Virginia pine, eastern white pine, black cherry, yellow-poplar, red pine.
Crider-------------	4o	Slight	Slight	Slight	Slight	------------	White oak----------- Black oak-----------	60 65	Eastern white pine, black walnut, green ash, white oak, northern red oak.
GwF*: Gilpin-------------	3r	Severe	Severe	Moderate	Slight	Moderate	Northern red oak---- Yellow-poplar-------	70 90	Northern red oak, Virginia pine, eastern white pine, black cherry, yellow-poplar.
Weikert------------	4d	Moderate	Severe	Severe	Moderate	------------	Northern red oak---- Virginia pine-------	64 60	Eastern white pine, Virginia pine.
Wellston-----------	3r	Moderate	Moderate	Moderate	Slight	Severe	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.

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	Plant competition	Common trees	Site index	
Ho----------------- Haymond	1o	Slight	Slight	Slight	Slight	Moderate	Yellow-poplar-------- White oak------------ Black walnut---------	100 90 70	Eastern white pine, black walnut, yellow-poplar, white oak, white ash.
HrA---------------- Henshaw	1o	Slight	Slight	Slight	Slight	Severe	Pin oak-------------- Yellow-poplar-------- Sweetgum-------------	95 95 95	White ash, sweetgum, eastern cottonwood, yellow-poplar, cherrybark oak.
Hs----------------- Hoosierville	3w	Slight	Severe	Moderate	Moderate	Severe	Pin oak-------------- White oak------------ Sweetgum-------------	85 70 85	Eastern white pine, baldcypress, red maple, white ash, sweetgum.
HxB2--------------- Hosmer	2o	Slight	Slight	Slight	Moderate	Moderate	White oak------------ Yellow-poplar-------- Virginia pine-------- Sugar maple----------	75 90 75 75	Eastern white pine, red pine, yellow-poplar, white ash, Virginia pine.
MdB2--------------- Markland	2c	Slight	Slight	Severe	Severe	Moderate	White oak------------ Northern red oak----	75 78	Austrian pine, pin oak, yellow-poplar, green ash.
MhA---------------- McGary	2c	Slight	Slight	Moderate	Severe	Moderate	Pin oak-------------- Sweetgum------------- White oak------------ White ash------------ Red maple------------	85 90 75 --- ---	Austrian pine, baldcypress, green ash, red maple, yellow-poplar, American sycamore.
MuA---------------- Muren	1o	Slight	Slight	Slight	Slight	Severe	White oak------------ Yellow-poplar-------- Sweetgum-------------	90 98 76	Eastern white pine, black walnut, yellow-poplar, white ash.
Ne----------------- Newark	1w	Slight	Moderate	Slight	Moderate	Severe	Pin oak-------------- Eastern cottonwood-- Northern red oak---- Yellow-poplar-------- Sweetgum-------------	99 94 85 95 88	Eastern cottonwood, sweetgum, pin oak, red maple, American sycamore, eastern cottonwood, yellow-poplar.
No----------------- Nolin	1w	Slight	Moderate	Slight	Slight	Severe	Sweetgum------------- Cherrybark oak------- Eastern cottonwood-- River birch---------- Black willow--------- American sycamore---	92 97 --- --- --- ---	Sweetgum, red maple, green ash, pin oak.
PeB, PeC2---------- Pekin	3o	Slight	Slight	Slight	Slight	Slight	White oak------------ Yellow-poplar-------- Virginia pine-------- Sugar maple----------	70 85 75 75	Eastern white pine, red pine, yellow-poplar, white ash, 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	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Management concerns: Plant competition	Potential productivity: Common trees	Potential productivity: Site index	Trees to plant
Ph: Petrolia	2w	Slight	Moderate	Moderate	Slight	Severe	Eastern cottonwood	100	Eastern cottonwood, red maple, American sycamore, baldcypress, pin oak.
							Pin oak	90	
							Sweetgum	---	
							Cherrybark oak	---	
							American sycamore	---	
PnB*:									
Princeton	1o	Slight	Slight	Slight	Slight	Moderate	White oak	90	Eastern white pine, red pine, black walnut, yellow-poplar, white ash.
							Yellow-poplar	98	
							Sweetgum	76	
Alvin	2o	Slight	Slight	Slight	Slight	Moderate	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	
St: Stendal	2w	Slight	Moderate	Slight	Slight	Moderate	Pin oak	90	Eastern white pine, baldcypress, American sycamore, red maple, green ash.
							Sweetgum	85	
							Yellow-poplar	90	
							Virginia pine	90	
TyB*:									
Tyner	3s	Slight	Slight	Moderate	Slight	Slight	White oak	70	Eastern white pine, red pine, black oak.
							Red pine	72	
							Eastern white pine	65	
							Quaking aspen	72	
							Northern red oak	70	
Alvin	2o	Slight	Slight	Slight	Slight	Moderate	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	
WbF*:									
Weikert	4d	Moderate	Severe	Severe	Moderate	---	Northern red oak	64	Eastern white pine, red pine, Virginia pine, black oak.
							Virginia pine	60	
Berks	4f	Moderate	Severe	Moderate	Slight	---	Northern red oak	60	Virginia pine, eastern white pine, red pine, black oak.
							Black oak	60	
							Virginia pine	60	

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	Plant competition	Potential productivity: Common trees	Site index	Trees to plant
WbF*:									
Gilpin	3r	Severe	Severe	Moderate	Slight	Moderate	Northern red oak	70	Northern red oak, Virginia pine, eastern white pine, black cherry, yellow-poplar, red pine.
							Yellow-poplar	90	
WeC2 Wellston	2o	Slight	Slight	Slight	Slight	Severe	Northern red oak	71	Eastern white pine, black walnut, yellow-poplar, white oak, northern red oak, white ash, red pine, green ash, black cherry, American sycamore.
							Yellow-poplar	90	
							Virginia pine	70	
							White oak	---	
							Black walnut	---	
							Black cherry	---	
							Sugar maple	---	
							White ash	---	
WeD2, WfD3 Wellston	2r	Moderate	Moderate	Slight	Slight	Severe	Northern red oak	71	Eastern white pine, black walnut, yellow-poplar, white oak, northern red oak, white ash, red pine, green ash, black cherry, American sycamore.
							Yellow-poplar	90	
							Virginia pine	70	
							White oak	---	
							Black walnut	---	
							Black cherry	---	
							Sugar maple	---	
							White ash	---	
WgD2*:									
Wellston	2o	Slight	Slight	Slight	Slight	Severe	Northern red oak	71	Eastern white pine, black walnut, yellow-poplar, white oak, northern red oak, white ash, red pine, green ash, black cherry, American sycamore.
							Yellow-poplar	90	
							Virginia pine	70	
							White oak	---	
							Black walnut	---	
							Black cherry	---	
							Sugar maple	---	
							White ash	---	
Gilpin	2r	Moderate	Moderate	Slight	Slight	Moderate	Northern red oak	80	Northern red oak, Virginia pine, eastern white pine, black cherry, yellow-poplar, red pine.
							Yellow-poplar	95	
Wr Wilbur	1o	Slight	Slight	Slight	Slight	Moderate	Yellow-poplar	100	Eastern white pine, black walnut, yellow-poplar.

* 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 heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
Ab----------------- Abscota	---	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.
AnD---------------- 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.	---
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.	---
BdB2--------------- Bedford	---	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, Amur honeysuckle, Tatarian honeysuckle, American cranberrybush.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
BmC---------------- 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----------------- Bonnie	---	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	White fir, blue spruce, Washington hawthorn, northern white-cedar, Austrian pine, Norway spruce.	Eastern white pine	Pin oak.
Bu----------------- Burnside	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
CcC2, CcD2--------- Caneyville	---	American plum, Amur honeysuckle, autumn-olive.	Amur maple, eastern redcedar, Russian-olive.	American sycamore, Austrian pine, eastern white pine.	Eastern cottonwood, European alder, silver maple.

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of-- <8	8-15	16-25	26-35	>35
CfF*:					
Caneyville	---	American plum, Amur honeysuckle, autumn-olive.	Amur maple, eastern redcedar, Russian-olive.	American sycamore, Austrian pine, eastern white pine.	Eastern cottonwood, European alder, silver maple.
Gilpin	Mockorange	European burningbush, blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, American cranberrybush, autumn-olive.	Eastern hemlock	---	Honeylocust, eastern white pine, Norway spruce.
Rock outcrop.					
Cg: Chagrin	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
CrB, CrC2, CrD2: Crider	---	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.
CsD2*:					
Crider	---	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.
Caneyville	---	American plum, Amur honeysuckle, autumn-olive.	Amur maple, eastern redcedar, Russian-olive.	American sycamore, Austrian pine, eastern white pine.	Eastern cottonwood, European alder, silver maple.
CwD2*:					
Crider	Silky dogwood	Alternateleaf dogwood, autumn-olive, Amur honeysuckle, American plum.	Amur maple, eastern redcedar, green ash, hackberry, jack pine.	Shortleaf pine, eastern white pine.	---
Frederick.					
Dp*:					
Dumps.					
Pits.					
Udorthents.					
EbC2: Ebal	---	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 heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
EdD*:					
Ebal	---	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, Amur honeysuckle, Tatarian honeysuckle, American cranberrybush.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
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.
EkB2 Elkinsville Variant	---	Silky dogwood, American cranberrybush, Amur honeysuckle, white fir, Amur privet.	Washington hawthorn, northern white-cedar, blue spruce.	Austrian pine, Norway spruce.	Pin oak, eastern white pine.
FrC2, FrD, FtD3. Frederick					
FwC2*: Frederick.					
Crider	Silky dogwood	Alternateleaf dogwood, autumn-olive, Amur honeysuckle, American plum.	Amur maple, eastern redcedar, green ash, hackberry, jack pine.	Shortleaf pine, eastern white pine.	---
GrC*:					
Gilpin	Mockorange	European burningbush, blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, American cranberrybush, autumn-olive.	Eastern hemlock	---	Honeylocust, eastern white pine, Norway spruce.
Crider	Silky dogwood	Alternateleaf dogwood, autumn-olive, Amur honeysuckle, American plum.	Amur maple, eastern redcedar, green ash, hackberry, jack pine.	Shortleaf pine, eastern white pine.	---
GwF*:					
Gilpin	Mockorange	European burningbush, blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, American cranberrybush, autumn-olive.	Eastern hemlock	---	Honeylocust, eastern white pine, Norway spruce.

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
GwF*:					
Weikert	American hazel, flowering quince.	Blackhaw, cutleaf staghorn sumac, forsythia, autumn-olive.	Jack pine, Austrian pine, Russian-olive.	Virginia pine, red pine, scarlet oak.	---
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.
Ho 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.
HrA Henshaw	---	Blackhaw, arrowwood, cornelian cherry dogwood, Amur honeysuckle, American cranberrybush, autumn-olive.	---	Norway spruce, white spruce.	Eastern white pine.
Hs Hoosierville	---	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.
HxB2 Hosmer	---	Eastern redcedar, arrowwood, Washington hawthorn, Tatarian honeysuckle, Amur privet, American cranberrybush, Amur honeysuckle.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
MdB2 Markland	---	Arrowwood, Washington hawthorn, eastern redcedar, Amur honeysuckle, American cranberrybush, Tatarian honeysuckle, Amur privet.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
MhA McGary	---	Eastern redcedar, arrowwood, Washington hawthorn, Amur privet, Amur honeysuckle, American cranberrybush, Tatarian honeysuckle.	Green ash, Austrian pine, 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 heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
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.
Ne: Newark	---	Amur honeysuckle, silky dogwood, American cranberrybush, Amur privet.	Northern white-cedar, Austrian pine, Washington hawthorn, white fir, blue spruce.	Norway spruce	Eastern white pine, pin oak.
No. Nolin					
PeB, PeC2: Pekin	---	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, Amur honeysuckle, Tatarian honeysuckle, American cranberrybush.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
Ph: 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.
PnB*:					
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.	---
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.	---
St: Stendal	---	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.
TyB*:					
Tyner	Siberian peashrub	Eastern redcedar, radiant crabapple, Washington hawthorn, autumn-olive, Amur honeysuckle, lilac, Tatarian honeysuckle.	Austrian pine, jack pine, red pine.	Eastern white pine	---

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
TyB*:					
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.	---
Ua*. Udorthents					
WbF*:					
Weikert	American hazel, flowering quince.	Blackhaw, cutleaf staghorn sumac, forsythia, autumn-olive.	Jack pine, Austrian pine, Russian-olive.	Virginia pine, red pine, scarlet oak.	---
Berks	Siberian peashrub	Eastern redcedar, radiant crabapple, Washington hawthorn, autumn-olive, Amur honeysuckle, lilac, Tatarian honeysuckle.	Eastern white pine, Austrian pine, red pine, jack pine.	---	---
Gilpin	Mockorange	European burningbush, blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, American cranberrybush, autumn-olive.	Eastern hemlock	---	Honeylocust, eastern white pine, Norway spruce.
WeC2, WeD2, WfD3-- 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.
WgD2*:					
Wellston	---	Amur honeysuckle, Amur privet, American cranberrybush, silky dogwood.	White fir, northern white-cedar, blue spruce, Washington hawthorn.	Norway spruce, Austrian pine.	Pin oak, eastern white pine.
Gilpin	Mockorange	European burningbush, blackhaw, late lilac, Amur honeysuckle, shadblow serviceberry, American cranberrybush, autumn-olive.	Eastern hemlock	---	Honeylocust, eastern white pine, Norway spruce.

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average heights, in feet, of--				
	<8	8-15	16-25	26-35	>35
Wr----------------- Wilbur	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
Ab: Abscota	Severe: flooding, too sandy.	Severe: too sandy.	Severe: too sandy, flooding.	Severe: too sandy.	Severe: flooding.
AnD: Alvin	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Ba: Bartle	Severe: flooding, wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
BdB2: Bedford	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Slight	Slight.
BmC: Bloomfield	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: droughty, slope.
Bo: Bonnie	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
Bu: Burnside	Severe: flooding.	Moderate: wetness.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
CcC2: Caneyville	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope, thin layer.
CcD2: Caneyville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
CfF*:					
Caneyville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.					
Cg: Chagrin	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
CrB: Crider	Slight	Slight	Moderate: slope.	Slight	Slight.
CrC2: Crider	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
CrD2: Crider	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
CsD2*:					
Crider	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Caneyville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
CwD2*:					
Crider	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Frederick	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Dp*:					
Dumps.					
Pits.					
Udorthents.					
EbC2 Ebal	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Moderate: slope.
EdD*:					
Ebal	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Severe: slope.
Wellston	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
EkB2 Elkinsville Variant	Slight	Slight	Moderate: slope.	Slight	Slight.
FrC2 Frederick	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
FrD, FtD3 Frederick	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
FwC2*:					
Frederick	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Crider	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
GrC*:					
Gilpin	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope, thin layer, small stones.
Crider	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
GwF*:					
Gilpin	Severe: slope.	Severe: slope.	Severe: small stones, slope.	Severe: slope.	Severe: slope.
Weikert	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, depth to rock, small stones.	Severe: slope.	Severe: slope, thin layer, small stones.
Wellston	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Ho Haymond	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
HrA: Henshaw	Severe: flooding, wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Severe: erodes easily.	Moderate: wetness.
Hs: Hoosierville	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
HxB2: Hosmer	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Severe: erodes easily.	Slight.
MdB2: Markland	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
MhA: McGary	Severe: flooding, wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, flooding, percs slowly.	Moderate: wetness.	Severe: flooding.
MuA: Muren	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Slight	Slight.
Ne: Newark	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness, erodes easily.	Severe: wetness, flooding.
No: Nolin	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
PeB: Pekin	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Slight	Slight.
PeC2: Pekin	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Moderate: slope.
Ph: Petrolia	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
PnB*:					
Princeton	Slight	Slight	Moderate: slope.	Slight	Slight.
Alvin	Slight	Slight	Moderate: slope.	Slight	Slight.
St: Stendal	Severe: flooding, wetness.	Moderate: flooding, wetness.	Severe: wetness, flooding.	Moderate: wetness, flooding.	Severe: flooding.
TyB*:					
Tyner	Slight	Slight	Moderate: slope, small stones.	Slight	Moderate: droughty.
Alvin	Slight	Slight	Moderate: slope.	Slight	Slight.
Ua*. Udorthents					
WbF*:					
Weikert	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, depth to rock, small stones.	Severe: slope.	Severe: slope, thin layer, small stones.

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
WbF*:					
Berks	Severe: slope.	Severe: small stones.	Severe: slope.	Severe: slope.	Severe: slope.
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
WeC2 Wellston	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
WeD2, WfD3 Wellston	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
WgD2*:					
Wellston	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Wr Wilbur	Severe: flooding.	Moderate: flooding, wetness.	Severe: flooding.	Moderate: flooding.	Severe: flooding.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--WILDLIFE HABITAT

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
Ab----------------- Abscota	Poor	Fair	Good	Fair	Fair	Poor	Very poor.	Fair	Fair	Very poor.
AnD---------------- Alvin	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Ba----------------- Bartle	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
BdB2--------------- Bedford	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
BmC---------------- Bloomfield	Poor	Fair	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Bo----------------- Bonnie	Poor	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
Bu----------------- Burnside	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
CcC2--------------- Caneyville	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
CcD2--------------- Caneyville	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
CfF*:										
Caneyville---------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Gilpin-------------	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Rock outcrop.										
Cg----------------- Chagrin	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
CrB---------------- Crider	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
CrC2--------------- Crider	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
CrD2--------------- Crider	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
CsD2*:										
Crider-------------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Caneyville---------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
CwD2*:										
Crider-------------	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Frederick----------	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
Dp*: Dumps.										
Pits.										
Udorthents.										
EbC2 Ebal	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
EdD*: Ebal	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Wellston	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
EkB2 Elkinsville Variant	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
FrC2 Frederick	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
FrD, FtD3 Frederick	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
FwC2*: Frederick	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Crider	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
GrC*: Gilpin	Fair	Good	Good	Fair	Fair	Very poor.	Very poor.	Good	Fair	Very poor.
Crider	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
GwF*: Gilpin	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
Weikert	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Wellston	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Ho Haymond	Poor	Fair	Fair	Good	Good	Poor	Poor	Fair	Good	Poor.
HrA Henshaw	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Hs Hoosierville	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
HxB2 Hosmer	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
MdB2 Markland	Good	Good	Good	Good	Good	Poor	Very poor.	Good	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 herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
MhA: McGary	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
MuA: Muren	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Ne: Newark	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
No: Nolin	Poor	Fair	Fair	Good	Good	Poor	Very poor.	Fair	Fair	Very poor.
PeB: Pekin	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
PeC2: Pekin	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Ph: Petrolia	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
PnB*:										
Princeton	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Alvin	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
St: Stendal	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
TyB*:										
Tyner	Fair	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Alvin	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Ua*. Udorthents										
WbF*:										
Weikert	Very poor.	Poor	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Poor	Very poor.	Very poor.
Berks	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Gilpin	Very poor.	Poor	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
WeC2: Wellston	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
WeD2, WfD3: Wellston	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
WgD2*:										
Wellston	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Gilpin	Poor	Fair	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
Wr: Wilbur	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 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]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Ab----------------- Abscota	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
AnD---------------- Alvin	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Ba----------------- Bartle	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: frost action.	Moderate: wetness.
BdB2--------------- Bedford	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength, frost action.	Slight.
BmC---------------- Bloomfield	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope.	Moderate: droughty, slope.
Bo----------------- Bonnie	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding.
Bu----------------- Burnside	Moderate: depth to rock, large stones, wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
CcC2--------------- Caneyville	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Severe: low strength.	Moderate: slope, thin layer.
CcD2--------------- Caneyville	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
CfF*:						
Caneyville--------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Gilpin------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Rock outcrop.						
Cg----------------- Chagrin	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
CrB---------------- Crider	Moderate: too clayey.	Slight----------	Slight----------	Moderate: slope.	Severe: low strength.	Slight.
CrC2--------------- Crider	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength.	Moderate: slope.
CrD2--------------- Crider	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, 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
CsD2*:						
Crider	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Caneyville	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
CwD2*:						
Crider	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
Frederick	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Dp*:						
Dumps.						
Pits.						
Udorthents.						
EbC2 Ebal	Moderate: too clayey, wetness, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: slope.
EdD*:						
Ebal	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
Wellston	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, frost action.	Severe: slope.
EkB2 Elkinsville Variant	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
FrC2 Frederick	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Severe: shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
FrD, FtD3 Frederick	Severe: slope.	Severe: slope.	Severe: slope, shrink-swell.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
FwC2*:						
Frederick	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Severe: shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
Crider	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
GrC*:						
Gilpin	Moderate: slope, depth to rock.	Moderate: slope.	Moderate: slope, depth to rock.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope, thin layer.
Crider	Moderate: too clayey, slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: low strength, frost action.	Moderate: 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
GwF*:						
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Weikert	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.	Severe: slope, thin layer, small stones.
Wellston	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, frost action.	Severe: slope.
Ho Haymond	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding, frost action.	Severe: flooding.
HrA Henshaw	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness, flooding.	Severe: wetness, flooding.	Severe: low strength.	Moderate: wetness.
Hs Hoosierville	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action, low strength.	Severe: wetness.
HxB2 Hosmer	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness.	Moderate: shrink-swell, slope.	Severe: frost action.	Slight.
MdB2 Markland	Moderate: too clayey, wetness.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
MhA McGary	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, flooding, shrink-swell.	Severe: flooding.
MuA Muren	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
Ne Newark	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding.
No Nolin	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: low strength, flooding.	Severe: flooding.
PeB Pekin	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness, slope.	Severe: low strength, frost action.	Slight.
PeC2 Pekin	Severe: wetness.	Moderate: wetness, slope.	Severe: wetness.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
Ph Petrolia	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding.
PnB*:						
Princeton	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.

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
PnB*:						
Alvin	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
St: Stendal	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.	Severe: flooding.
TyB*:						
Tyner	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Slight	Moderate: droughty.
Alvin	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
Ua*. Udorthents						
WbF*:						
Weikert	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope.	Severe: slope, thin layer, small stones.
Berks	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
WeC2: Wellston	Moderate: depth to rock, slope.	Moderate: slope.	Moderate: depth to rock, slope.	Severe: slope.	Severe: frost action.	Moderate: slope.
WeD2, WfD3: Wellston	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, frost action.	Severe: slope.
WgD2*:						
Wellston	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: frost action, slope.	Severe: slope.
Gilpin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Wr: Wilbur	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding, frost action.	Severe: flooding.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Ab-------------------- Abscota	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage, too sandy.	Severe: flooding, seepage.	Poor: seepage, too sandy.
AnD------------------- Alvin	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: slope.
Ba-------------------- Bartle	Severe: wetness, percs slowly.	Slight-----------	Severe: wetness.	Severe: wetness.	Poor: wetness.
BdB2------------------ Bedford	Severe: wetness, percs slowly.	Moderate: slope.	Severe: too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
BmC------------------- Bloomfield	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage.	Severe: seepage.	Poor: seepage.
Bo-------------------- Bonnie	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
Bu-------------------- Burnside	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, depth to rock, wetness.	Severe: flooding, wetness.	Poor: small stones.
CcC2------------------ Caneyville	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
CcD2------------------ Caneyville	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
CfF*:					
Caneyville------------	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
Gilpin----------------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Poor: slope, area reclaim, thin layer.
Rock outcrop.					
Cg-------------------- Chagrin	Severe: flooding.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Good.
CrB------------------- Crider	Slight-----------	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.

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
CrC2: Crider	Moderate: slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
CrD2: Crider	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
CsD2*:					
Crider	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Caneyville	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
CwD2*:					
Crider	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope, thin layer.
Frederick	Severe: slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
Dp*:					
Dumps.					
Pits.					
Udorthents.					
EbC2: Ebal	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.
EdD*:					
Ebal	Severe: wetness, percs slowly, slope.	Severe: slope, wetness.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
Wellston	Severe: slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.
EkB2: Elkinsville Variant	Slight	Moderate: seepage, slope.	Slight	Slight	Good.
FrC2: Frederick	Moderate: percs slowly, slope.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
FrD, FtD3: Frederick	Severe: slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
FwC2*:					
Frederick	Moderate: percs slowly, slope.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
Crider	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Poor: thin layer.

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
GrC*:					
Gilpin	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, thin layer.
Crider	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Poor: thin layer.
GwF*:					
Gilpin	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Poor: slope, area reclaim, thin layer.
Weikert	Severe: slope, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage, depth to rock.	Poor: slope, area reclaim, seepage.
Wellston	Severe: slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.
Ho Haymond	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Good.
HrA Henshaw	Severe: wetness, percs slowly.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Hs Hoosierville	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness, hard to pack.
HxB2 Hosmer	Severe: wetness, percs slowly.	Moderate: slope.	Moderate: wetness, too clayey.	Moderate: wetness.	Fair: too clayey, wetness.
MdB2 Markland	Severe: wetness, percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
MhA McGary	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
MuA Muren	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
Ne Newark	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
No Nolin	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: too clayey.
PeB Pekin	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, 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
PeC2----------------- Pekin	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, slope, wetness.
Ph------------------- Petrolia	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
PnB*:					
Princeton-----------	Slight-----------	Severe: seepage.	Severe: seepage.	Slight-----------	Good.
Alvin---------------	Slight-----------	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: thin layer.
St------------------- Stendal	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
TyB*:					
Tyner---------------	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: too sandy, seepage.
Alvin---------------	Slight-----------	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: thin layer.
Ua*. Udorthents					
WbF*:					
Weikert-------------	Severe: slope, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage, depth to rock.	Poor: slope, area reclaim, seepage.
Berks---------------	Severe: slope, depth to rock.	Severe: slope, seepage, depth to rock.	Severe: slope, depth to rock, seepage.	Severe: slope, seepage, depth to rock.	Poor: slope, small stones, area reclaim.
Gilpin--------------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Poor: slope, area reclaim, thin layer.
WeC2----------------- Wellston	Moderate: depth to rock, percs slowly, slope.	Severe: slope.	Severe: depth to rock.	Moderate: depth to rock, slope.	Fair: area reclaim, small stones, slope.
WeD2, WfD3----------- Wellston	Severe: slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.
WgD2*:					
Wellston------------	Severe: slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.
Gilpin--------------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Poor: slope, area reclaim, thin layer.

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
Wr-------------------- Wilbur	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Ab: Abscota	Good	Probable	Improbable: too sandy.	Poor: too sandy.
AnD: Alvin	Fair: slope.	Probable	Improbable: too sandy.	Poor: slope.
Ba: Bartle	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
BdB2: Bedford	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim.
BmC: Bloomfield	Good	Probable	Improbable: too sandy.	Fair: too sandy, slope.
Bo: Bonnie	Poor: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Bu: Burnside	Fair: area reclaim, thin layer, large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: small stones, area reclaim.
CcC2: Caneyville	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
CcD2: Caneyville	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
CfF*:				
Caneyville	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
Gilpin	Poor: area reclaim, thin layer, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
Rock outcrop.				
Cg: Chagrin	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
CrB: Crider	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
CrC2: Crider	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
CrD2: Crider	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
CsD2*:				
Crider	Poor: low strength.	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
CsD2*:				
Caneyville	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
CwD2*:				
Crider	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Frederick	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey, thin layer.
Dp*:				
Dumps.				
Pits.				
Udorthents.				
EbC2 Ebal	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
EdD*:				
Ebal	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Wellston	Fair: area reclaim, thin layer, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
EkB2 Elkinsville Variant	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
FrC2 Frederick	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, thin layer.
FrD, FtD3 Frederick	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, too clayey, thin layer.
FwC2*:				
Frederick	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, thin layer.
Crider	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim, slope.
GrC*:				
Gilpin	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Crider	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim, slope.

See footnote at end of table.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
GwF*:				
Gilpin	Poor: area reclaim, thin layer, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
Weikert	Poor: slope, area reclaim, thin layer.	Improbable: small stones.	Improbable: thin layer.	Poor: slope, small stones, area reclaim.
Wellston	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Ho Haymond	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
HrA Henshaw	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Hs Hoosierville	Poor: wetness, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
HxB2 Hosmer	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
MdB2 Markland	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
MhA McGary	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
MuA Muren	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
Ne Newark	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
No Nolin	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
PeB Pekin	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
PeC2 Pekin	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
Ph Petrolia	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
PnB*:				
Princeton	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
Alvin	Good	Probable	Improbable: too sandy.	Fair: too sandy.
St Stendal	Poor: low strength.	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
TyB*:				
Tyner	Good	Probable	Improbable: too sandy.	Poor: thin layer.
Alvin	Good	Probable	Improbable: too sandy.	Fair: too sandy.
Ua*. Udorthents				
WbF*:				
Weikert	Poor: slope, area reclaim.	Improbable: small stones.	Improbable: thin layer.	Poor: slope, small stones, area reclaim.
Berks	Poor: slope, area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
Gilpin	Poor: thin layer, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
WeC2 Wellston	Fair: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
WeD2, WfD3 Wellston	Fair: area reclaim, thin layer, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
WgD2*:				
Wellston	Fair: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Gilpin	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope, small stones.
Wr Wilbur	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 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]

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
Ab----------------- Abscota	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Droughty.
AnD---------------- Alvin	Severe: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, soil blowing.	Slope.
Ba----------------- Bartle	Moderate: seepage.	Moderate: piping, wetness.	Severe: no water.	Percs slowly, frost action.	Erodes easily, wetness, rooting depth.	Wetness, erodes easily, rooting depth.
BdB2--------------- Bedford	Moderate: seepage, slope.	Moderate: hard to pack, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Erodes easily, wetness.	Erodes easily, rooting depth.
BmC---------------- Bloomfield	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, too sandy, soil blowing.	Slope, droughty, rooting depth.
Bo----------------- Bonnie	Moderate: seepage.	Severe: wetness.	Severe: slow refill.	Flooding, frost action, wetness.	Erodes easily, wetness.	Wetness, erodes easily.
Bu----------------- Burnside	Moderate: seepage, depth to rock.	Severe: large stones.	Moderate: deep to water, slow refill, large stones.	Deep to water	Large stones, erodes easily.	Large stones, erodes easily.
CcC2, CcD2--------- Caneyville	Moderate: depth to rock.	Severe: thin layer, hard to pack.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock.
CfF*:						
Caneyville---------	Severe: slope.	Severe: thin layer, hard to pack.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock.
Gilpin------------	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock, large stones.	Slope, depth to rock, large stones.
Rock outcrop.						
Cg----------------- Chagrin	Moderate: seepage.	Severe: piping.	Severe: cutbanks cave.	Deep to water	Favorable-------	Favorable.
CrB---------------- Crider	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Favorable-------	Favorable.
CrC2, CrD2--------- Crider	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Slope-----------	Slope.
CsD2*:						
Crider------------	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Slope-----------	Slope.
Caneyville---------	Moderate: depth to rock.	Severe: thin layer, hard to pack.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock.
CwD2*:						
Crider------------	Severe: slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope-----------	Slope.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
CwD2*:						
Frederick	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope	Slope.
Dp*:						
Dumps.						
Pits.						
Udorthents.						
EbC2 Ebal	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope, erodes easily, percs slowly.	Slope, erodes easily, rooting depth.
EdD*:						
Ebal	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope, erodes easily, percs slowly.	Slope, erodes easily, rooting depth.
Wellston	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
EkB2 Elkinsville Variant	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Favorable	Favorable.
FrC2, FrD, FtD3 Frederick	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope	Slope.
FwC2*:						
Frederick	Severe: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Slope	Slope.
Crider	Severe: slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope	Slope.
GrC*:						
Gilpin	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock, large stones.	Slope, depth to rock, large stones.
Crider	Severe: slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope	Slope.
GwF*:						
Gilpin	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock, large stones.	Slope, depth to rock, large stones.
Weikert	Severe: depth to rock, slope, seepage.	Severe: seepage, thin layer.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, droughty.
Wellston	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
Ho Haymond	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
HrA Henshaw	Slight	Severe: piping, wetness.	Severe: slow refill.	Favorable	Erodes easily, wetness.	Wetness, erodes easily.
Hs Hoosierville	Slight	Severe: wetness.	Severe: slow refill.	Frost action	Erodes easily, wetness.	Wetness, erodes easily.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
HxB2: Hosmer	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Percs slowly, frost action, slope.	Erodes easily, wetness.	Erodes easily, rooting depth.
MdB2: Markland	Moderate: slope.	Moderate: hard to pack.	Severe: no water.	Deep to water	Erodes easily, percs slowly.	Erodes easily, percs slowly.
MhA: McGary	Slight	Severe: wetness.	Severe: slow refill.	Percs slowly, flooding.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily.
MuA: Muren	Moderate: seepage.	Moderate: thin layer, wetness.	Severe: slow refill.	Deep to water	Erodes easily	Erodes easily.
Ne: Newark	Moderate: seepage.	Severe: piping, wetness.	Moderate: slow refill.	Flooding, frost action.	Erodes easily, wetness.	Wetness, erodes easily.
No: Nolin	Severe: seepage.	Severe: piping.	Moderate: deep to water slow refill.	Deep to water	Erodes easily	Erodes easily.
PeB: Pekin	Moderate: seepage, slope.	Severe: piping.	Severe: slow refill.	Percs slowly, frost action, slope.	Erodes easily, wetness.	Erodes easily, rooting depth.
PeC2: Pekin	Severe: slope.	Severe: piping.	Severe: slow refill.	Percs slowly, frost action, slope.	Slope, erodes easily, wetness.	Slope, erodes easily, rooting depth.
Ph: Petrolia	Slight	Severe: wetness.	Severe: slow refill.	Flooding, frost action.	Wetness	Wetness.
PnB*: Princeton	Moderate: seepage, slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Soil blowing	Favorable.
Alvin	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Soil blowing	Favorable.
St: Stendal	Moderate: seepage.	Severe: piping, wetness.	Severe: slow refill.	Flooding, frost action.	Erodes easily, wetness.	Wetness, erodes easily.
TyB*: Tyner	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Droughty.
Alvin	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Soil blowing	Favorable.
Ua*. Udorthents						
WbF*: Weikert	Severe: depth to rock, slope, seepage.	Severe: seepage, thin layer.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, droughty.
Berks	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, droughty, depth to rock.
Gilpin	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock, large stones.	Slope, depth to rock, large stones.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Features affecting-- Drainage	Terraces and diversions	Grassed waterways
WeC2, WeD2, WfD3-- Wellston	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
WgD2*:						
Wellston----------	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily.
Gilpin------------	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock, large stones.	Slope, depth to rock, large stones.
Wr---------------- Wilbur	Moderate: seepage.	Severe: piping, wetness.	Moderate: slow refill.	Flooding, frost action.	Erodes easily, wetness.	Erodes easily.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments > 3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
Ab: Abscota	0-6	Sand	SM, SP-SM	A-2-4, A-3	0	95-100	95-100	50-70	5-15	---	NP
	6-60	Loamy sand, sand	SP, SM, SP-SM	A-2-4, A-1, A-3	0	95-100	95-100	45-75	3-20	---	NP
AnD: Alvin	0-13	Sandy loam	SM, ML	A-4, A-2	0	100	100	80-95	30-60	<25	NP-4
	13-59	Very fine sandy loam, sandy loam, sandy clay loam.	SM, SC, CL, ML	A-2, A-4, A-6	0	100	100	90-100	20-80	15-38	NP-13
	59-80	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
Ba: Bartle	0-16	Silt loam	CL, CL-ML	A-4, A-6	0	100	100	85-100	65-90	20-35	5-15
	16-24	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
	24-67	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	90-100	70-95	30-45	10-25
	67-80	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	70-95	30-45	10-25
BdB2: Bedford	0-7	Silt loam	CL, ML	A-6, A-4	0	100	100	95-100	85-95	30-40	5-15
	7-21	Silty clay loam	CL	A-6, A-7	0	100	95-100	95-100	85-95	25-45	15-25
	21-39	Silty clay loam	CL	A-6, A-7	0	100	95-100	95-100	85-95	25-45	15-25
	39-80	Silty clay, clay, silty clay loam.	CL, CH	A-7	0-5	90-100	75-95	70-95	65-90	45-55	20-30
BmC: Bloomfield	0-31	Loamy sand, sand	SM, SP, SP-SM	A-2-4, A-3, A-4	0	100	100	70-90	4-40	---	NP
	31-74	Sand, fine sandy loam, loamy sand.	SM, SP, SP-SM	A-2-4, A-4, A-3	0	100	100	65-80	4-40	<20	NP-3
	74-80	Sand	SP, SM, SP-SM	A-2-4, A-3	0	100	100	65-80	4-30	---	NP
Bo: Bonnie	0-9	Silt loam	CL	A-4, A-6	0	100	100	95-100	90-100	27-34	8-12
	9-36	Silt loam	CL	A-4, A-6	0	100	100	95-100	90-100	27-34	8-12
	36-60	Silt loam	CL	A-4, A-6	0	100	100	90-100	80-100	25-39	8-15
Bu: Burnside	0-16	Silt loam	ML, CL, CL-ML	A-4	0-10	100	100	80-95	75-95	20-35	2-10
	16-42	Very channery loam, channery silt loam.	SC, GC, SM, GM	A-2, A-4	10-60	35-80	30-60	30-50	26-45	<20	NP-10
	42	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
CcC2, CcD2: Caneyville	0-14	Silt loam	ML, CL, CL-ML	A-4, A-6	0-3	90-100	85-100	75-100	60-95	20-35	2-12
	14-33	Silty clay, clay, silty clay loam.	CH, CL	A-7	0-3	90-100	85-100	75-100	65-100	42-70	20-45
	33	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
CfF*:											
Caneyville	0-9	Silt loam	ML, CL, CL-ML	A-4, A-6	0-3	90-100	85-100	75-100	60-95	20-35	2-12
	9-24	Silty clay, clay, silty clay loam.	CH, CL	A-7	0-3	90-100	85-100	75-100	65-100	42-70	20-45
	24-34	Clay, silty clay	CH	A-7	0-3	90-100	85-100	75-100	65-100	50-75	30-45
	34	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
CfF*:											
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
	6-33	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
	33	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
Cg--------------- Chagrin	0-10	Loam-------------	ML, CL, CL-ML	A-4	0	95-100	85-100	80-100	70-90	20-35	2-10
	10-42	Silt loam, loam, sandy loam.	ML, SM	A-4, A-2, A-6	0	90-100	75-100	55-90	30-80	20-40	NP-14
	42-60	Stratified silt loam to fine sand.	ML, SM	A-4, A-2	0	85-100	75-100	50-85	15-80	20-40	NP-10
CrB, CrC2, CrD2-- Crider	0-7	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	95-100	90-100	85-100	25-35	4-12
	7-32	Silt loam, silty clay loam.	CL, ML, CL-ML	A-7, A-6, A-4	0	100	95-100	90-100	85-100	25-42	4-20
	32-80	Silty clay, clay, silty clay loam.	CL, CH	A-7, A-6	0-5	85-100	75-100	70-100	60-100	35-65	15-40
CsD2*:											
Crider----------	0-7	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	95-100	90-100	85-100	25-35	4-12
	7-36	Silt loam, silty clay loam.	CL, ML, CL-ML	A-7, A-6, A-4	0	100	95-100	90-100	85-100	25-42	4-20
	36-80	Silty clay, clay, silty clay loam.	CL, CH	A-7, A-6	0-5	85-100	75-100	70-100	60-100	35-65	15-40
Caneyville------	0-11	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0-3	90-100	85-100	75-100	60-95	20-35	2-12
	11-26	Silty clay, clay, silty clay loam.	CH, CL	A-7	0-3	90-100	85-100	75-100	65-100	42-70	20-45
	26-38	Clay, silty clay	CH	A-7	0-3	90-100	85-100	75-100	65-100	50-75	30-45
	38	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
CwD2*:											
Crider----------	0-17	Silt loam--------	ML, CL	A-4, A-6	0	100	95-100	90-100	85-100	25-35	3-11
	17-29	Silt loam, silty clay loam.	CL	A-7, A-6, A-4	0	100	95-100	90-100	85-100	30-45	8-22
	29-62	Cherty silty clay loam, cherty silty clay, cherty clay.	GC, CL, CH, SC	A-7	5-10	50-85	50-75	40-70	35-70	44-65	22-40
Frederick-------	0-13	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0-5	80-100	75-100	75-95	75-90	<35	NP-15
	13-32	Silt loam, silty clay loam, cherty silty clay loam.	CL, CL-ML	A-6, A-7, A-4	0-5	80-100	60-100	55-100	50-95	20-45	5-25
	32-80	Silty clay, clay, cherty clay.	CH, MH	A-7	0-5	80-100	65-100	65-100	65-100	50-70	20-40
Dp*:											
Dumps.											
Pits.											
Udorthents.											

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	
EbC2----------- Ebal	0-7	Silt loam--------	CL-ML, CL	A-4, A-6	0	95-100	95-100	85-100	70-90	25-35	5-15
	7-22	Channery silt loam, channery loam, very channery silty clay loam.	CL, GC	A-6, A-7	0-3	60-70	50-70	45-70	40-65	30-45	12-20
	22-27	Channery silty clay, very channery clay.	CL, CH, GC	A-7	3-15	60-70	50-70	45-70	40-65	40-55	20-30
	27-50	Clay-------------	CH	A-7	0-3	95-100	90-100	80-100	70-95	60-75	35-45
	50-80	Weathered bedrock	---	---	---	---	---	---	---	---	---
EdD*:											
Ebal------------	0-3	Silt loam--------	CL-ML, CL	A-4, A-6	0	95-100	95-100	85-100	70-90	25-35	5-15
	3-27	Channery silt loam, channery loam, very channery silty clay loam.	CL, GC	A-6, A-7	0-3	60-70	50-70	45-70	40-65	30-45	12-20
	27-56	Clay-------------	CH	A-7	0-3	95-100	90-100	80-100	70-95	60-75	35-45
	56-80	Weathered bedrock	---	---	---	---	---	---	---	---	---
Wellston--------	0-5	Silt loam--------	ML	A-4	0	95-100	90-100	85-100	70-95	25-35	3-10
	5-40	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0-5	75-100	70-100	60-95	60-90	25-40	5-20
	40-60	Silt loam, loam, gravelly loam.	CL-ML, CL, SC, SM-SC	A-4, A-6	0-10	65-90	65-90	60-90	40-65	20-35	5-15
	60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
EkB2----------- Elkinsville Variant	0-8	Loam-------------	ML, CL-ML, CL	A-4	0	100	100	75-95	60-75	<25	2-8
	8-71	Loam, clay loam	ML, CL-ML, SM-SC, SM	A-4	0	90-100	85-100	65-100	45-85	<25	2-8
	71-80	Gravelly loam, silt loam.	CL, CL-ML, SM-SC, SM	A-6, A-4	0-10	70-90	65-85	55-80	40-75	<30	3-11
FrC2, FrD-------- Frederick	0-14	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0-5	80-100	75-100	75-95	75-90	<35	NP-15
	14-19	Silt loam, silty clay loam, cherty silty clay loam.	CL, CL-ML	A-6, A-7, A-4	0-5	80-100	60-100	55-100	50-95	20-45	5-25
	19-54	Clay, clay loam, silty clay.	CH, MH	A-7	0-5	90-100	85-100	70-100	60-95	60-85	30-55
	54-80	Clay, silty clay	CH	A-7	0-5	90-100	85-100	75-100	65-95	60-85	30-55
FtD3----------- Frederick	0-14	Silty clay loam	CL, CL-ML	A-4, A-6, A-7	0-5	80-100	75-100	70-95	50-95	20-45	5-25
	14-28	Silty clay, clay, cherty clay.	CH, MH	A-7	0-5	80-100	65-100	65-100	65-100	50-70	20-40
	28-33	Clay, clay loam, silty clay.	CH, MH	A-7	0-5	90-100	85-100	70-100	60-95	60-85	30-55
	33-80	Clay, silty clay	CH	A-7	0-5	90-100	85-100	75-100	65-95	60-85	30-55
FwC2*:											
Frederick-------	0-9	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0-5	80-100	75-100	75-95	75-90	<35	NP-15
	9-36	Silty clay, clay, cherty clay.	CH, MH	A-7	0-5	80-100	65-100	65-100	65-100	50-70	20-40
	36-70	Clay, silty clay	CH	A-7	0-5	90-100	85-100	75-100	65-95	60-85	30-55
Crider----------	0-7	Silt loam--------	ML, CL	A-4, A-6	0	100	95-100	90-100	85-100	25-35	3-11
	7-16	Silt loam, silty clay loam.	CL	A-7, A-6, A-4	0	100	95-100	90-100	85-100	30-45	8-22
	16-59	Cherty silty clay loam, cherty silty clay, cherty clay.	GC, CL, CH, SC	A-7	5-10	50-85	50-75	40-70	35-70	44-65	22-40
	59-70	Silty clay, clay	CL, CH	A-7	0-5	85-100	75-100	70-100	60-100	41-70	25-45

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	
GrC*:											
Gilpin	0-9	Silt loam	CL, CL-ML	A-4, A-6	0-5	80-95	75-90	70-85	65-80	20-40	4-15
	9-26	Channery silt loam, silt 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
	26-34	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Crider	0-12	Silt loam	ML, CL	A-4, A-6	0	100	95-100	90-100	85-100	25-35	3-11
	12-22	Silt loam, silty clay loam.	CL	A-7, A-6, A-4	0	100	95-100	90-100	85-100	30-45	8-22
	22-80	Cherty silty clay loam, cherty silty clay, cherty clay.	GC, CL, CH, SC	A-7	5-10	50-85	50-75	40-70	35-70	44-65	22-40
GwF*:											
Gilpin	0-17	Channery silt loam.	GC, SC, CL, CL-ML	A-2, A-4, A-6	0-30	50-90	45-85	35-75	30-70	20-40	4-15
	17-34	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
	34	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Weikert	0-5	Channery silt loam.	GM, ML, SM	A-1, A-2, A-4	0-10	35-70	35-70	25-65	20-55	30-40	4-10
	5-17	Weathered bedrock	GM, GP-GM	A-1, A-2	0-20	15-60	10-55	5-45	5-35	28-36	3-9
	17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Wellston	0-10	Silt loam	ML	A-4	0	95-100	90-100	85-100	70-95	25-35	3-10
	10-45	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
	45-54	Weathered bedrock	---	---	---	---	---	---	---	---	---
	54	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Ho Haymond	0-12	Silt loam	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
	12-42	Silt loam	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
	42-69	Fine sandy loam, silt loam, loam.	ML, SM	A-4	0	95-100	90-100	80-100	35-90	27-36	4-10
HrA Henshaw	0-8	Silt loam	ML, CL, CL-ML	A-4	0	95-100	95-100	90-100	80-100	20-35	3-10
	8-30	Silty clay loam, silt loam.	CL, ML	A-6, A-4	0	95-100	95-100	95-100	85-100	30-40	8-18
	30-60	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6	0	95-100	90-100	85-100	75-100	25-40	5-15
Hs Hoosierville	0-10	Silt loam	CL	A-4, A-6	0	100	100	90-100	70-90	27-36	8-15
	10-17	Silt loam	CL	A-4, A-6	0	100	100	90-100	80-90	27-36	8-15
	17-75	Silty clay loam, silt loam.	CL, CH	A-6, A-7	0	100	100	90-100	85-95	38-54	20-32
	75-80	Silt loam	CL	A-4, A-6	0	100	100	90-100	70-90	27-36	8-15
HxB2 Hosmer	0-7	Silt loam	ML, CL-ML, CL	A-4	0	100	100	90-100	70-90	<25	3-10
	7-28	Silt loam, silty clay loam.	CL, CL-ML, ML	A-4, A-6	0	100	100	90-100	70-95	25-35	5-15
	28-80	Silt loam, silty clay loam, clay.	CL, CL-ML, ML	A-4, A-6	0	100	100	90-100	70-95	20-30	5-15

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
MdB2------------- Markland	0-7	Silty clay loam	CL	A-6, A-7	0	100	100	95-100	85-95	30-45	10-20
	7-28	Silty clay, clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	90-95	45-60	19-32
	28-60	Stratified clay to silty clay loam.	CL, CH	A-7	0	100	100	90-100	75-95	40-55	15-25
MhA-------------- McGary	0-8	Silty clay loam	CL-ML, CL	A-4, A-6	0	100	100	90-100	70-90	25-36	5-15
	8-80	Silty clay, silty clay loam, silt loam.	CL, CH	A-7	0	100	100	95-100	90-100	46-58	24-32
MuA-------------- Muren	0-10	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	25-35	5-15
	10-80	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	80-95	35-50	15-30
Ne--------------- Newark	0-7	Silt loam--------	ML, CL, CL-ML	A-4	0	95-100	90-100	80-100	55-95	<32	NP-10
	7-26	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6, A-7	0	95-100	90-100	85-100	70-95	22-42	3-20
	26-60	Silt loam, silty clay loam.	ML, CL, CL-ML	A-4, A-6, A-7	0-3	75-100	70-100	65-100	55-95	22-42	3-20
No--------------- Nolin	0-10	Silt loam--------	ML, CL, CL-ML	A-4, A-6	0	100	95-100	90-100	80-100	25-40	5-18
	10-60	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
PeB, PeC2-------- Pekin	0-12	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	85-100	65-100	20-30	5-15
	12-31	Silt loam, silty clay loam.	CL	A-6	0	100	100	90-100	70-100	25-40	10-20
	31-77	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	88-98	65-90	25-35	5-15
	77-80	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
Ph--------------- Petrolia	0-9	Silty clay loam	CL	A-6, A-7	0	100	95-100	90-100	80-100	30-45	12-20
	9-60	Silty clay loam, silt loam.	CL	A-6, A-7, A-4	0	100	95-100	80-100	60-100	20-45	8-20
PnB*: Princeton--------	0-8	Sandy loam-------	SM, SC, ML, CL	A-4, A-2-4	0	100	100	60-85	30-55	<25	NP-10
	8-40	Sandy clay loam, fine sandy loam, loam.	SC, CL	A-6	0	100	100	70-90	35-70	25-35	10-15
	40-52	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
	52-80	Stratified fine sand to silt.	SM, ML, CL-ML, SM-SC	A-2-4, A-4	0	100	100	65-90	20-55	<20	NP-5
Alvin------------	0-14	Loamy sand-------	SM	A-2	0	100	100	50-75	15-30	<20	NP-4
	14-48	Very fine sandy loam, sandy loam, sandy clay loam.	SM, SC, CL, ML	A-2, A-4, A-6	0	100	100	90-100	20-80	15-38	NP-13
	48-70	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
St--------------- Stendal	0-15	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	90-100	70-90	20-35	5-15
	15-56	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	90-100	70-95	20-40	5-20
	56-80	Silty clay loam, silty clay.	CL, CH	A-6, A-7	0	100	100	95-100	85-95	35-55	15-30

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	
TyB*:											
Tyner-----------	0-15	Loamy sand-------	SM	A-2-4	0	90-100	85-95	50-75	15-25	---	NP
	15-48	Sand, loamy sand, loamy fine sand.	SM, SP-SM	A-2-4	0	90-100	85-95	50-70	10-30	---	NP
	48-80	Fine sand, sand, loamy sand.	SM, SP-SM	A-3, A-2-4	0-5	80-95	75-95	50-70	5-25	---	NP
Alvin-----------	0-15	Loamy sand-------	SM	A-2	0	100	100	50-75	15-30	<20	NP-4
	15-51	Very fine sandy loam, sandy loam, sandy clay loam.	SM, SC, CL, ML	A-2, A-4, A-6	0	100	100	90-100	20-80	15-38	NP-13
	51-80	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
Ua*. Udorthents											
WbF*:											
Weikert---------	0-3	Channery silt loam.	GM, ML, SM	A-1, A-2, A-4	0-10	35-70	35-70	25-65	20-55	30-40	4-10
	3-16	Channery silt loam.	GM, GP-GM	A-1, A-2	0-20	15-60	10-55	5-45	5-35	28-36	3-9
	16	Weathered bedrock.	---	---	---	---	---	---	---	---	---
Berks-----------	0-16	Silt loam--------	CL, ML, CL-ML	A-4	0-10	80-100	75-100	65-85	50-75	25-36	5-10
	16-26	Channery loam, very channery loam, channery silt loam.	GM, SM, GC, SC	A-1, A-2, A-4	0-30	40-80	35-70	25-60	20-45	25-36	5-10
	26-34	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
	34	Weathered bedrock	---	---	---	---	---	---	---	---	---
Gilpin----------	0-16	Silt loam--------	CL, CL-ML	A-4, A-6	0-5	80-95	75-90	70-85	65-80	20-40	4-15
	16-26	Channery loam, shaly silt loam, silty clay loam.	GC, SC, CL, CL-ML	A-2, A-4, A-6	0-30	50-95	45-90	35-85	30-80	20-40	4-15
	26-31	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
	31	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
WeC2, WeD2------- Wellston	0-4	Silt loam--------	ML	A-4	0	95-100	90-100	85-100	70-95	25-35	3-10
	4-20	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
	20-46	Silt loam, loam, gravelly loam.	CL-ML, CL, SC, SM-SC	A-4, A-6	0-10	65-90	65-90	60-90	40-65	20-35	5-15
	46	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
WfD3------------- Wellston	0-3	Silt loam--------	ML	A-4	0	95-100	90-100	85-100	70-95	25-35	3-10
	3-32	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
	32-45	Silt loam, loam, gravelly loam.	CL-ML, CL, SC, SM-SC	A-4, A-6	0-10	65-90	65-90	60-90	40-65	20-35	5-15
	45-54	Weathered bedrock	---	---	---	---	---	---	---	---	---
	54	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
WgD2*:											
Wellston---------	0-9	Silt loam--------	ML	A-4	0	95-100	90-100	85-100	70-95	25-35	3-10
	9-46	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
	46	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
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
	6-23	Channery loam, shaly silt loam, silty clay loam.	GC, SC, CL, CL-ML	A-2, A-4, A-6	0-30	50-95	45-90	35-85	30-80	20-40	4-15
	23-26	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
	26	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Wr---------------- Wilbur	0-7	Silt loam--------	ML, CL-ML	A-4	0	100	100	90-100	70-90	<25	3-7
	7-60	Silt loam--------	ML, CL-ML	A-4	0	100	100	90-100	70-90	<25	3-7

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH					Pct
Ab Abscota	0-6	0-10	1.20-1.60	6.0-20	0.07-0.09	6.1-7.8	Low	0.17	5	1	.5-1
	6-60	0-10	1.25-1.60	6.0-20	0.05-0.11	6.1-8.4	Low	0.17			
AnD Alvin	0-13	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
	13-59	15-18	1.45-1.65	0.6-6.0	0.12-0.20	4.5-6.0	Low	0.24			
	59-80	3-10	1.55-1.75	2.0-6.0	0.05-0.13	5.1-7.8	Low	0.24			
Ba Bartle	0-16	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
	16-24	22-35	1.40-1.60	0.6-2.0	0.20-0.22	4.5-5.5	Low	0.43			
	24-67	22-35	1.60-1.80	<0.06	0.06-0.08	4.5-5.5	Low	0.43			
	67-80	22-35	1.40-1.60	0.2-0.6	0.15-0.18	5.1-7.3	Low	0.43			
BdB2 Bedford	0-7	10-16	1.30-1.45	0.6-2.0	0.22-0.24	3.6-6.0	Low	0.43	4-3	5	1-2
	7-21	27-32	1.30-1.45	0.6-2.0	0.18-0.20	3.6-5.0	Moderate	0.43			
	21-39	28-35	1.50-1.70	<0.06	0.06-0.08	3.6-5.0	Moderate	0.43			
	39-80	35-55	1.30-1.50	0.2-0.6	0.06-0.08	3.6-5.0	Moderate	0.32			
BmC Bloomfield	0-31	3-10	1.60-1.80	6.0-20	0.07-0.12	5.1-6.5	Low	0.15	5	1	.5-1
	31-74	6-18	1.60-1.80	2.0-20	0.06-0.17	5.1-6.5	Low	0.15			
	74-80	3-18	1.70-1.90	6.0-20	0.06-0.08	5.1-6.5	Low	0.15			
Bo Bonnie	0-9	18-25	1.20-1.40	0.6-2.0	0.22-0.24	6.6-7.3	Low	0.43	5	6	1-2
	9-36	18-25	1.40-1.60	0.2-2.0	0.20-0.22	4.5-5.5	Low	0.43			
	36-60	18-25	1.45-1.65	0.2-2.0	0.18-0.20	5.1-7.3	Low	0.43			
Bu Burnside	0-16	20-27	1.20-1.40	0.6-2.0	0.22-0.24	4.5-6.0	Low	0.37	4	5	1-2
	16-42	15-25	1.40-1.60	0.6-2.0	0.10-0.16	4.5-5.5	Low	0.37			
	42	---	---	---	---	---	---	---			
CcC2, CcD2 Caneyville	0-14	10-25	1.20-1.40	0.6-2.0	0.15-0.22	4.5-7.3	Low	0.43	3	5	2-4
	14-33	36-60	1.35-1.60	0.2-0.6	0.12-0.18	4.5-7.3	Moderate	0.28			
	33	---	---	---	---	---	---	---			
CfF*:											
Caneyville	0-9	10-25	1.20-1.40	0.6-2.0	0.15-0.22	4.5-7.3	Low	0.43	3	5	2-4
	9-24	36-60	1.35-1.60	0.2-0.6	0.12-0.18	4.5-7.3	Moderate	0.28			
	24-34	40-60	1.35-1.60	0.2-0.6	0.12-0.18	5.6-7.8	Moderate	0.28			
	34	---	---	---	---	---	---	---			
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	5	2-4
	6-33	15-35	1.20-1.50	0.6-2.0	0.06-0.10	3.6-5.5	Low	0.24			
	33	---	---	---	---	---	---	---			
Rock outcrop.											
Cg Chagrin	0-10	10-27	1.20-1.40	0.6-2.0	0.20-0.24	5.6-7.3	Low	0.32	5	5	2-4
	10-42	18-30	1.20-1.50	0.6-2.0	0.14-0.20	5.6-7.3	Low	0.32			
	42-60	5-25	1.20-1.40	0.6-2.0	0.08-0.20	5.6-7.3	Low	0.32			
CrB, CrC2, CrD2 Crider	0-7	15-27	1.20-1.40	0.6-2.0	0.19-0.23	5.1-7.3	Low	0.32	5	5	2-4
	7-32	18-35	1.20-1.45	0.6-2.0	0.18-0.23	5.1-7.3	Low	0.28			
	32-80	30-60	1.20-1.55	0.6-2.0	0.12-0.18	4.5-6.5	Moderate	0.28			
CsD2*:											
Crider	0-7	15-27	1.20-1.40	0.6-2.0	0.19-0.23	5.1-7.3	Low	0.32	5	5	2-4
	7-36	18-35	1.20-1.45	0.6-2.0	0.18-0.23	5.1-7.3	Low	0.28			
	36-80	30-60	1.20-1.55	0.6-2.0	0.12-0.18	4.5-6.5	Moderate	0.28			
Caneyville	0-11	10-25	1.20-1.40	0.6-2.0	0.15-0.22	4.5-7.3	Low	0.43	3	5	2-4
	11-26	36-60	1.35-1.60	0.2-0.6	0.12-0.18	4.5-7.3	Moderate	0.28			
	26-38	40-60	1.35-1.60	0.2-0.6	0.12-0.18	5.6-7.8	Moderate	0.28			
	38	---	---	---	---	---	---	---			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF 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/cm³	In/hr	In/in	pH					Pct
CwD2*:											
Crider	0-17	20-27	1.10-1.30	0.6-2.0	0.19-0.23	5.1-6.5	Low	0.32	4	6	1-2
	17-29	25-35	1.20-1.40	0.6-2.0	0.18-0.23	5.1-6.5	Low	0.32			
	29-62	35-65	1.40-1.60	0.6-2.0	0.08-0.13	5.1-6.5	Moderate	0.24			
Frederick	0-13	13-23	1.25-1.50	2.0-6.0	0.15-0.24	4.5-6.0	Low	0.32	4	5	1-2
	13-32	20-40	1.40-1.65	0.6-2.0	0.12-0.18	4.5-6.0	Moderate	0.24			
	32-80	40-75	1.40-1.65	0.6-2.0	0.09-0.18	4.5-5.5	Moderate	0.24			
Dp*:											
Dumps.											
Pits.											
Udorthents.											
EbC2 Ebal	0-7	20-28	1.35-1.50	0.6-2.0	0.22-0.24	4.5-6.0	Low	0.37	3	5	.5-1
	7-22	20-30	1.40-1.60	0.6-2.0	0.12-0.17	4.5-6.0	Moderate	0.28			
	22-27	38-50	1.45-1.65	0.2-0.6	0.06-0.09	4.5-6.0	Moderate	0.28			
	27-50	55-70	1.55-1.75	<0.06	0.07-0.10	4.5-6.0	High	0.28			
	50-80	---	---	---	---	---	---	---			
EdD*:											
Ebal	0-3	20-28	1.35-1.50	0.6-2.0	0.22-0.24	4.5-6.0	Low	0.37	3	5	1-2
	3-27	20-30	1.40-1.60	0.6-2.0	0.12-0.17	4.5-6.0	Moderate	0.28			
	27-56	55-70	1.55-1.75	<0.06	0.07-0.10	4.5-6.0	High	0.28			
	56-80	---	---	---	---	---	---	---			
Wellston	0-5	13-27	1.30-1.50	0.6-2.0	0.18-0.22	5.1-6.5	Low	0.37	4	6	1-2
	5-40	18-35	1.30-1.65	0.6-2.0	0.17-0.21	4.5-6.0	Low	0.37			
	40-60	15-30	1.30-1.60	0.6-2.0	0.12-0.17	4.5-6.0	Low	0.37			
	60	---	---	---	---	---	---	---			
EkB2 Elkinsville Variant	0-8	7-18	1.25-1.40	0.6-2.0	0.18-0.20	5.6-7.3	Low	0.32	5	5	.5-1
	8-71	12-18	1.35-1.55	0.6-2.0	0.15-0.20	4.5-6.0	Low	0.32			
	71-80	12-20	1.35-1.55	0.6-2.0	0.11-0.18	4.5-6.0	Low	0.32			
FrC2, FrD Frederick	0-14	13-23	1.25-1.50	2.0-6.0	0.15-0.24	4.5-6.0	Low	0.32	4	5	1-2
	14-19	20-40	1.40-1.65	0.6-2.0	0.12-0.18	4.5-6.0	Moderate	0.24			
	19-54	50-85	1.40-1.65	0.6-2.0	0.09-0.18	4.5-5.5	High	0.24			
	54-80	45-80	1.40-1.65	0.6-2.0	0.09-0.20	4.5-5.5	Moderate	0.24			
FtD3 Frederick	0-14	27-35	1.30-1.60	0.6-2.0	0.15-0.20	4.5-6.0	Low	0.32	4	5	.5-1
	14-28	40-75	1.40-1.65	0.6-2.0	0.09-0.18	4.5-5.5	Moderate	0.24			
	28-33	50-85	1.40-1.65	0.6-2.0	0.09-0.18	4.5-5.5	High	0.24			
	33-80	45-80	1.40-1.65	0.6-2.0	0.09-0.20	4.5-5.5	Moderate	0.24			
FwC2*:											
Frederick	0-9	13-23	1.25-1.50	2.0-6.0	0.15-0.24	4.5-6.0	Low	0.32	4	5	1-2
	9-36	40-75	1.40-1.65	0.6-2.0	0.09-0.18	4.5-5.5	Moderate	0.24			
	36-70	45-80	1.40-1.65	0.6-2.0	0.09-0.20	4.5-5.5	Moderate	0.24			
Crider	0-7	20-27	1.10-1.30	0.6-2.0	0.19-0.23	5.1-6.5	Low	0.32	4	6	1-2
	7-16	25-35	1.20-1.40	0.6-2.0	0.18-0.23	5.1-6.5	Low	0.32			
	16-59	35-65	1.40-1.60	0.6-2.0	0.08-0.13	5.1-6.5	Moderate	0.24			
	59-70	50-70	1.30-1.60	0.6-2.0	0.12-0.18	5.1-6.5	Moderate	0.32			
GrC*:											
Gilpin	0-9	15-27	1.20-1.40	0.6-2.0	0.12-0.18	3.6-5.5	Low	0.32	3	5	1-2
	9-26	18-35	1.20-1.50	0.6-2.0	0.10-0.16	3.6-5.5	Low	0.24			
	26-34	---	---	---	---	---	---	---			
Crider	0-12	20-27	1.10-1.30	0.6-2.0	0.19-0.23	5.1-6.5	Low	0.32	4	6	1-2
	12-22	25-35	1.20-1.40	0.6-2.0	0.18-0.23	5.1-6.5	Low	0.32			
	22-80	35-65	1.40-1.60	0.6-2.0	0.08-0.13	5.1-6.5	Moderate	0.24			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF 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/cm3	In/hr	In/in	pH					Pct
GwF*:											
Gilpin----------	0-17	15-27	1.20-1.40	0.6-2.0	0.10-0.16	3.6-5.5	Low----------	0.24	3	8	1-2
	17-34	15-35	1.20-1.50	0.6-2.0	0.06-0.10	3.6-5.5	Low----------	0.24			
	34	---	---	---	---	---	------------	----			
Weikert---------	0-5	15-27	1.20-1.40	2.0-6.0	0.08-0.14	4.5-6.0	Low----------	0.28	2	8	1-2
	5-17	15-27	1.20-1.40	2.0-6.0	0.04-0.08	4.5-6.0	Low----------	0.28			
	17	---	---	---	---	---	------------	----			
Wellston--------	0-10	13-27	1.30-1.50	0.6-2.0	0.18-0.22	5.1-6.5	Low----------	0.37	4	6	1-2
	10-45	18-35	1.30-1.65	0.6-2.0	0.17-0.21	4.5-6.0	Low----------	0.37			
	45-54	---	---	---	---	---	------------	----			
	54	---	---	---	---	---	------------	----			
Ho--------------- Haymond	0-12	10-18	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.37	5	5	1-2
	12-42	10-18	1.30-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low----------	0.37			
	42-69	10-18	1.30-1.45	0.6-2.0	0.20-0.22	6.1-7.3	Low----------	0.37			
HrA-------------- Henshaw	0-8	12-27	1.20-1.40	0.6-2.0	0.18-0.23	5.6-6.5	Low----------	0.43	4	5	.5-1
	8-30	18-34	1.20-1.40	0.2-0.6	0.15-0.19	5.1-7.3	Low----------	0.43			
	30-60	15-34	1.20-1.40	0.2-0.6	0.17-0.22	6.6-8.4	Low----------	0.43			
Hs--------------- Hoosierville	0-10	10-18	1.30-1.45	0.6-2.0	0.20-0.24	4.5-7.3	Low----------	0.43	3	5	2-4
	10-17	16-24	1.35-1.50	0.6-2.0	0.20-0.22	4.5-6.0	Low----------	0.43			
	17-75	26-32	1.40-1.60	0.2-0.6	0.18-0.20	4.5-6.0	Moderate-----	0.43			
	75-80	10-18	1.35-1.55	0.2-0.6	0.20-0.22	5.6-6.5	Low----------	0.43			
HxB2------------- Hosmer	0-7	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
	7-28	24-30	1.30-1.50	0.6-2.0	0.18-0.22	4.5-5.5	Moderate-----	0.43			
	28-80	16-26	1.60-1.70	<0.06	0.06-0.08	4.5-6.0	Low----------	0.43			
MdB2------------- Markland	0-7	28-40	1.35-1.50	0.2-0.6	0.18-0.20	5.1-7.3	Moderate-----	0.43	2	7	1-2
	7-28	40-55	1.55-1.70	0.06-0.2	0.11-0.13	5.1-7.3	High---------	0.32			
	28-60	35-50	1.55-1.70	0.06-0.2	0.09-0.11	7.4-8.4	High---------	0.32			
MhA-------------- McGary	0-8	22-27	1.35-1.50	0.6-2.0	0.22-0.24	6.6-7.3	Low----------	0.43	3	5	1-2
	8-80	35-50	1.60-1.75	<0.2	0.11-0.13	5.6-7.8	High---------	0.32			
MuA-------------- Muren	0-10	18-27	1.25-1.40	0.6-2.0	0.22-0.24	5.1-6.0	Low----------	0.37	5-4	5	.5-1
	10-80	22-30	1.35-1.50	0.2-0.6	0.18-0.20	5.1-6.0	Moderate-----	0.37			
Ne--------------- Newark	0-7	7-27	1.20-1.40	0.6-2.0	0.15-0.23	5.6-7.8	Low----------	0.43	5	5	1-2
	7-26	18-35	1.20-1.45	0.6-2.0	0.18-0.23	5.6-7.8	Low----------	0.43			
	26-60	12-40	1.30-1.50	0.6-2.0	0.15-0.22	5.6-7.8	Low----------	0.43			
No--------------- Nolin	0-10	12-27	1.20-1.40	0.6-2.0	0.18-0.23	5.6-8.4	Low----------	0.43	5	5	2-4
	10-60	18-35	1.25-1.50	0.6-2.0	0.18-0.23	5.6-8.4	Low----------	0.43			
PeB, PeC2-------- Pekin	0-12	15-26	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.43	4	5	1-2
	12-31	25-35	1.40-1.60	0.6-2.0	0.20-0.22	4.5-5.5	Low----------	0.43			
	31-77	22-30	1.60-1.80	<0.06	0.06-0.08	4.5-5.5	Low----------	0.43			
	77-80	20-34	1.40-1.60	0.6-2.0	0.06-0.08	4.5-7.3	Low----------	0.43			
Ph--------------- Petrolia	0-9	27-35	1.20-1.40	0.2-0.6	0.21-0.23	5.6-6.0	Moderate-----	0.32	4	7	2-3
	9-60	20-35	1.40-1.60	0.2-0.6	0.18-0.20	6.1-7.8	Moderate-----	0.32			
PnB*:											
Princeton--------	0-8	12-20	1.35-1.50	0.6-2.0	0.13-0.18	5.6-7.3	Low----------	0.24	5-4	3	.5-1
	8-40	18-25	1.40-1.55	0.6-2.0	0.16-0.18	5.1-6.5	Low----------	0.32			
	40-52	8-18	1.40-1.55	2.0-6.0	0.12-0.14	5.1-7.3	Low----------	0.32			
	52-80	4-10	1.45-1.60	2.0-6.0	0.06-0.08	6.1-8.4	Low----------	0.17			
Alvin------------	0-14	5-10	1.50-1.70	6.0-20	0.10-0.12	5.1-6.5	Low----------	0.17	5	2	.5-1
	14-48	15-18	1.45-1.65	0.6-6.0	0.12-0.20	4.5-6.0	Low----------	0.24			
	48-70	3-10	1.55-1.75	2.0-6.0	0.05-0.13	5.1-7.8	Low----------	0.24			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	G/cm3	In/hr	In/in	pH					Pct
St----------------- Stendal	0-15	18-27	1.30-1.44	0.6-2.0	0.22-0.24	6.1-7.3	Low-----------	0.37	5	5	1-2
	15-56	18-35	1.45-1.60	0.6-2.0	0.20-0.22	5.1-6.5	Low-----------	0.37			
	56-80	35-50	1.55-1.65	0.06-0.2	0.10-0.12	5.1-6.5	High----------	0.37			
TyB*:											
Tyner-------------	0-15	3-8	1.40-1.55	6.0-20	0.10-0.12	5.1-7.3	Low-----------	0.17	5	2	.5-1
	15-48	3-8	1.45-1.60	6.0-20	0.09-0.11	4.5-6.5	Low-----------	0.17			
	48-80	1-3	1.55-1.70	>20	0.05-0.08	5.1-6.0	Low-----------	0.17			
Alvin-------------	0-15	5-10	1.50-1.70	6.0-20	0.10-0.12	5.1-6.5	Low-----------	0.17	5	2	.5-1
	15-51	15-18	1.45-1.65	0.6-6.0	0.12-0.20	4.5-6.0	Low-----------	0.24			
	51-80	3-10	1.55-1.75	2.0-6.0	0.05-0.13	5.1-7.8	Low-----------	0.24			
Ua*. Udorthents											
WbF*:											
Weikert-----------	0-3	15-27	1.20-1.40	2.0-6.0	0.08-0.14	4.5-6.0	Low-----------	0.28	2	8	.5-1
	3-16	15-27	1.20-1.40	2.0-6.0	0.04-0.08	4.5-6.0	Low-----------	0.28			
	16	---	---	---	---	---	--------------	----			
Berks-------------	0-16	5-23	1.20-1.50	0.6-6.0	0.12-0.17	3.6-6.5	Low-----------	0.24	3	5	.5-1
	16-26	5-32	1.20-1.60	0.6-6.0	0.04-0.10	3.6-6.5	Low-----------	0.17			
	26-34	5-20	1.20-1.60	2.0-6.0	0.04-0.10	3.6-6.5	Low-----------	0.17			
	34	---	---	---	---	---	--------------	----			
Gilpin------------	0-16	15-27	1.20-1.40	0.6-2.0	0.12-0.18	3.6-5.5	Low-----------	0.32	3	5	2-4
	16-26	18-35	1.20-1.50	0.6-2.0	0.10-0.16	3.6-5.5	Low-----------	0.24			
	26-31	15-35	1.20-1.50	0.6-2.0	0.06-0.10	3.6-5.5	Low-----------	0.24			
	31	---	---	---	---	---	--------------	----			
WeC2, WeD2-------- Wellston	0-4	13-27	1.30-1.50	0.6-2.0	0.18-0.22	5.1-6.5	Low-----------	0.37	4	6	1-2
	4-20	18-35	1.30-1.65	0.6-2.0	0.17-0.21	4.5-6.0	Low-----------	0.37			
	20-46	15-30	1.30-1.60	0.6-2.0	0.12-0.17	4.5-6.0	Low-----------	0.37			
	46	---	---	---	---	---	--------------	----			
WfD3-------------- Wellston	0-3	13-27	1.30-1.50	0.6-2.0	0.18-0.22	5.1-6.5	Low-----------	0.37	4	6	1-2
	3-32	18-35	1.30-1.65	0.6-2.0	0.17-0.21	4.5-6.0	Low-----------	0.37			
	32-45	15-30	1.30-1.60	0.6-2.0	0.12-0.17	4.5-6.0	Low-----------	0.37			
	45-54	---	---	---	---	---	--------------	----			
	54	---	---	---	---	---	--------------	----			
WgD2*:											
Wellston----------	0-9	13-27	1.30-1.50	0.6-2.0	0.18-0.22	5.1-6.5	Low-----------	0.37	4	6	1-2
	9-46	18-35	1.30-1.65	0.6-2.0	0.17-0.21	4.5-6.0	Low-----------	0.37			
	46	---	---	---	---	---	--------------	----			
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	5	2-4
	6-23	18-35	1.20-1.50	0.6-2.0	0.10-0.16	3.6-5.5	Low-----------	0.24			
	23-26	15-35	1.20-1.50	0.6-2.0	0.06-0.10	3.6-5.5	Low-----------	0.24			
	26	---	---	---	---	---	--------------	----			
Wr---------------- Wilbur	0-7	10-17	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low-----------	0.37	5	5	1-2
	7-60	10-17	1.30-1.45	0.6-2.0	0.20-0.22	5.6-7.3	Low-----------	0.37			

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 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]

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
Ab------------------ Abscota	A	Frequent----	Brief-----	Mar-Jun	>6.0	---	---	>60	---	Low-------	Low-------	Low.
AnD------------------ Alvin	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Low-------	High.
Ba------------------ Bartle	D	Rare---------	---	---	1.0-2.0	Perched	Jan-Apr	>60	---	High------	High------	High.
BdB2---------------- Bedford	C	None---------	---	---	2.0-4.0	Perched	Mar-Apr	>60	---	High------	High------	High.
BmC----------------- Bloomfield	A	None---------	---	---	>6.0	---	---	>60	---	Low-------	Low-------	High.
Bo------------------ Bonnie	C/D	Frequent-----	Long------	Mar-Jun	0-1.0	Apparent	Mar-Jun	>60	---	High------	High------	High.
Bu------------------ Burnside	B	Frequent----	Brief-----	Mar-Jun	3.0-5.0	Apparent	Feb-Jun	40-65	Hard	Moderate	Low-------	High.
CcC2, CcD2---------- Caneyville	C	None---------	---	---	>6.0	---	---	20-40	Hard	---	High------	Moderate.
CfF*:												
Caneyville--------	C	None---------	---	---	>6.0	---	---	20-40	Hard	---	High------	Moderate.
Gilpin------------	C	None---------	---	---	>6.0	---	---	20-40	Soft	Moderate	Low-------	High.
Rock outcrop.												
Cg------------------ Chagrin	B	Frequent----	Brief-----	Nov-May	4.0-6.0	Apparent	Feb-Mar	>60	---	Moderate	Low-------	Moderate.
CrB, CrC2, CrD2--- Crider	B	None---------	---	---	>6.0	---	---	>60	---	---	Moderate	Moderate.
CsD2*:												
Crider------------	B	None---------	---	---	>6.0	---	---	>60	---	---	Moderate	Moderate.
Caneyville--------	C	None---------	---	---	>6.0	---	---	20-40	Hard	---	High------	Moderate.
CwD2*:												
Crider------------	B	None---------	---	---	>6.0	---	---	>60	---	High------	Moderate	Moderate.
Frederick---------	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	High.
Dp*: Dumps.												

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Bedrock: Depth	Bedrock: Hardness	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft			In				
Dp*:												
Pits.												
Udorthents.												
EbC2 Ebal	B	None	---	---	3.0-6.0	Perched	Nov-Mar	50-80	Soft	Moderate	High	High.
EdD*:												
Ebal	B	None	---	---	3.0-6.0	Perched	Nov-Mar	50-80	Soft	Moderate	High	High.
Wellston	B	None	---	---	>6.0	---	---	>40	Hard	High	Moderate	High.
EkB2 Elkinsville Variant	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
FrC2, FrD, FtD3 Frederick	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	High.
FwC2*:												
Frederick	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	High.
Crider	B	None	---	---	>6.0	---	---	>60	---	High	Moderate	Moderate.
GrC*:												
Gilpin	C	None	---	---	>6.0	---	---	20-40	Soft	Moderate	Low	High.
Crider	B	None	---	---	>6.0	---	---	>60	---	High	Moderate	Moderate.
GwF*:												
Gilpin	C	None	---	---	>6.0	---	---	20-40	Soft	Moderate	Low	High.
Weikert	C/D	None	---	---	>6.0	---	---	10-20	Soft	Moderate	Moderate	Moderate.
Wellston	B	None	---	---	>6.0	---	---	>40	Hard	High	Moderate	High.
Ho Haymond	B	Frequent	Brief	Jan-May	>6.0	---	---	>60	---	High	Low	Low.
HrA Henshaw	C	Rare	---	---	1.0-2.0	Apparent	Nov-Mar	>60	---	---	High	Moderate.
Hs Hoosierville	C	None	---	---	0-1.0	Apparent	Jan-Apr	>60	---	High	High	Moderate.
HxB2 Hosmer	C	None	---	---	2.5-3.0	Perched	Mar-Apr	>60	---	High	Moderate	High.
MdB2 Markland	C	None	---	---	3.0-6.0	Perched	Mar-Apr	>60	---	Moderate	High	Moderate.
MhA McGary	C	Frequent	Brief	Jan-May	1.0-3.0	Apparent	Jan-Apr	>60	---	Moderate	High	Low.

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				
MuA----------------- Muren	B	None---------	---	---	3.0-6.0	Apparent	Mar-Apr	>60	---	High-----	High-----	Moderate.
Ne------------------ Newark	C	Frequent-----	Brief------	Jan-Apr	0.5-1.5	Apparent	Dec-May	>60	---	High-----	High-----	Low.
No------------------ Nolin	B	Frequent-----	Brief to long.	Feb-May	3.0-6.0	Apparent	Feb-Mar	>60	---	---	Low------	Moderate.
PeB, PeC2----------- Pekin	C	None---------	---	---	2.0-6.0	Apparent	Mar-Apr	>60	---	High-----	Moderate	High.
Ph------------------ Petrolia	B/D	Frequent-----	Long-------	Mar-Jun	0-3.0	Apparent	Apr-Jun	>60	---	High-----	High-----	Low.
PnB*:												
Princeton----------	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Alvin--------------	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Low------	High.
St------------------ Stendal	C	Frequent-----	Brief------	Jan-May	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	Moderate	Moderate.
TyB*:												
Tyner--------------	A	None---------	---	---	>6.0	---	---	>60	---	Low------	Low------	High.
Alvin--------------	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Low------	High.
Ua*. Udorthents												
WbF*:												
Weikert------------	C/D	None---------	---	---	>6.0	---	---	10-20	Soft	Moderate	Moderate	Moderate.
Berks--------------	C	None---------	---	---	>6.0	---	---	20-40	Soft	Low------	Low------	High.
Gilpin-------------	C	None---------	---	---	>6.0	---	---	20-40	Soft	Moderate	Low------	High.
WeC2, WeD2, WfD3--- Wellston	B	None---------	---	---	>6.0	---	---	>40	Hard	High-----	Moderate	High.
WgD2*:												
Wellston-----------	B	None---------	---	---	>6.0	---	---	>40	Hard	High-----	Moderate	High.
Gilpin-------------	C	None---------	---	---	>6.0	---	---	20-40	Soft	Moderate	Low------	High.
Wr------------------ Wilbur	B	Frequent-----	Brief------	Oct-Jun	1.5-3.0	Apparent	Mar-Apr	>60	---	High-----	Moderate	Moderate.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 19.--CLASSIFICATION OF THE SOILS

Soil name	Family or higher taxonomic class
Abscota	Mixed, mesic Typic Udipsamments
Alvin	Coarse-loamy, mixed, mesic Typic Hapludalfs
Bartle	Fine-silty, mixed, mesic Aeric Fragiaqualfs
*Bedford	Fine-silty, mixed, mesic Typic Fragiudults
Berks	Loamy-skeletal, mixed, mesic Typic Dystrochrepts
*Bloomfield	Coarse-loamy, mixed, mesic Psammentic Hapludalfs
*Bonnie	Fine-silty, mixed, acid, mesic Typic Fluvaquents
Burnside	Loamy-skeletal, mixed, acid, mesic Typic Udifluvents
Caneyville	Fine, mixed, mesic Typic Hapludalfs
*Chagrin	Fine-loamy, mixed, mesic Dystric Fluventic Eutrochrepts
Crider	Fine-silty, mixed, mesic Typic Paleudalfs
Ebal	Fine, mixed, mesic Typic Hapludalfs
Elkinsville Variant	Coarse-loamy, mixed, mesic Typic Hapludalfs
Frederick	Clayey, mixed, mesic Typic Paleudults
Gilpin	Fine-loamy, mixed, mesic Typic Hapludults
Haymond	Coarse-silty, mixed, nonacid, mesic Typic Udifluvents
Henshaw	Fine-silty, mixed, mesic Aquic Hapludalfs
Hoosierville	Fine-silty, mixed, mesic Typic Ochraqualfs
Hosmer	Fine-silty, mixed, mesic Typic Fragiudalfs
Markland	Fine, mixed, mesic Typic Hapludalfs
*McGary	Fine, mixed, mesic Aeric Ochraqualfs
*Muren	Fine-silty, mixed, mesic Aquic Hapludalfs
Newark	Fine-silty, mixed, nonacid, mesic Aeric Fluvaquents
Nolin	Fine-silty, mixed, mesic Dystric Fluventic Eutrochrepts
*Pekin	Fine-silty, mixed, mesic Aquic Fragiudalfs
Petrolia	Fine-silty, mixed, nonacid, mesic Typic Fluvaquents
Princeton	Fine-loamy, mixed, mesic Typic Hapludalfs
*Stendal	Fine-silty, mixed, acid, mesic Aeric Fluvaquents
Tyner	Mixed, mesic Typic Udipsamments
Udorthents	Loamy, mixed, nonacid, mesic Udorthents
Weikert	Loamy-skeletal, mixed, mesic Lithic Dystrochrepts
Wellston	Fine-silty, mixed, mesic Ultic Hapludalfs
Wilbur	Coarse-silty, mixed, nonacid, mesic Aquic Udifluvents

* 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.

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