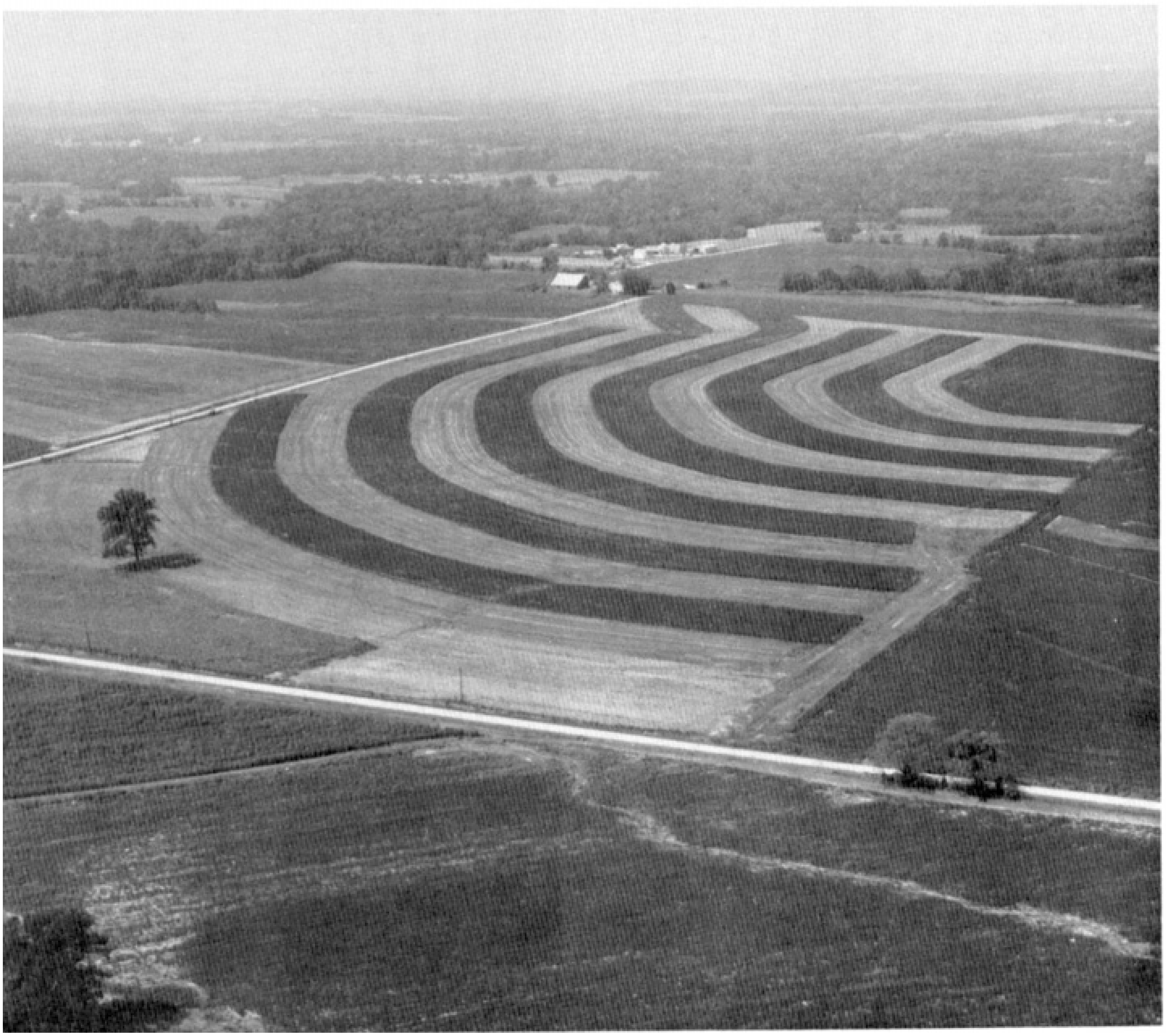
United States
Department of
Agriculture

Soil
Conservation
Service

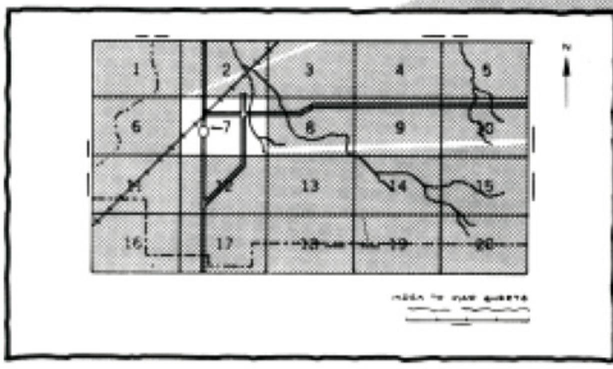
In cooperation with
Illinois Agricultural
Experiment Station

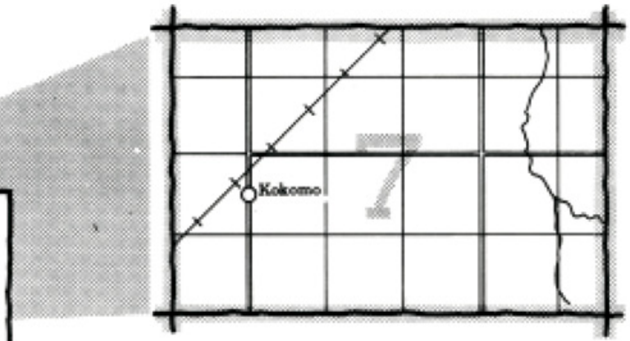
Soil Survey of Randolph County, Illinois



HOW TO USE

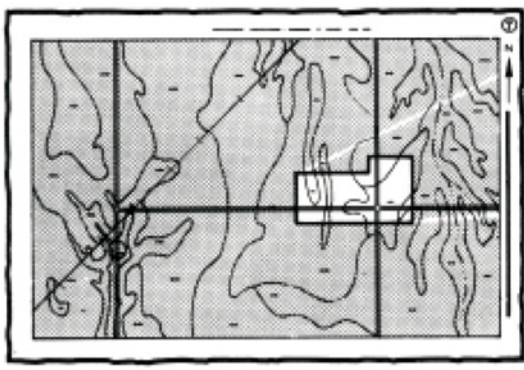
1. Locate your area of interest on the "Index to Map Sheets"

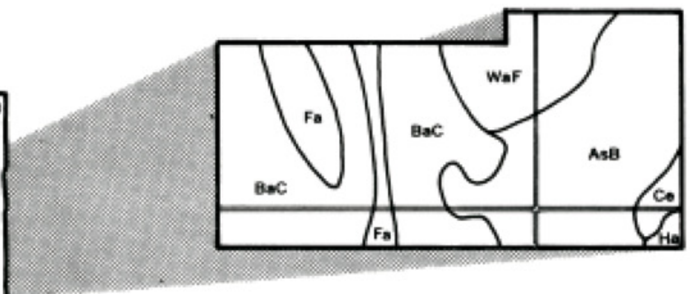




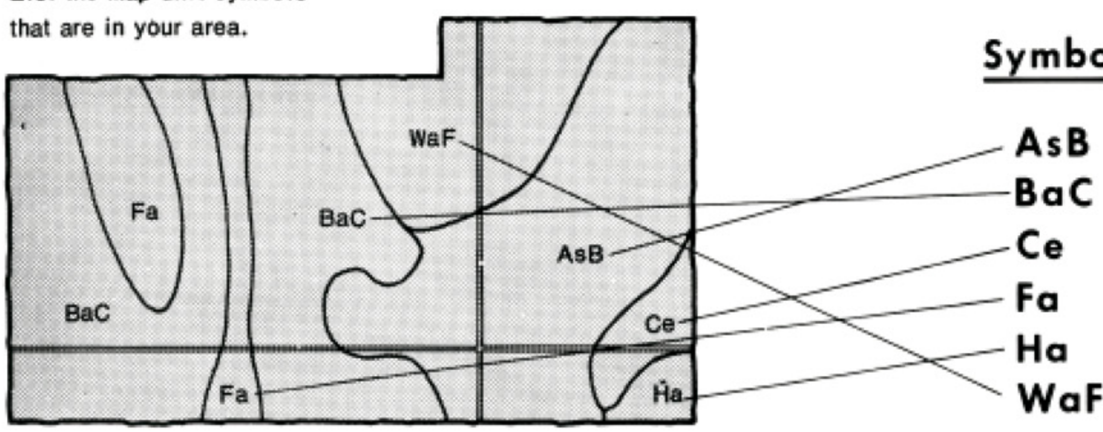
2. Note the number of the map sheet and turn to that sheet.

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



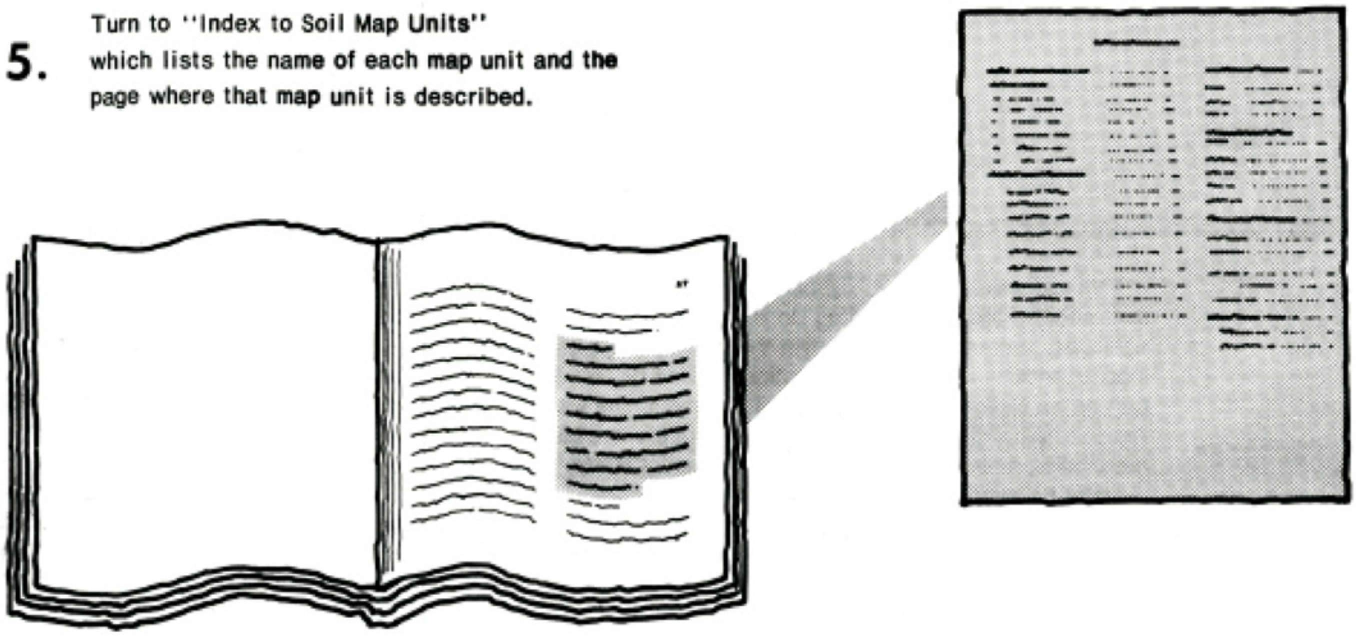


4. List the map unit symbols that are in your area.

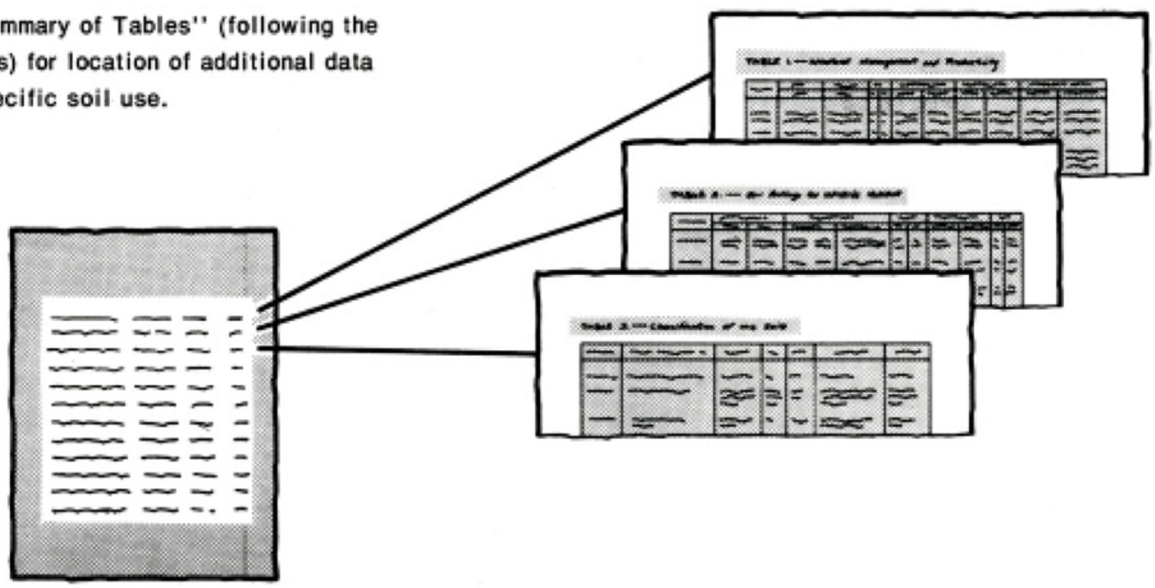


THIS SOIL SURVEY

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



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



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

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

Major fieldwork for this soil survey was completed in 1982. Soil names and descriptions were approved in 1983. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1982. This survey was made cooperatively by the Soil Conservation Service and the Illinois Agricultural Experiment Station. It is part of the technical assistance furnished to the Randolph County Soil and Water Conservation District. The cost was shared by the Randolph County Board.

This soil survey is Illinois Agricultural Experiment Station Soil Report No. 122.

Cover: Strips of soybeans and wheat in an area of Hosmer and Stoy soils. Contour stripcropping helps to control erosion on these soils.

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Soil Series

Issued September 1988

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Summary of Tables

Foreword

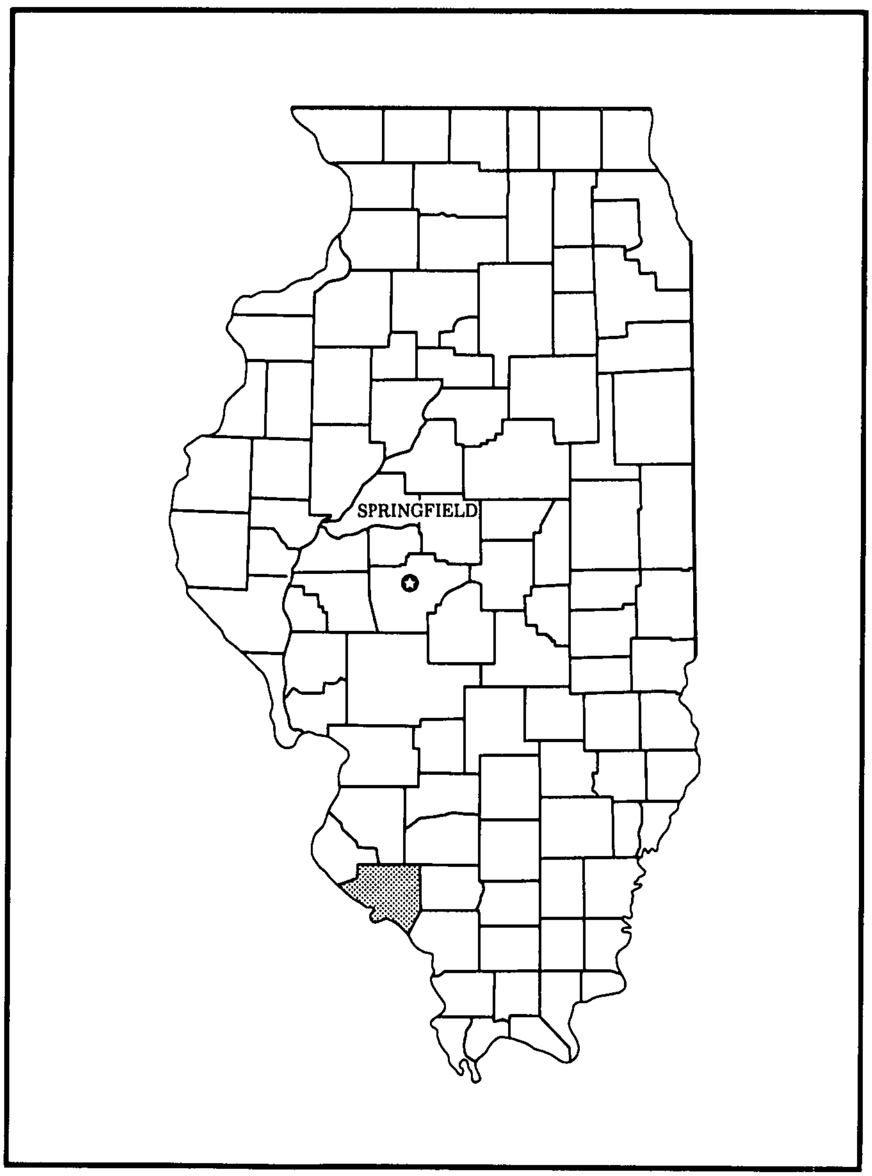
This soil survey contains information that can be used in land-planning programs in Randolph County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact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

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

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

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

John J. Eckes
State Conservationist
Soil Conservation Service



Location of Randolph County in Illinois.

Soil Survey of Randolph County, Illinois

By C.C. Miles, Soil Conservation Service

Soils surveyed by C.C. Miles, G. Hamilton, and W.R. Kreznor,
Soil Conservation Service, and D. Fieldling and R.W. Schoeppel,
Randolph County

United States Department of Agriculture, Soil Conservation Service,
in cooperation with
the Illinois Agricultural Experiment Station

RANDOLPH COUNTY is in the southwestern part of Illinois. It is about 40 miles southeast of the metropolitan area of St. Louis. It has an area of about 387,840 acres, or 604 square miles. It is bordered on the north by Monroe, St. Clair, and Washington Counties; on the east by Jackson and Perry Counties; and on the south and west by Perry and St. Genevieve Counties, Missouri, and by the Mississippi River.

This soil survey updates the survey of Randolph County published in 1925 (*6*). It provides more recent information about the soils and larger maps, which show the soils in greater detail.

General Nature of the County

The paragraphs that follow give general information about the county. They describe history and development, natural resources, and climate.

History and Development

The area now known as Randolph County formerly was part of the territory claimed by the Kaskaskia Indians. The French established a settlement on a peninsula between the Mississippi and Kaskaskia Rivers in 1703 (*5*). This settlement, Kaskaskia, began as a mission but soon became a center of commerce and culture.

In 1795, the original county of St. Clair was divided and the southern portion became Randolph County. Later, Randolph County was divided into Randolph, Jackson, Monroe, and Perry Counties. The first county seat was Kaskaskia. After a flood in 1844, it was moved to Chester, which is located on higher ground. The county has 13 incorporated communities. Two of the largest towns are Chester, which has a population of about 8,400, and Sparta, which has a population of about 5,000.

In 1818, when Illinois became a state, the First General Assembly met at Kaskaskia. Because of the need for a more central location, however, the capital was moved to Vandalia and later to Springfield.

In the early 1800's, rapid immigration changed the survey area from a wilderness into farmland. Fur trading gave way to farming. Corn, cotton, and castor beans were some of the early crops.

Transportation facilities in the county include seven primary state highways and two major railroads. Barge transportation service is available on the Mississippi and Kaskaskia Rivers.

Natural Resources

Soil is the major natural resource of Randolph County. Most of the soils are nearly level to strongly sloping and formed in loess, or windblown silty material, under timber vegetation. The soils range from clayey on bottom land to stony on very steep hillsides. Approximately 1,100 farms make up about 75 percent of the land area in the county (*11*). Soybeans, corn, and wheat are the major crops. Secondary farm products include hay, grain sorghum, timber, cattle, and hogs. There are over 9,000 dwellings in urban and rural areas.

The county has about 41,800 acres of woodland, mainly on the steep bluffs adjacent to the Mississippi and Kaskaskia Rivers (*11*). Much of this acreage is unimproved. Wildlife, such as deer, squirrel, and fur-bearing animals, inhabit these wooded areas. The county has over 7,800 acres of water in streams and lakes 40 acres or more in size. These water areas provide ample fishing opportunities. State-owned conservation areas, including the Kaskaskia River Area, the Turkey Bluff Area, and the Randolph County Conservation Area, make up about 12,000 acres. They are open to the public for recreational uses.

The subsurface mineral resources in the county include coal, limestone, and oil. Coal mining has played an important part in the development of the county. Commercial mining began about 1900. It rapidly became a major industry. It brought many newcomers into the villages of Sparta, Tilden, and Percy. Randolph County is the second leading coal-producing county in Illinois. Three major strip-mining companies and two underground mining companies are active in the county. Coal reserves are estimated at over 700 million mineable tons. As a result, coal is the most important mineral resource in the county. Stone and crude oil also are important mineral resources. Stone is extracted from caverns along the limestone bluff between Chester and the Monroe County line. Crude oil is produced from a field in the northeastern part of the county.

Climate

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

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

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

In winter the average temperature is 35 degrees F, and the average daily minimum temperature is 26 degrees. The lowest temperature on record, which occurred at Sparta on January 17, 1977, is -14 degrees. In summer the average temperature is 77 degrees, and the average daily maximum temperature is 89 degrees. The highest recorded temperature, which occurred on July 14, 1954, is 109 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is about 40 inches. Of this, about 23 inches, or nearly 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 5.84 inches at Sparta on August 17, 1959. Thunderstorms occur on about 50 days each year. Tornadoes and severe thunderstorms occur occasionally. They are usually local in extent and of short duration and cause damage in scattered areas.

The average seasonal snowfall is about 17 inches. The greatest snow depth at any one time during the period of record was 11 inches. On the average, 11 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 75 percent of the time possible in summer and 50 percent in winter. The prevailing wind is from the south. Average windspeed is highest, 9 miles per hour, in spring.

How This Survey Was Made

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

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

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

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

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

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

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

Map Unit Composition

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

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

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

General Soil Map Units

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

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

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

The associations shown on the general soil map have been grouped into three general kinds of landscapes for broad interpretive purposes. Each of the broad groups and the soil associations in them are described on the following pages.

The general soil map of Randolph County joins with the general soil maps of Jackson, Monroe, and Perry Counties in Illinois and Perry and St. Genevieve Counties in Missouri. In places the names of soil associations do not agree across county and state lines because of differences in the extent of the major soils in the associations or because of conceptual changes that resulted from changes in soil classification. The soils, parent materials, and landscapes are similar, and the soils have similar properties and behavior characteristics.

In places the general soil map of Randolph County does not join with the general soil map of St. Clair County. The soil association on terraces along the Kaskaskia River in St. Clair County consists of major soils that extend into Randolph County but that are not extensive enough to be recognized as major soils in Randolph County. Also, the soil association in the southeastern part of St. Clair County consists of major soils that are not extensive enough to be considered major soils in Randolph County. The differences in soil association names do not significantly affect the use of these maps for general planning. The parent materials and landscapes are similar.

Soil Descriptions

Nearly Level to Gently Sloping, Well Drained to Poorly Drained Soils; on Flood Plains

These soils are on flood plains adjacent to the major rivers or to streams. Flooding is the main management concern. Maintaining the drainage system in low areas and maintaining tilth and overcoming the shrink-swell potential in areas of clayey soils are additional concerns.

1. Darwin-Fults Association

Nearly level, poorly drained, clayey soils that formed in alluvium

This association consists of nearly level or depressional soils on the flood plains along the Mississippi River. Slopes range from 0 to 2 percent.

This association makes up about 5 percent of the county. It is about 50 percent Darwin and similar soils, 30 percent Fults and similar soils, and 20 percent minor soils (fig. 1).

Typically, the Darwin soils have a surface layer of very dark gray silty clay about 10 inches thick. The subsoil is dark gray and gray, mottled silty clay about 49 inches thick. The substratum to a depth of 65 inches is gray, mottled silty clay.

Typically, the Fults soils have a surface layer of very dark gray silty clay about 10 inches thick. The subsoil is about 32 inches thick. The upper part is dark gray and dark grayish brown, mottled silty clay. The lower part is grayish brown, mottled silty clay loam and silt loam. The substratum to a depth of 60 inches is dark grayish brown fine sand.

Minor in this association are the Dupo, Haynie, Jacob, Landes, Raddle, and Wakeland soils. Dupo soils are in the slightly higher positions on the flood plains. They have silty overwash at least 20 inches deep over clayey material. The moderately well drained Haynie and Raddle soils and the well drained Landes soils are on ridges, natural levees, or low terraces. Jacob soils are on broad flats. They have a surface layer that is lighter colored than that of the Darwin and Fults soils and are more acid in the subsoil. The somewhat poorly drained Wakeland soils formed in silty alluvium. They are adjacent to bluffs or along stream channels flowing from the bluffs.

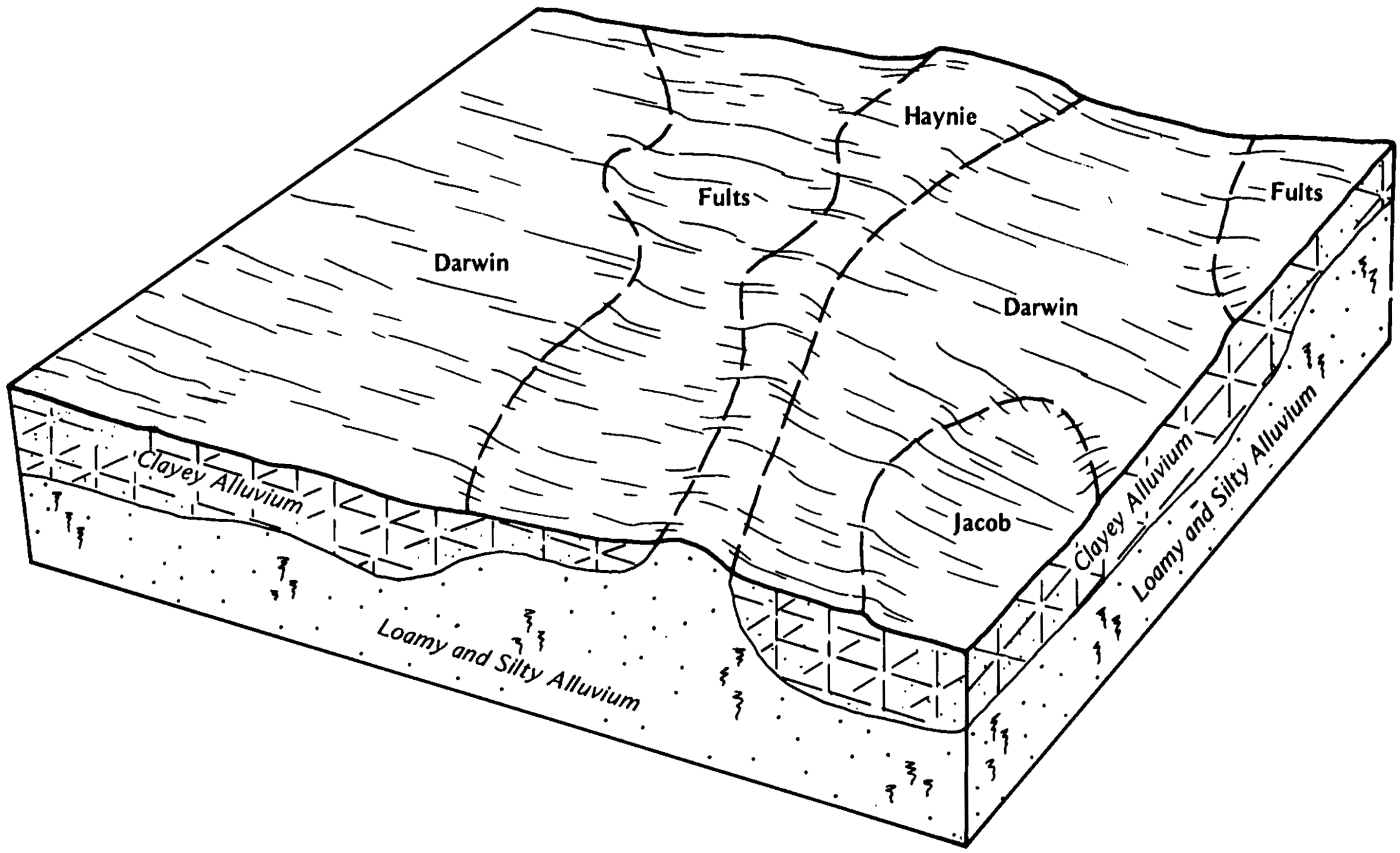


Figure 1.—Pattern of soils and parent material in the Darwin-Fults association.

Most of this association is used for cultivated crops. Some areas are wooded or are used for wetland wildlife habitat. The soils that are protected from flooding are moderately suited to cropland, but unprotected areas are poorly suited. Flooding, ponding, wetness, and poor tilth are management concerns. Measures that maintain the drainage system are needed.

This association is moderately suited to woodland. The equipment limitation and seedling mortality are management concerns because of the wetness and the high content of clay. Plant competition also is a concern. The association generally is moderately suited to habitat for wildlife. The frequently flooded soils, however, are poorly suited to habitat for openland and woodland wildlife and are well suited to habitat for wetland wildlife.

This association generally is unsuited to dwellings and septic tank absorption fields. Flooding, ponding, the seasonal high water table, and a high shrink-swell potential are management concerns.

2. Haynie-Blake-Landes Association

Nearly level to gently sloping, well drained to somewhat poorly drained, silty and loamy soils that formed in alluvium

This association consists of soils on ridges and natural levees and in swales on the flood plains along the Mississippi River. Slopes range from 0 to 5 percent.

This association makes up about 5 percent of the county. It is about 35 percent Haynie and similar soils, 20 percent Blake and similar soils, 15 percent Landes and similar soils, and 30 percent minor soils.

The Haynie soils are gently sloping and moderately well drained. Typically, the surface layer is very dark grayish brown silt loam about 8 inches thick. The upper part of the substratum is brown and grayish brown very fine sandy loam. The next part is grayish brown and dark grayish brown, mottled very fine sandy loam. The lower part to a depth of 60 inches is dark grayish brown, mottled silt loam.

The Blake soils are nearly level and very gently sloping and are somewhat poorly drained. Typically, the surface layer is very dark grayish brown silty clay loam about 6 inches thick. The upper part of the substratum is very dark grayish brown and dark grayish brown silty clay loam. The next part is stratified brown and dark grayish brown, mottled silt loam and silty clay loam. The lower part to a depth of 60 inches is stratified brown and dark grayish brown, mottled silt loam.

The Landes soils are gently sloping and well drained. Typically, the surface soil is very dark grayish brown very fine sandy loam about 12 inches thick. The subsoil is about 25 inches of dark grayish brown and brown very fine sandy loam and loam. The substratum to a depth of 60 inches is brown loamy fine sand and very fine sandy loam.

Minor in this association are Aquents and Orthents and the Darwin, Dupo, Fults, Haymond, and Parkville soils. Aquents and Orthents occur together as a complex on a levee and in the adjacent borrow areas. The poorly drained Darwin and Fults soils are in low areas. They have more clay than the major soils. Dupo soils are adjacent to the low areas. They formed in silty sediments over clayey alluvium. The moderately well drained Haymond soils are adjacent to bluffs or along stream channels flowing from the bluffs. The somewhat poorly drained Parkville soils are on low ridges. They have more clay in the subsoil than the major soils.

Most areas of this association are cultivated. The Blake and Haynie soils are well suited to cultivated crops, and the Landes soils are moderately suited. Flooding is a hazard in unprotected areas. The wetness of the Blake soils is a limitation. Measures that maintain the drainage system are needed. In areas of the Landes soils, a moderate available water capacity is a limitation and soil blowing is a hazard.

This association generally is unsuited to dwellings and septic tank absorption fields because of the flooding.

3. Wakeland-Haymond Association

Nearly level, somewhat poorly drained and moderately well drained, silty soils that formed in alluvium

This association consists of soils along overflow channels, on alluvial fans, and on flood plains along the major rivers. Slopes range from 0 to 2 percent.

This association makes up about 8 percent of the county. It is about 60 percent Wakeland soils, 20 percent Haymond soils, and 20 percent minor soils (fig. 2).

The Wakeland soils are somewhat poorly drained. Typically, the surface layer is brown silt loam about 8 inches thick. The substratum to a depth of 60 inches is mottled silt loam. The upper part is brown, and the lower part is grayish brown.

The Haymond soils are moderately well drained. Typically, the surface layer is mixed dark brown and yellowish brown silt loam about 9 inches thick. The subsoil is brown, dark brown, and yellowish brown silt loam about 34 inches thick. The substratum to a depth of 60 inches is stratified brown loam and silt loam and very pale brown fine sandy loam.

Minor in this association are Aquents and the Banlic, Birds, and Coffeen soils. Aquents are in areas where sediments have been dredged from the Kaskaskia River. The somewhat poorly drained Banlic soils are on low stream terraces. The poorly drained Birds soils are in low areas on the flood plains. The somewhat poorly drained Coffeen soils are in landscape positions similar to those of the Wakeland soils. Their surface layer is darker and commonly thicker than that of the Wakeland soils.

Most areas of this association are cultivated or pastured. Some are wooded. The major soils are well suited to cultivated crops and to hay and pasture. Flooding is a hazard on both soils, and the wetness of the Wakeland soils is a limitation. Measures that maintain the drainage system are needed.

This association is well suited to woodland and to habitat for woodland wildlife. It is well suited or moderately suited to habitat for openland wildlife. Because of the flowing streams and the strongly sloping or steep adjacent hillsides, the wooded areas of this association are suitable for paths and trails.

This association generally is unsuited to dwellings and septic tank absorption fields because of the flooding on both of the major soils and the wetness of the Wakeland soils.

Nearly Level to Strongly Sloping, Well Drained to Somewhat Poorly Drained Soils; on Terraces

These soils are on broad ridges and convex side slopes on terraces adjacent to the flood plains along the larger streams and rivers. Protecting the soils from erosion and maintaining the drainage system are the main management concerns. Restricted permeability and the shrink-swell potential are additional concerns.

4. St. Charles-Hurst-Martinsville Association

Nearly level to strongly sloping, well drained to somewhat poorly drained, silty and loamy soils that formed in silty material over outwash, in silty material over clayey lacustrine sediments, or in loamy outwash

This association consists of nearly level to strongly sloping soils on plains, ridges, and side slopes on terraces. Slopes range from 0 to 18 percent.

This association makes up about 6 percent of the county. It is about 40 percent St. Charles and similar soils, 30 percent Hurst and similar soils, 15 percent Martinsville and similar soils, and 15 percent minor soils (fig. 3).

The moderately well drained St. Charles soils are on gently sloping, uneroded ridges and on strongly sloping, severely eroded side slopes. Typically, the surface layer is dark brown silt loam about 7 inches thick. The subsurface layer is yellowish brown silt loam about 4 inches thick. The subsoil is about 45 inches thick. It is yellowish brown. The upper part is silt loam, the next part is silty clay loam, and the lower part is mottled silty clay loam and silt loam. The substratum to a depth of 60 inches is yellowish brown, mottled silt loam that has strata of very fine sandy loam.

The somewhat poorly drained, nearly level and gently sloping Hurst soils are on the crest of ridges. Typically, the surface layer is dark brown silt loam about 8 inches thick. The subsurface layer is light gray silt loam about 3 inches thick. The subsoil is about 37 inches thick. It is mottled. The upper part is brown silty clay loam, the next part is brown silty clay, and the lower part is light brownish gray silty clay loam. The substratum to a depth of 60 inches is dark grayish brown, mottled silty clay loam.

The well drained Martinsville soils are on the gently sloping crest of ridges and on strongly sloping side slopes. Typically, the surface layer is very dark grayish brown and dark brown silt loam about 8 inches thick. The subsurface layer is light yellowish brown silt loam about 2 inches thick. The subsoil is about 39 inches thick. The upper part is yellowish brown silt loam and strong brown, yellowish brown, and brown silty clay loam that has common sand grains. The lower part is brown clay loam and loam. The substratum to a depth of 60 inches is brown fine sandy loam.

Minor in this association are the somewhat excessively drained Bloomfield soils, the well drained Colp soils, the moderately well drained Markland soils, and the very poorly drained Montgomery soils. Bloomfield, Colp, and Markland soils are in landscape positions similar to those of the St. Charles and Martinsville soils. Bloomfield soils are sandy. Colp and Markland soils are more clayey in the subsoil than the St. Charles and Martinsville soils. Montgomery soils are in depressions. They are dark and are clayey.

Most areas of this association are cultivated. Some are used for pasture and hay, wildlife habitat, woodland, or recreation. The gently sloping St. Charles and Martinsville soils are well suited to cultivated crops, and the more sloping areas are moderately suited or poorly suited. The Hurst soils are moderately suited to cultivated crops. Erosion is a hazard on the St. Charles

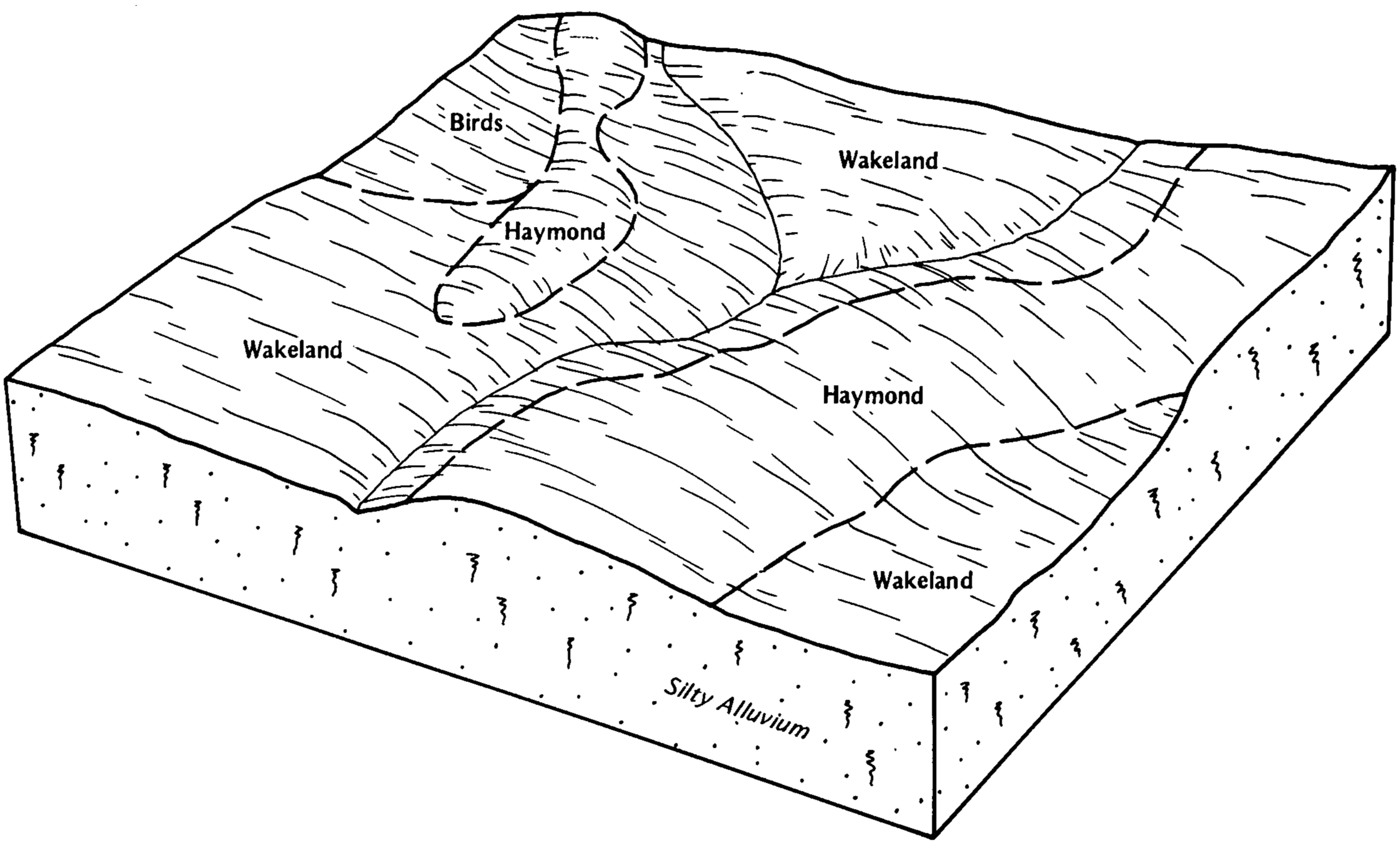


Figure 2.—Pattern of soils and parent material in the Wakeland-Haymond association.

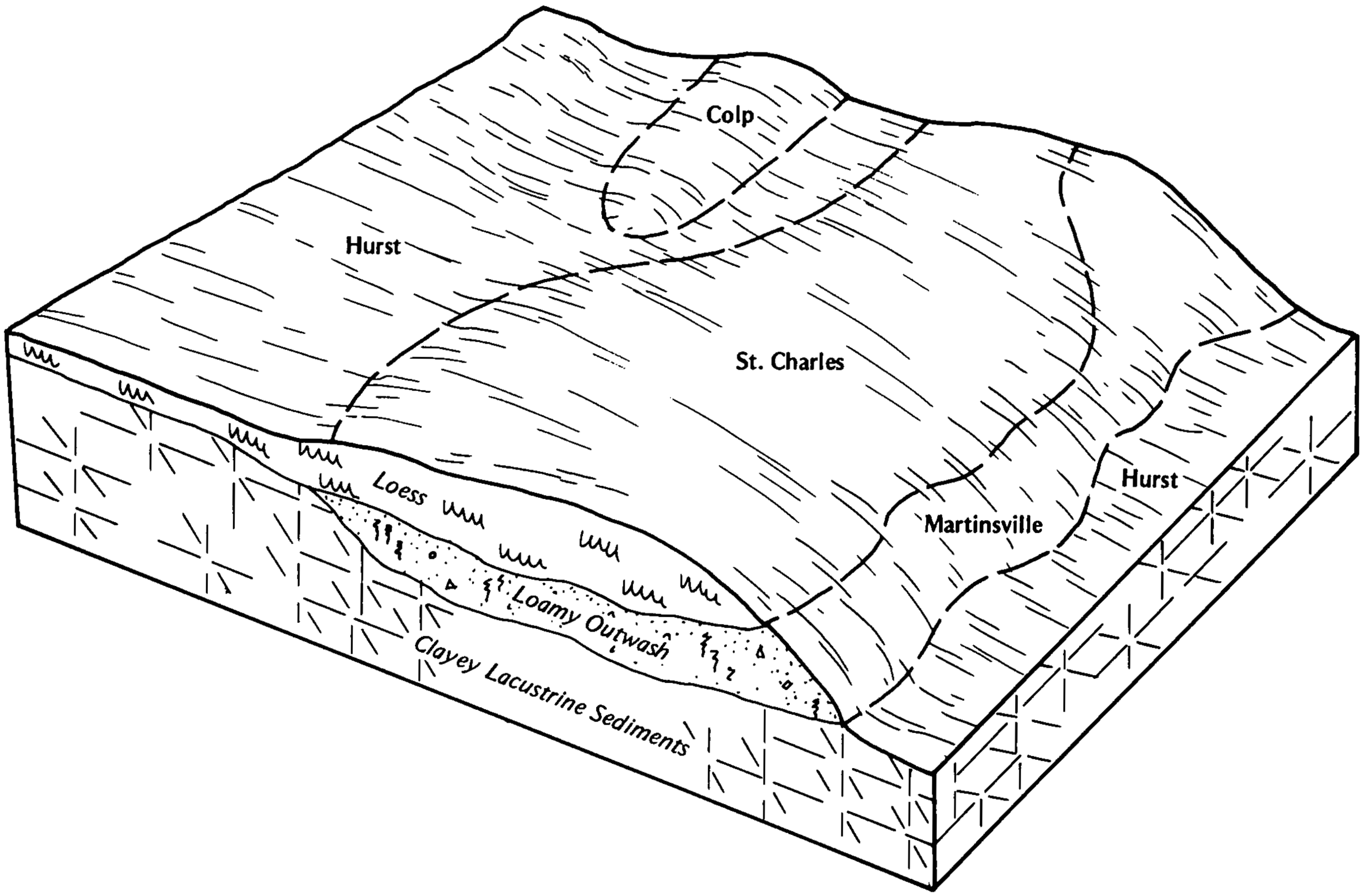


Figure 3.—Pattern of soils and parent material in the St. Charles-Hurst-Martinsville association.

and Martinsville soils, and the wetness of the Hurst soils is a limitation.

The St. Charles and Martinsville soils generally are well suited to woodland and to habitat for openland and woodland wildlife. In the areas used as woodland, plant competition is a limitation. Also, erosion is a hazard in the more sloping areas. The Hurst soils are moderately suited to woodland and well suited to habitat for openland and woodland wildlife. The nearly level Hurst soils are moderately suited to habitat for wetland wildlife.

The St. Charles and Martinsville soils are moderately suited to dwellings, and the Hurst soils are poorly suited. The shrink-swell potential, the seasonal wetness, and the slope are limitations. The Martinsville soils are well suited to septic tank absorption fields, but the St. Charles and Hurst soils are poorly suited because of the seasonal wetness of both soils, the slope of the St. Charles soils, and very slow permeability in the Hurst soils.

Nearly Level to Sloping, Somewhat Poorly Drained Soils; on Uplands

These soils are on loess-covered till plains. Overcoming restricted permeability and maintaining or improving the drainage system are the main management concerns. Overcoming the shrink-swell potential of some soils and protecting the more sloping soils from erosion are additional concerns.

5. Marine-Stoy-Blair Association

Nearly level to sloping, somewhat poorly drained, silty soils that formed in loess or in erosional sediments and glacial till

This association consists of soils on upland flats, on broad ridges, and on side slopes along drainageways. Shallow depressions that generally are broad are in scattered areas throughout the association. Slopes are dominantly 0 to 3 percent but range from 0 to 10 percent.

This association makes up about 4 percent of the county. It is about 40 percent Marine soils, 25 percent Stoy soils, 15 percent Blair soils, and 20 percent minor soils.

The Marine soils are very gently sloping. Typically, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsurface layer is light brownish gray silt loam about 3 inches thick. The subsoil is about 35 inches thick. The upper part is yellowish brown silty clay loam that has light brownish gray silt coatings; the next part is yellowish brown and brown, mottled silty clay; and the lower part is grayish brown and light brownish gray, mottled silty clay loam. The substratum to a depth of 60 inches is grayish brown, gray, and light brownish gray, mottled silt loam.

The Stoy soils are nearly level. Typically, the surface layer is dark brown silt loam about 7 inches thick. The subsurface layer is brown silt loam about 5 inches thick. The subsoil is about 41 inches thick. It is mottled. The upper part is yellowish brown silt loam and silty clay loam, the next part is grayish brown silty clay loam, and the lower part is yellowish brown silty clay loam. The substratum to a depth of 60 inches is yellowish brown, mottled silt loam.

The Blair soils are sloping. Typically, the surface layer is dark grayish brown silt loam about 3 inches thick. The subsoil is mottled silty clay loam about 37 inches thick. The upper part is yellowish brown and brown, and the lower part is grayish brown and gray. Sand grains and pebbles are common in the subsoil. The substratum to a depth of 60 inches is gray, mottled silty clay loam and clay loam.

Minor in this association are the Coulterville, Grantfork, Hosmer, and Rushville soils. Coulterville and Grantfork soils have a high content of exchangeable sodium in the subsoil. Coulterville soils are in landscape positions similar to those of the Stoy soils, and Grantfork soils are in positions similar to those of the Blair soils. The moderately well drained Hosmer soils are in the slightly higher positions. The poorly drained Rushville soils are in slightly depressional areas.

Most areas of this association are cultivated. Some are wooded. The major soils are well suited or moderately suited to cultivated crops. The seasonal wetness is the main limitation. Also, erosion is a hazard in the gently sloping and sloping areas.

Because of the seasonal wetness, restricted permeability, and the shrink-swell potential, this association is poorly suited to dwellings and septic tank absorption fields. It is poorly suited to local roads and streets because of low strength, the shrink-swell potential, and frost action.

6. Coulterville-Oconee Association

Nearly level to gently sloping, somewhat poorly drained, silty soils that formed in loess

This association consists of soils on broad interstream divides. Slopes range from 0 to 5 percent.

This association makes up about 9 percent of the county. It is about 55 percent Coulterville soils, 20 percent Oconee soils, and 25 percent minor soils (fig. 4).

Typically, the Coulterville soils have a surface layer of dark brown silt loam about 8 inches thick. The subsoil is about 25 inches thick. It has a high concentration of sodium. The upper part is brown, mottled silty clay; the next part is pale brown and grayish brown, mottled silty clay loam; and the lower part is grayish brown, mottled silt loam. The substratum to a depth of 60 inches is gray, mottled silt loam.

Typically, the Oconee soils have a surface layer of very dark grayish brown silt loam about 9 inches thick. The subsurface layer is dark grayish brown and grayish brown silt loam about 7 inches thick. The subsoil is about 37 inches thick. The upper part is brown and grayish brown, mottled silty clay loam, and the lower part is multicolored silt loam. The substratum to a depth of 60 inches is light brownish gray, mottled silt loam.

Minor in this association are the Blair, Huey, Marine, Piasa, and Stoy soils. Blair, Marine, and Stoy soils are in positions on the landscape similar to those of the major soils. They have a surface layer that is lighter colored than that of the major soils and do not have a high content of sodium in the subsoil. The poorly drained Huey and Piasa soils are in the slightly lower positions on the landscape. Also of minor extent are the more sloping Coulterville soils on side slopes along drainageways.

Most areas of this association are cultivated. These soils are well suited to cultivated crops. The seasonal wetness is a limitation. Also, erosion is a hazard in the gently sloping areas.

This association is poorly suited to dwellings and septic tank absorption fields. The seasonal wetness, restricted permeability, and the shrink-swell potential are limitations.

Nearly Level to Very Steep, Well Drained to Somewhat Poorly Drained Soils; on Uplands

These soils are on crests or tops of ridges or are on side slopes of knolls and hills. Protecting the soils from erosion is the main management concern. Slope, slow permeability, sinkholes, and areas of stony soils are additional concerns.

7. Lenzburg-Swanwick-Schuline Association

Nearly level to very steep, moderately well drained and well drained, silty soils that formed in excavated material

This association consists of soils in surface-mined areas. The soils are on ungraded crests and side slopes or in areas that have been graded. Slopes range from 0 to 70 percent.

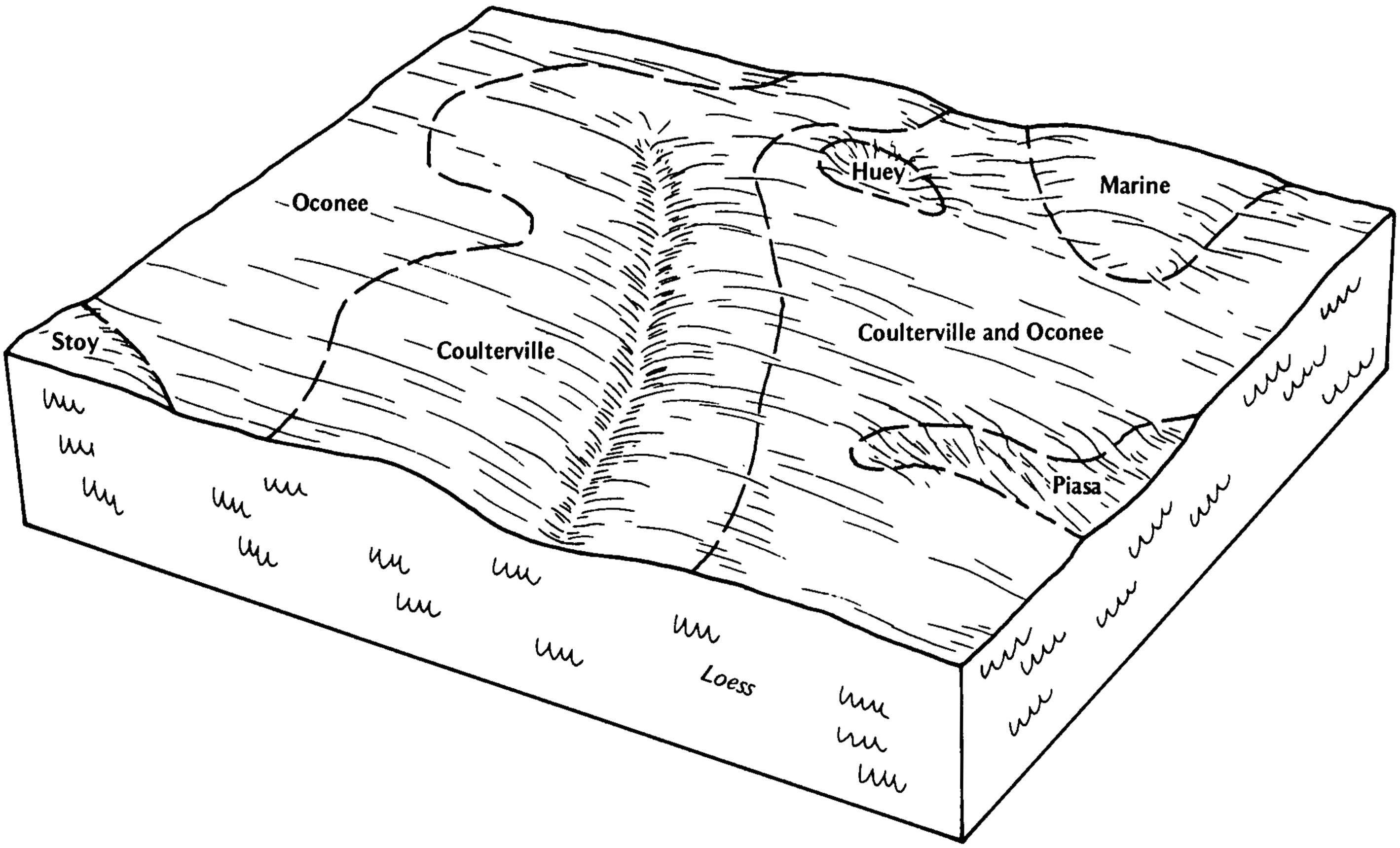


Figure 4.—Pattern of soils and parent material in the Coulterville-Oconee association.

This association makes up about 4 percent of the county. It is about 45 percent Lenzburg soils, 15 percent Swanwick soils, 15 percent Schuline soils, and 25 percent minor soils (fig. 5).

The Lenzburg soils are gently sloping to very steep and are well drained. They generally are in ungraded areas. Typically, the surface layer is multicolored silt loam about 3 inches thick. Below this is mixed yellowish brown, light brownish gray, and strong brown silt loam about 3 inches thick. The upper part of the substratum is mixed pale brown and brown silty clay loam. The lower part to a depth of 60 inches is mixed brown and gray silty clay. Flagstones, pebbles, and channers of limestone and pieces of carbolithic material are throughout the profile.

The Swanwick soils are nearly level to sloping and are moderately well drained. The profile consists of replaced soil material. In most areas the surface layer is replaced topsoil material. Typically, it is dark brown silt loam about 9 inches thick. Below this is multicolored silty clay loam about 3 inches thick. The substratum to a depth of 60 inches is multicolored silty clay loam. A few sand grains and pebbles are common in the profile.

The Schuline soils are gently sloping and sloping and are well drained. The profile consists of replaced soil material. In most areas the surface layer is replaced topsoil material. Typically, it is mixed yellowish brown and strong brown silt loam about 3 inches thick. Below this is mixed dark yellowish brown, grayish brown, strong brown, and light gray clay loam about 10 inches thick. The substratum to a depth of 60 inches is multicolored silty clay loam. Pebbles generally are throughout the profile.

Minor in this association are the Coulterville, Morristown, and Stoy soils and Orthents. The somewhat poorly drained Coulterville and Stoy soils are in undisturbed areas. The well drained Morristown soils are very stony. They are in positions on the landscape similar to those of the Lenzburg soils. Orthents are on cut and filled construction sites.

Most areas of this association are used for hay and pasture or for cultivated crops. The nearly level to steep areas are well suited or moderately suited to pasture.

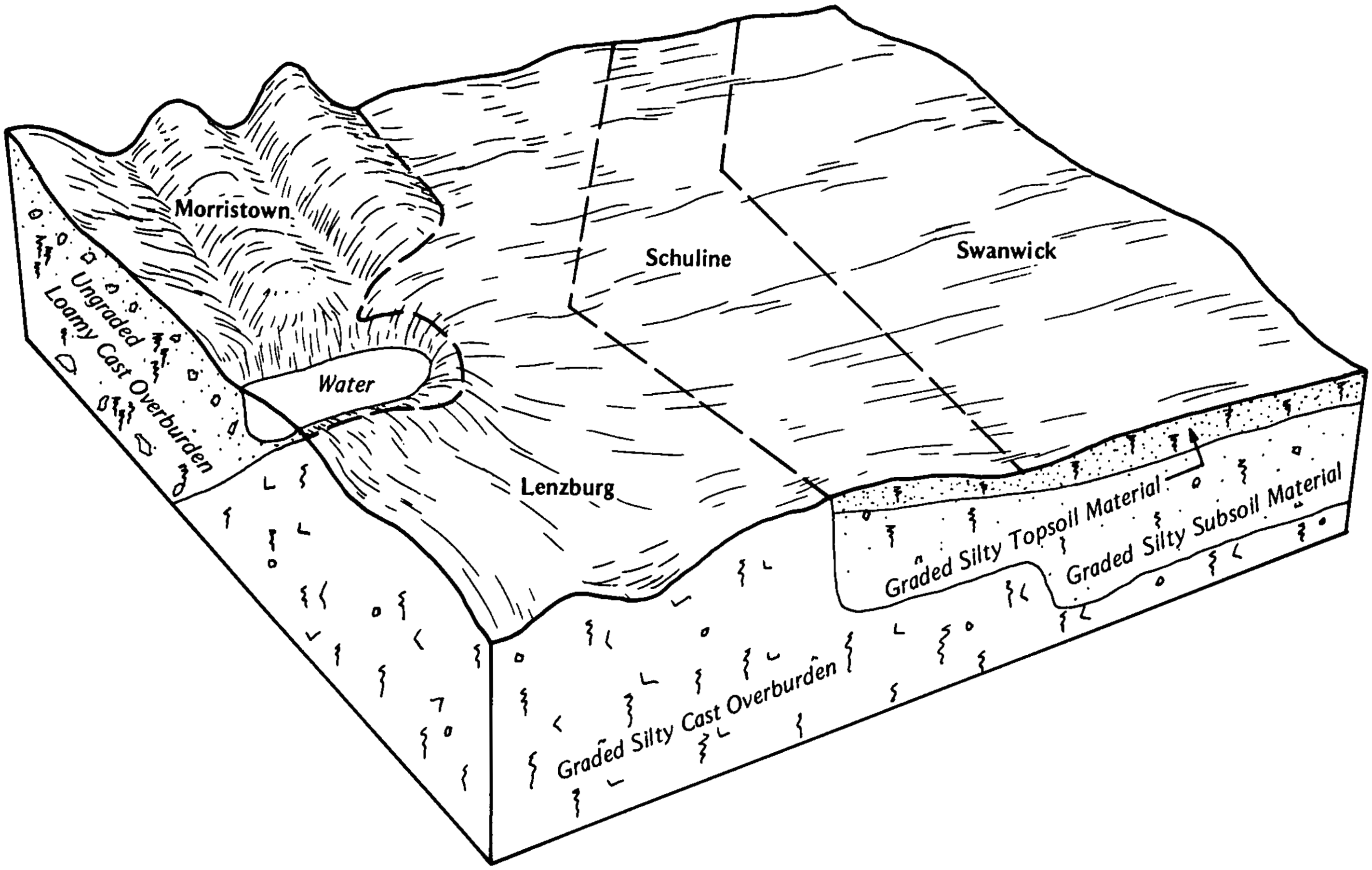


Figure 5.—Pattern of soils and parent material in the Lenzburg-Swanwick-Schuline association.

The Swanwick and Schuline soils are well suited or moderately suited to cultivated crops, but the Lenzburg soils generally are unsuited. Erosion is a hazard in the gently sloping to very steep areas. The seasonal wetness of the nearly level Swanwick soils is a limitation. Measures that maintain the drainage system are needed.

In most areas this association is moderately suited to dwellings, but the steep and very steep Lenzburg soils generally are unsuited. The shrink-swell potential, the slope, and the seasonal wetness are limitations. In most areas the association is poorly suited to septic tank absorption fields, and the steep and very steep Lenzburg soils generally are unsuited. Restricted permeability and the slope are limitations.

8. Hosmer-Stoy-Hickory Association

Gently sloping to very steep, well drained to somewhat poorly drained, silty soils that formed in loess, in loess and glacial till, or in glacial till

This association consists of soils on convex ridgetops and the sides of knolls and hills on dissected till plains and in bedrock-controlled areas. Slopes range from 1 to 60 percent.

This association makes up about 36 percent of the county. It is about 35 percent Hosmer soils, 20 percent Stoy soils, 10 percent Hickory and similar soils, and 35 percent minor soils (fig. 6).

The Hosmer soils formed entirely in loess. They are gently sloping on ridges and strongly sloping on side slopes and are moderately well drained. Typically, the surface layer is dark brown silt loam about 6 inches thick. The subsurface layer is yellowish brown silt loam about 6 inches thick. The subsoil is about 38 inches thick. The upper part is yellowish brown silt loam and silty clay loam; the next part is yellowish brown, mottled silty clay loam; and the lower part is yellowish brown, mottled, very firm, slightly brittle silty clay loam. The substratum to a depth of 60 inches is yellowish brown, mottled silt loam.

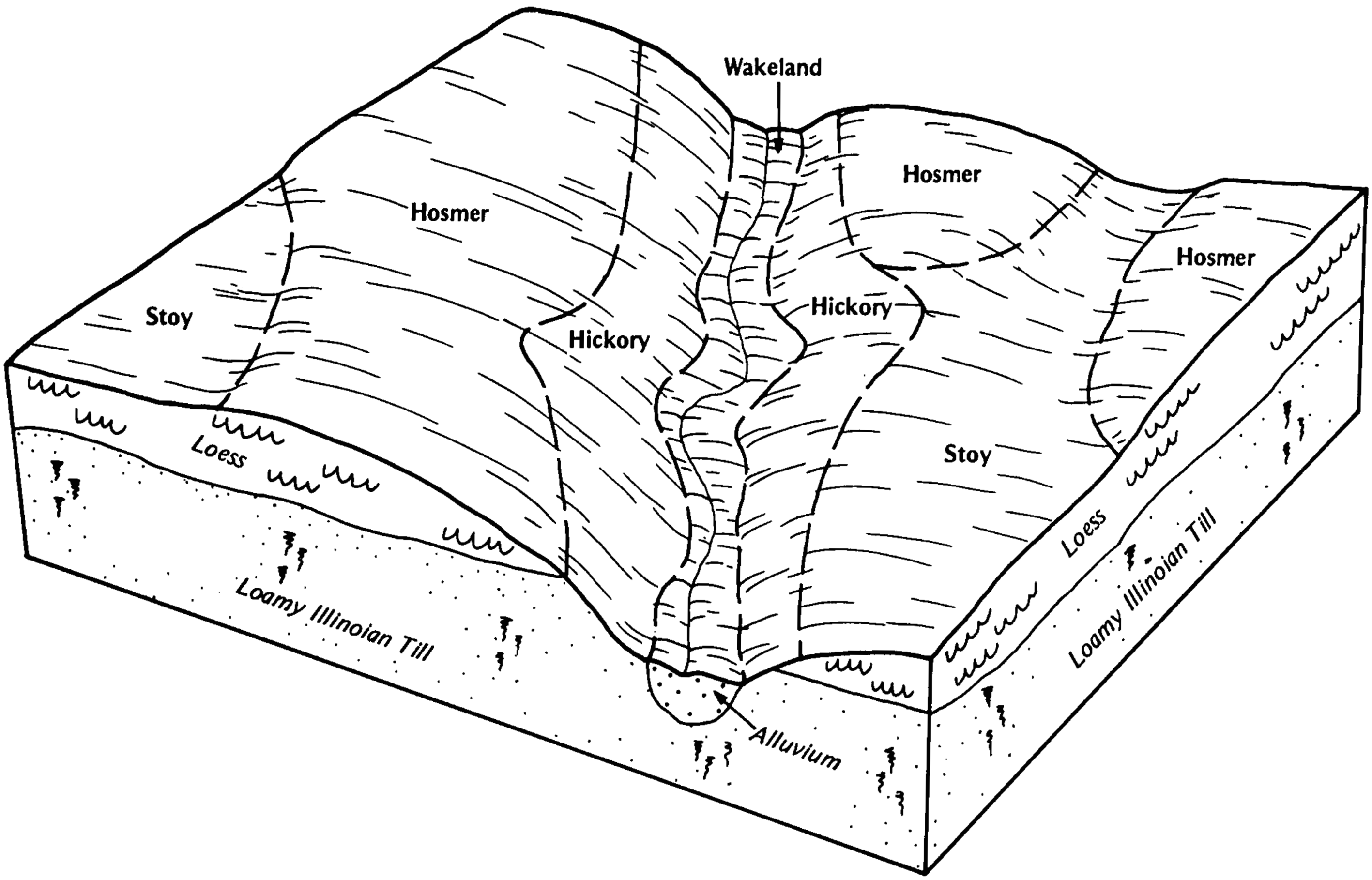


Figure 6.—Pattern of soils and parent material in the Hosmer-Stoy-Hickory association.

The Stoy soils formed entirely in loess. They are gently sloping and sloping. They are on ridgetops and on side slopes at the head of drainageways and are somewhat poorly drained. Typically, the surface layer is dark brown silt loam about 9 inches thick. The subsurface layer is yellowish brown silt loam about 7 inches thick. The subsoil is about 31 inches thick. The upper part is yellowish brown silt loam; the next part is brown and yellowish brown, mottled silty clay loam; and the lower part is grayish brown, light brownish gray, and brown, mottled, very firm, brittle silt loam. The substratum to a depth of 60 inches is grayish brown, mottled silt loam.

The Hickory soils formed entirely in glacial till or in a thin mantle of loess and in the underlying glacial till. They are steep and very steep. They are on side slopes along drainageways and are well drained. Typically, the surface layer is dark grayish brown silt loam about 4 inches thick. The subsurface layer is brown silt loam about 4 inches thick. The subsoil is about 43 inches thick. The upper part is strong brown silt loam and clay loam, and the lower part is yellowish brown and brownish yellow clay loam. The substratum to a depth of 60 inches is brownish yellow loam.

Minor in this association are the Blair, Grantfork, Wakeland, and Wellston soils. The somewhat poorly drained Blair and Grantfork soils are on side slopes between the Hosmer and Hickory soils. Grantfork soils have a high content of sodium in the subsoil. The somewhat poorly drained Wakeland soils are on narrow flood plains along small streams. The well drained Wellston soils commonly are at the base of very steep side slopes. They are underlain by bedrock and have rock fragments throughout.

Most areas of this association are cultivated or are used for hay and pasture. Some are used for woodland, wildlife habitat, recreation, or residences and farmsteads. The gently sloping and sloping Hosmer and Stoy soils are well suited or moderately suited to cultivated crops, but the strongly sloping Hosmer soils are poorly suited and the strongly sloping, severely eroded Hosmer soils and Hickory soils generally are unsuited. Most areas are well suited to hay and pasture, but the very steep Hickory soils generally are unsuited. Erosion is a hazard, and the slope is a limitation.

This association generally is well suited to woodland and to habitat for openland and woodland wildlife. The Stoy soils, however, are moderately suited to woodland, and the Hickory soils are moderately suited or poorly suited to habitat for openland wildlife. In the areas used as woodland, the erosion hazard, plant competition, and the equipment limitation are management concerns. Because of contrasting relief, scenic overlooks, wooded slopes, and rocky areas, the association is suitable for paths and trails.

This association is poorly suited or generally unsuited to dwellings and septic tank absorption fields. The seasonal wetness and restricted permeability of the Hosmer and Stoy soils, the shrink-swell potential of all three soils, and the slope of the Hosmer and Hickory soils are limitations.

9. Alford Association

Gently sloping to very steep, well drained, silty soils that formed in loess

This association consists of soils on ridgetops, knolls, and side slopes or hillsides on dissected, loess-covered till plains and in bedrock-controlled areas. Some areas have small or large sinkholes. Slopes range from 1 to 50 percent.

This association makes up about 23 percent of the county. It is about 65 percent Alford soils and 35 percent minor soils (fig. 7).

The Alford soils typically have a surface layer of dark yellowish brown silt loam about 9 inches thick. The subsoil is about 49 inches of yellowish brown and strong

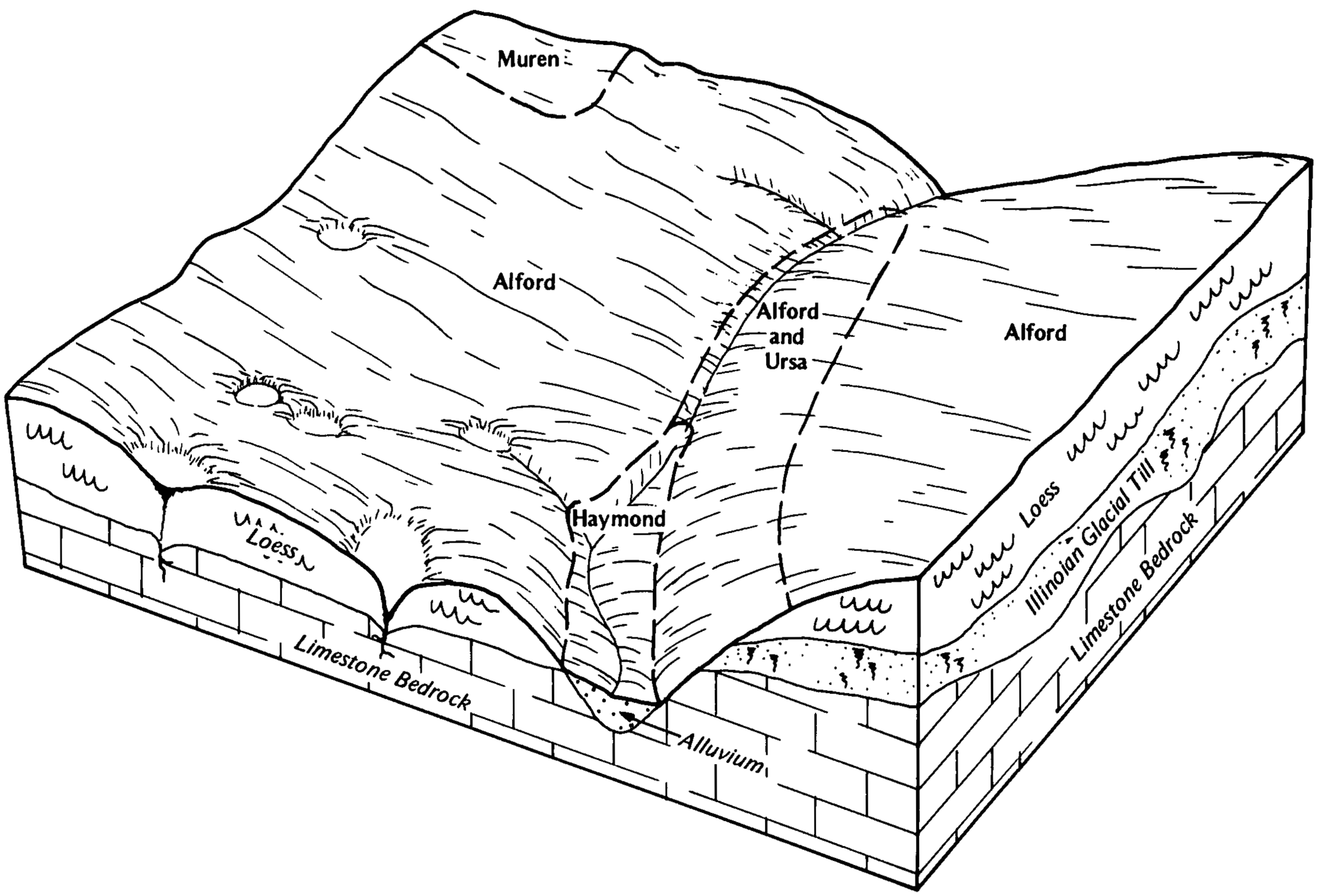


Figure 7.—Pattern of soils and parent material in the Alford association.

brown silty clay loam and silt loam. The substratum to a depth of 60 inches is strong brown silt loam.

Minor in this association are the Haymond, Muren, Neotoma, and Ursa soils. The well drained Haymond soils are on narrow flood plains along small streams. The moderately well drained Muren soils are commonly on the slightly lower or less sloping parts of the landscape. The well drained Neotoma soils are commonly at the base of steep or very steep slopes. They are stony throughout and have bedrock within a depth of 60 inches. Ursa soils have more clay and sand in the subsoil than the Alford soils. Also, they are lower on the landscape.

The gently sloping and sloping Alford soils are commonly cultivated. These soils are suited to cultivated crops and to pasture and hay. Erosion is a hazard.

The steeper areas are wooded. This association is well suited to woodland and to habitat for woodland wildlife. Plant competition, the equipment limitation, and the erosion hazard are concerns in managing woodland. The gently sloping to strongly sloping areas are well suited or moderately well suited to habitat for openland wildlife, but the steep and very steep areas are poorly suited. Because of contrasting relief, overlooks, wooded slopes, and rocky areas, the association is suitable for paths and trails.

The gently sloping to strongly sloping Alford soils are well suited or moderately suited to dwellings and septic tank absorption fields, but the steeper soils are generally unsuited. The slope and the shrink-swell potential are limitations.

Broad Land Use Considerations

The soils in Randolph County vary widely in their suitability for major land uses. In 1976, about 48 percent of the county was used for cultivated crops, mainly soybeans, corn, and wheat (*8*). This cropland is in scattered areas throughout the county, mainly in associations 1, 2, 3, 4, 6, and 8. The soils in these associations generally are suitable for cultivated crops. Most areas in associations 1 and 2 are protected by a levee system and are subject to only rare flooding. Low areas are subject to ponding. Unprotected areas in associations 1 and 2 and most of the areas in association 3 are more frequently flooded. The flooding occurs principally in winter and early spring and causes slight or moderate crop damage. Wetness is a major limitation in associations 5 and 6. The hazard of erosion is a major problem on the terraces and uplands in associations 4, 7, and 8.

About 28 percent of the county was pasture or hayland in 1976. Most of the pasture and hayland was in associations 4, 5, 7, 8, and 9. The soils in these associations generally are suitable for grasses and legumes. In some areas grazing is restricted during wet periods.

About 14 percent of the county was wooded in 1976. This woodland is mainly in associations 7, 8, and 9. The soils in these associations generally are suitable for woodland. In some areas the equipment limitation is moderate or severe because of slope, surface stoniness, or wetness, but these limitations can be overcome by using special equipment or by restricting the use of equipment during wet periods.

In 1976, less than about 2 percent of the county was urban or built-up land. Alford, Hosmer, Martinsville, and St. Charles soils, which are mainly in associations 4, 8, and 9, generally are better suited to residential uses than other soils. The steep and very steep soils in associations 7, 8, and 9 are generally unsuited to dwellings. In other associations, a high shrink-swell potential, wetness, and restricted permeability are the major limitations. The soils on flood plains, such as those in associations 1, 2, and 3, generally are unsuited to residential development because they are subject to flooding.

The suitability for recreational uses ranges from good to poor, depending on the soil and the intensity of the expected use. Many areas in associations 4, 8, and 9 are suitable for intensive recreational uses, such as playgrounds and camp areas. In some areas, however, the slope and surface stoniness are limitations. Associations 1, 2, and 3 are poorly suited to intensive recreational uses because of flooding. Wetness limits intensive recreational development in associations 5 and 6. Small areas that are suitable for intensive recreational development are available in most associations. Most of the associations are suited to paths and trails for hiking or horseback riding.

The suitability for wildlife habitat generally is good throughout the county. The soils in associations 2 through 9 generally are suitable for openland and woodland wildlife habitat. The soils in association 1 are suitable for wetland wildlife habitat.

Detailed Soil Map Units

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

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

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

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

Soils of one series can differ in texture of the surface layer or of the substratum. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alford silt loam, 1 to 5 percent slopes, is a phase of the Alford series.

Some map units are made up of two or more major soils. These map units are called soil complexes. A *soil complex* consists of two or more soils, or one or more soils and a miscellaneous area, in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Neotoma-Wellston complex, 25 to 50 percent slopes, is an example.

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

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

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

Soil Descriptions

5C2—Blair silt loam, 5 to 10 percent slopes, eroded. This sloping, somewhat poorly drained soil is on side slopes along drainageways in the uplands. Slopes are mainly 50 to 150 feet long. Individual areas are circular or irregular in shape and range from about 5 to 40 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 6 inches thick. It has been thinned by erosion. The subsoil is firm silty clay loam about 39 inches thick. It is mottled. The upper part is yellowish brown, and the lower part is grayish brown and light brownish gray. Sand grains and pebbles are common in the subsoil. The substratum to a depth of 60 inches is light brownish gray and gray, mottled silty clay loam. In places the upper part of the subsoil is grayish brown. In some areas the slope is less than 5 percent.

Included with this soil in mapping are small areas of Hosmer and Stoy soils on the upper part of some slopes. These soils have a dense and brittle layer in the lower part of the subsoil. They make up about 5 to 10 percent of the unit.

Water and air move through the Blair soil at a moderately slow rate. Surface runoff is medium. Available water capacity is moderate or high. The seasonal high water table is 1.5 to 3.5 feet below the surface from March through June in most years. The subsoil is medium acid to very strongly acid in the upper part and medium acid to neutral in the lower part. Organic matter content is moderately low. The surface layer tends to puddle and crust after hard rains. The potential for frost action is high, and the shrink-swell potential is moderate.

Most areas are used for cultivated crops or for hay and pasture. This soil is moderately suited to cultivated crops and woodland. It is well suited to habitat for openland and woodland wildlife and to hay and pasture. It is poorly suited to dwellings and septic tank absorption fields.

If this soil is used for corn, soybeans, or small grain, further erosion is a hazard and tilth is a limitation. Soil loss can be kept within tolerable limits by a crop rotation that includes 1 or more years of forage crops, by a conservation tillage system that leaves crop residue on the surface after planting, by contour farming, by terraces, or by a combination of these. Returning crop residue to the soil and regularly adding other organic material help to maintain productivity, prevent crusting, and improve tilth.

Adapted forage and hay plants grow well on this soil. Timely deferment of grazing helps to prevent overgrazing and thus also helps to prevent surface compaction, excessive runoff, and a greater susceptibility to erosion. Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion. Applications of fertilizer are needed. The plants should not be grazed or clipped until they are sufficiently established.

If this soil is used as a site for dwellings, the seasonal high water table and the shrink-swell potential are limitations. Installing either tile drains near the foundations or interceptor drains on the higher adjacent side slopes helps to lower the water table. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

The moderately slow permeability and the seasonal wetness are limitations if this soil is used as a septic tank absorption field. Tile drains help to lower the water table. Enlarging the absorption area helps to overcome the moderately slow permeability. A septic tank system can function satisfactorily if a sealed sand filter and a disinfection tank or an evapotranspiration bed are installed.

On sites for local roads and streets, low strength is a limitation and frost action is a hazard. Strengthening or replacing the base material can help to prevent road damage.

The land capability classification is IIIe.

5C3—Blair silt loam, 5 to 10 percent slopes, severely eroded. This sloping, somewhat poorly drained soil is on side slopes along drainageways in the uplands. In most areas, nearly all of the original surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. Slopes are mainly 50 to 150 feet long. Individual areas are circular or irregular in shape and range from about 5 to 30 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 3 inches thick. The subsoil is about 37 inches thick. The upper part is yellowish brown, friable silt loam; the next part is brown, mottled, firm silty clay loam; and the lower part is grayish brown and gray, mottled, firm silty clay loam. Sand grains and pebbles are common in the subsoil. The substratum to a depth of 60 inches is gray, mottled, firm silty clay loam and clay loam. In places the upper part of the subsoil is grayish brown. In some areas the slope is less than 5 percent. In other areas the surface layer is silty clay loam.

Included with this soil in mapping are small areas of Hosmer and Stoy soils on the upper part of some slopes. These soils have a dense and brittle layer in the lower part of the subsoil. They make up about 5 to 10 percent of the unit.

Water and air move through the Blair soil at a moderately slow rate. Surface runoff is medium or rapid in cultivated areas. Available water capacity is moderate or high. The seasonal high water table is 1.5 to 3.5 feet below the surface from March through June in most years. The subsoil is medium acid to very strongly acid in the upper part and medium acid to neutral in the lower part. Natural fertility and organic matter content are low. Tilth is poor in the surface layer. This layer tends to crust after hard rains. The potential for frost action is high, and the shrink-swell potential is moderate.

Most areas are used for cultivated crops or for pasture. This soil is moderately suited to hay, pasture, and woodland. It is well suited to habitat for openland and woodland wildlife. It is poorly suited to cultivated crops and to dwellings and septic tank absorption fields.

Unless the surface is protected, further erosion is a severe hazard in the areas used for soybeans, corn, or small grain. It can be controlled by a system of conservation tillage that leaves crop residue on the surface after planting, by contour farming, by terraces, and by a crop rotation that is dominated by forage crops. Tilling when the soil is wet causes surface cloddiness and compaction and excessive runoff and erosion. Returning crop residue to the soil and regularly adding other organic material increase the rate of water infiltration and improve tilth.

Adapted forage and hay plants grow well on this soil (fig. 8). Timely deferment of grazing helps to prevent overgrazing and thus also helps to prevent surface compaction, excessive runoff, and a greater susceptibility to erosion. Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion. Applications of fertilizer are needed. The plants should not be grazed or clipped until they are sufficiently established.

If this soil is used as a site for dwellings, the seasonal high water table and the shrink-swell potential are limitations. Installing either tile drains near the foundations or interceptor drains on the higher adjacent side slopes helps to lower the water table. Extending the

Figure 8.—Seeding alfalfa and orchardgrass on Blair silt loam, 5 to 10 percent slopes, severely eroded.

footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

The moderately slow permeability and the seasonal wetness are limitations if this soil is used as a septic tank absorption field. Tile drains help to lower the water table. Enlarging the absorption area helps to overcome the moderately slow permeability. A septic tank system can function satisfactorily if a sealed sand filter and a disinfection tank or an evapotranspiration bed are installed.

On sites for local roads and streets, low strength is a limitation and frost action is a hazard. Strengthening or replacing the base material can help to prevent road damage.

The land capability classification is IVe.

5D2—Blair silt loam, 10 to 18 percent slopes, eroded. This strongly sloping, somewhat poorly drained soil is on hillsides in the uplands. Slopes are mainly 50 to 150 feet long. Individual areas generally are long and irregular in shape and range from about 5 to 35 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. It has been thinned by erosion. The subsoil is firm and hard silty clay loam about 52 inches thick. The upper part is yellowish brown and pale brown, the next part is grayish brown and light brownish gray and is mottled, and the lower part is gray and mottled. The substratum to a depth of 65 inches is gray, mottled silty clay loam. Sand grains and pebbles are common throughout the profile. In places the surface layer is silty clay loam.

Included with this soil in mapping are small areas of alluvial soils along drainageways and small streams. Also included are areas of the moderately well drained Hosmer and well drained Ursa soils. Hosmer soils have a dense and brittle layer in the subsoil. They are on the higher slopes. Ursa soils have more clay in the subsoil than the Blair soil. They are on the lower slopes. Included soils make up about 3 to 8 percent of the unit.

Water and air move through the Blair soil at a moderately slow rate. Surface runoff is medium or rapid in cultivated areas. Available water capacity is moderate or high. The seasonal high water table is 1.5 to 3.5 feet below the surface from March through June in most years. The subsoil is medium acid to very strongly acid in the upper part and strongly acid to neutral in the lower part. Natural fertility is low, and organic matter content is moderately low. The potential for frost action is high, and the shrink-swell potential is moderate.

Most areas are used for hay or pasture. Some areas are used as woodland. This soil is well suited to hay and pasture and moderately suited to woodland and cultivated crops. It is well suited to habitat for openland and woodland wildlife. It is poorly suited to dwellings and septic tank absorption fields.

Further erosion is a hazard if this soil is used for corn, soybeans, or small grain. Also, tilth is a limitation. Soil loss can be kept within tolerable limits by a crop rotation dominated by forage crops and by a combination of contour farming and a conservation tillage system that leaves crop residue on the surface after planting. Stripcropping also helps to control erosion. Returning crop residue to the soil and regularly adding other organic material help to maintain productivity, prevent crusting, and improve tilth.

Establishing pasture plants or hay helps to keep soil loss within tolerable limits. A no-till method of pasture renovation or seeding helps to establish forage species and control further erosion. The plants should not be grazed until they are sufficiently established. Proper stocking rates, rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to prevent surface compaction and excessive runoff.

If this soil is used as a site for dwellings without basements, the seasonal high water table, the shrink-swell potential, and the slope are limitations. Installing subsurface tile drains near the foundations lowers the water table. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling. Cutting, filling, and land shaping help to overcome the slope. During construction erosion and sedimentation are hazards. Bare areas should be seeded and mulched, or they should be sodded as soon as possible. Use of sediment basins during construction reduces sedimentation in surface waters.

The seasonal wetness, the moderately slow permeability, and the slope are limitations if this soil is used as a septic tank absorption field. A septic tank system can function satisfactorily if a sealed sand filter and a disinfection tank or an evapotranspiration bed are installed and the site is leveled.

On sites for local roads and streets, frost action is a hazard and low strength is a limitation. Strengthening or replacing the base material helps to prevent road damage. Grading may be needed during construction. During periods before a plant cover is established in disturbed areas, additions of mulch are needed to control erosion.

The land capability classification is IVe.

5D3—Blair silt loam, 10 to 18 percent slopes, severely eroded. This strongly sloping, somewhat poorly drained soil is on hillsides in the uplands. In most areas, nearly all of the original surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. Slopes are mainly 50 to 150 feet long. Individual areas generally are long and irregular in shape and range from about 5 to 30 acres in size.

Typically, the surface layer is dark yellowish brown, friable silt loam about 8 inches thick. The subsoil is about 49 inches thick. The upper part is yellowish brown, mottled, friable silty clay loam; the next part is grayish brown, mottled, firm silt loam and silty clay loam; and the lower part is yellowish brown and dark yellowish brown, mottled, firm loam. The substratum to a depth of 65 inches is yellowish brown and light brownish gray loam. In some areas the slope is less than 10 percent.

Included with this soil in mapping are a few small areas of the moderately well drained Hosmer and well drained Ursa soils. Hosmer soils have a dense and brittle layer in the subsoil. They are on the higher slopes. Ursa soils have more clay in the subsoil than the Blair soil. They are on the lower slopes. Also included are small areas of alluvial soils along drainageways at the base of slopes. Included soils make up 3 to 8 percent of the unit.

Water and air move through the Blair soil at a moderately slow rate. Surface runoff is rapid in cultivated areas. The seasonal high water table is at a depth of 1.5

to 3.5 feet from March through June in most years. Available water capacity is moderate or high. The subsoil is medium acid to very strongly acid in the upper part and strongly acid to neutral in the lower part. Organic matter content is low. Tilth is poor in the surface layer. This layer tends to puddle and crust after hard rains. The potential for frost action is high, and the shrink-swell potential is moderate.

Most areas are used for pasture or cultivated crops. Some have reverted to forbs and shrubs. Because of the erosion hazard, this soil generally is unsuited to cultivated crops. It is moderately suited to woodland and is well suited to hay and pasture and to habitat for openland and woodland wildlife. It is poorly suited to dwellings and septic tank absorption fields.

Establishing pasture plants or hay helps to keep soil loss within tolerable limits. Seedbed preparation is difficult on severely eroded side slopes where the subsoil is exposed. A no-till method of pasture renovation or seeding helps to establish forage species and control further erosion. The plants should not be grazed until they are sufficiently established. Proper stocking rates, rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to prevent surface compaction and excessive runoff.

If this soil is used as a site for dwellings without basements, the seasonal high water table, the shrink-swell potential, and the slope are limitations. Installing subsurface tile drains near the foundations lowers the water table. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling. Cutting, filling, and land shaping help to overcome the slope. During construction erosion and sedimentation are hazards. Bare areas should be seeded and mulched, or they should be sodded as soon as possible. Use of sediment basins during construction reduces sedimentation in surface waters.

The seasonal wetness, the moderately slow permeability, and the slope are limitations if this soil is used as a septic tank absorption field. A septic tank system can function satisfactorily if a sealed sand filter and a disinfection tank or an evapotranspiration bed are installed and the site is leveled.

The land capability classification is VIe.

8E—Hickory silt loam, 18 to 30 percent slopes. This steep, well drained soil is on side slopes in the uplands. Individual areas are long and irregular in shape and range from 10 to 100 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 4 inches thick. The subsurface layer is yellowish brown, friable silt loam about 5 inches thick. The subsoil is about 42 inches of yellowish brown and strong brown, firm silty clay loam and clay loam. The substratum to a depth of 60 inches is yellowish brown, very firm loam. In some places the upper part of the subsoil has less clay. In other places the substratum has more clay.

Included with this soil in mapping are small areas of the moderately well drained Hosmer soils on the upper part of the slopes and the somewhat poorly drained Stoy soils at the head of drainageways. Hosmer soils have a dense, brittle layer in the lower part. Also included are seepy spots, small areas of stony soils on the lower part of some slopes, and small areas of silty alluvial soils along drainageways or small streams. Included soils make up 10 to 15 percent of the unit.

Water and air move through the Hickory soil at a moderate rate. Surface runoff is rapid. The available water capacity is high. The subsoil is dominantly very strongly acid to medium acid but ranges to neutral in the lower part. Organic matter content is moderately low. The shrink-swell potential and the potential for frost action are moderate.

Most areas are used as woodland or pasture. This soil is well suited to pasture, to woodland, and to habitat for woodland wildlife. It is moderately suited to habitat for openland wildlife. It generally is unsuited to cultivated crops and to dwellings and septic tank absorption fields because of the steep slope and a severe erosion hazard.

Establishing pasture plants or hay helps to control erosion on this soil. Overgrazing causes surface compaction, excessive runoff, and a greater susceptibility to erosion. Proper stocking rates and timely deferment of grazing help to prevent overgrazing. Applications of fertilizer are needed. The plants should not be grazed or clipped until they are sufficiently established. Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to keep the pasture in good condition and helps to control erosion.

If this soil is used as woodland, the erosion hazard and the equipment limitation are management concerns. They are caused by the slope. Plant competition also is a management concern. It affects the seedlings of desirable species. The competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Logging roads and skid trails should be established on the contour if possible. On the steeper slopes, the logs or trees should be skidded uphill with a cable and winch. Firebreaks should be the grass type. Bare logging areas should be seeded to grass or to a grass-legume mixture. Machinery should be used only when the soil is firm enough to support the equipment. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots.

The land capability classification is VIe.

8E3—Hickory silt loam, 18 to 30 percent slopes, severely eroded. This steep, well drained soil is on side slopes in the uplands. In most areas, nearly all of the original surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. Individual areas are long and irregular in shape and range from 5 to 75 acres in size.

Typically, the surface layer is dark yellowish brown, firm silt loam about 4 inches thick. The subsoil is about 43 inches of yellowish brown and strong brown, firm and very firm silty clay loam and clay loam. The substratum to a depth of 60 inches is brownish yellow, very firm loam. In places it has more clay.

Included with this soil in mapping are small areas of Hosmer and Stoy soils. The moderately well drained Hosmer soils are on the higher slopes. They have a dense, brittle layer in the lower part of the subsoil. The somewhat poorly drained Stoy soils are at the head of drainageways. Also included are a few small areas that are so severely eroded that most of the surface soil and subsoil has been removed, a few seepy spots, a few small areas of stony soils on the lower part of the slopes, and small areas of silty alluvial soils along drainageways. Included soils make up 10 to 15 percent of the unit.

Water and air move through the Hickory soil at a moderate rate. Surface runoff is rapid. Available water capacity is high. The subsoil is dominantly very strongly acid to medium acid but ranges to neutral in the lower part. Organic matter content is low. Tilth is poor in the surface layer. In bare areas this layer tends to puddle and crust after hard rains. The potential for frost action is moderate.

Most areas are used for hay and pasture. This soil is well suited to pasture but is poorly suited to hay. It is well suited to woodland and to habitat for woodland wildlife. It is moderately suited to habitat for openland wildlife. It generally is unsuited to cultivated crops and to dwellings and conventional septic tank absorption fields because of the steep slope and a severe erosion hazard.

Establishing pasture plants or hay helps to control erosion on this soil. Overgrazing causes surface compaction, excessive runoff, and a greater susceptibility to erosion. Proper stocking rates and timely deferment of grazing help to prevent overgrazing. Applications of fertilizer are needed. The plants should not be grazed or clipped until they are sufficiently established. Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to keep the pasture in good condition and helps to control erosion.

If this soil is used as woodland, the erosion hazard and the equipment limitation are management concerns. They are caused by the slope. Plant competition also is a management concern. It affects the seedlings of desirable species. The competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Logging roads and skid trails should be established on the contour if possible. On the steeper slopes, the logs or trees should be skidded uphill with a cable and winch. Firebreaks should be the grass type. Bare logging areas should be seeded to grass or to a grass-legume mixture. Machinery should be used only when the soil is firm enough to support the equipment. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots.

Trees and shrubs can be easily established on this soil. The existing stands of trees provide good habitat for woodland wildlife. Protection from fire and grazing helps to prevent depletion of the shrubs and sprouts that provide food for wildlife.

The land capability classification is VIe.

8G—Hickory silt loam, 25 to 60 percent slopes. This very steep, well drained soil is on side slopes in the uplands. Slopes generally are 75 to 350 feet long. Individual areas are irregular in shape and range from 10 to 40 acres in size.

Typically, about 1 inch of partially decomposed organic material is at the surface. The surface layer is dark grayish brown, friable silt loam about 4 inches thick. The subsurface layer is brown, friable silt loam about 4 inches thick. The subsoil is about 43 inches thick. The upper part is strong brown, firm silt loam and clay loam, and the lower part is yellowish brown and brownish yellow, firm clay loam. The substratum to a depth of 60 inches is brownish yellow loam. In places the upper part of the subsoil contains less sand.

Included with this soil in mapping are small areas of severely eroded soils. Also included are areas of stony soils at the base of the slopes and scattered small areas of droughty, sandy soils. Included soils make up 4 to 8 percent of this unit.

Water and air move through the Hickory soil at a moderate rate. Surface runoff is very rapid. Available water capacity is high. The subsoil is very strongly acid to medium acid. Organic matter content is moderately low. The potential for frost action is moderate.

Most areas are used as woodland. This soil is well suited to woodland and to habitat for woodland wildlife. It is poorly suited to openland wildlife habitat. It generally is unsuited to cultivated crops and to dwellings and septic tank absorption fields because of the very steep slope and a severe erosion hazard.

If this soil is used as woodland, the erosion hazard and the equipment limitation are management concerns. They are caused by the slope. Plant competition also is a management concern. It affects the seedlings of desirable species. The competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Logging roads and skid trails should be established on the contour if possible. On the steeper slopes, the logs or trees should be skidded uphill with a cable and winch. Firebreaks should be the grass type. Bare logging areas should be seeded to grass or to a grass-legume mixture. Machinery should be used only when the soil is firm enough to support the equipment. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots.

This soil is suitable for grain and seed crops, for wild herbaceous plants, and for hardwood trees, which are needed in areas of woodland wildlife habitat. Food plots of grain or seed crops should be established only in the less sloping areas. Also, the crops should be planted on the contour. Measures that protect the habitat from fire and grazing help to prevent depletion of the shrubs and sprouts that provide food for wildlife.

Generally, these wooded slopes have a significant range in elevation. The rugged landscape is esthetically appealing. Carefully planned trails or paths can be constructed for hiking and sightseeing. Control of erosion is essential.

The land capability classification is VIIe.

16—Rushville silt loam. This nearly level, poorly drained soil is on broad flats or in slight depressions in the uplands. It is ponded for brief periods in late winter and in spring. Individual areas are mainly circular and range from 5 to 30 acres in size.

Typically, the surface layer is dark grayish brown and grayish brown, friable silt loam about 10 inches thick. The subsurface layer is light gray and light brownish gray, friable silt loam about 3 inches thick. The subsoil extends below a depth of 60 inches. The upper part is grayish brown, friable silty clay loam; the next part is light brownish gray and grayish brown, mottled, very firm silty clay; and the lower part is grayish brown, mottled, firm and friable silty clay loam. In some areas the surface layer and subsurface layer are thicker.

Included with this soil in mapping are small areas of the somewhat poorly drained Marine soils on slight rises. Also included are small areas of depressional soils that remain wet for periods that extend into the growing season. Included soils make up 8 to 12 percent of the unit.

Water and air move through the Rushville soil at a very slow rate. Available water capacity is high or moderate. Surface runoff is slow to ponded. A perched seasonal high water table is 1 foot above the surface to 1 foot below from March through June in most years. The subsoil is medium acid to very strongly acid. Organic matter content is moderately low. The surface layer is friable and can be easily tilled, but it often remains wet until late in spring. It tends to puddle and crust after hard rains. The potential for frost action and the shrink-swell potential are high.

Most areas are used for cultivated crops. Some are used as woodland. This soil is moderately suited to cultivated crops, hay, pasture, woodland, and habitat for woodland wildlife. It is well suited to habitat for wetland wildlife but is poorly suited to habitat for openland wildlife. It generally is unsuited to dwellings and septic tank absorption fields because of the ponding, the very slow permeability, and the high shrink-swell potential.

A drainage system has been installed in the areas used for soybeans, corn, or small grain. Measures that maintain or improve the drainage system are needed. A combination of surface ditches and land leveling reduces the wetness. Tilling when the soil is wet causes surface compaction and decreases the rate of water infiltration. Returning crop residue to the soil, adding other organic material, and minimizing tillage increase the infiltration rate and improve tilth. Winter wheat and hay crops are subject to frost heave in some years.

The land capability classification is IIIw.

30G—Hamburg silt loam, 25 to 60 percent slopes. This very steep, somewhat excessively drained soil is on bluffs along the major river valleys. It generally is on west-facing slopes. Individual areas are long and irregular in shape and range from 10 to 80 acres in size.

Typically, the surface layer is dark brown, very friable, calcareous silt loam about 3 inches thick. The next layer is dark yellowish brown, very friable, calcareous silt loam about 4 inches thick. The substratum to a depth of 60 inches is yellowish brown and dark yellowish brown, friable, calcareous silt loam. In places the upper part of the substratum is not calcareous.

Included with this soil in mapping are bedrock escarpments and ledges. Also included, in most places, are stony soils on a narrow talus slope. Included areas make up 10 to 15 percent of the unit.

Water and air move through the Hamburg soil at a moderate rate. Surface runoff is rapid. Available water capacity is moderate. Organic matter content is low. The potential for frost action is high.

Most areas support native grasses and eastern redcedar. This soil is poorly suited to pasture, woodland, and openland wildlife habitat. It generally is unsuited to cultivated crops, to hay, and to dwellings and septic tank absorption fields because of the very steep slope and the erosion hazard.

The native plant cover helps to protect the soil against erosion and provides some food and cover for wildlife. Also, the high bluffs offer a scenic overview of the nearby bottom land. Because the hazard of erosion is very severe, revegetating exposed areas is difficult.

The land capability classification is VIIe.

38B—Rocher very fine sandy loam, 1 to 5 percent slopes. This gently sloping, somewhat excessively drained soil is on ridges and natural levees on flood plains along the major streams. It is protected by a levee system and is subject to only rare flooding. Individual areas are long and narrow and generally are adjacent to sloughs or overflow channels. They range from 5 to 95 acres in size.

Typically, the surface layer is dark brown, very friable very fine sandy loam about 5 inches thick. The substratum to a depth of 60 inches is brown, light yellowish brown, and yellowish brown, very friable and loose very fine sandy loam, loamy very fine sand, and loamy fine sand. In some areas the surface layer is darker.

Included with this soil in mapping are small areas of soils on short, steep slopes. Also included are small areas of moderately well drained Raddle soils, which have a dark surface layer and contain more clay throughout than the Rocher soil. Included soils make up 3 to 8 percent of the unit.

Water and air move through the Rocher soil at a moderately rapid rate. Surface runoff is slow. Available water capacity is low. The soil is neutral to moderately alkaline throughout and is calcareous in part or all of the substratum. Organic matter content is low. The soil dries out quickly after rains and warms up early in spring. The surface layer is very friable and can be easily tilled. The shrink-swell potential is low, and the potential for frost action is moderate.

Most areas are cultivated. This soil is well suited to cultivated crops; to certain specialty crops, such as melons, potatoes, and early season vegetables; to hay and pasture; and to woodland and habitat for woodland wildlife. It generally is unsuited to dwellings and septic tank absorption fields because of the flooding and a poor filtering capacity.

If this soil is used for corn, soybeans, or small grain, erosion and soil blowing are hazards. Also, the low available water capacity and the level of fertility are limitations. Irrigation is beneficial. A source of irrigation water generally is available. Fertilizer should be applied in several small applications rather than one large application. Erosion can be controlled and moisture conserved by a conservation tillage system that leaves crop residue on the surface after planting, by contour farming, or by terraces. Field windbreaks and a tillage system that leaves the surface rough are effective in controlling soil blowing.

Adapted forage and hay plants grow well on this soil. Timely deferment of grazing helps to prevent overgrazing and thus a greater susceptibility to erosion and soil blowing. The plants should not be grazed until they are sufficiently established. Applications of fertilizer are needed.

The land capability classification is IIe.

53B—Bloomfield loamy fine sand, 1 to 7 percent slopes. This gently sloping, somewhat excessively drained soil is on ridges on terraces. Individual areas are irregular in shape and range from 5 to 40 acres in size.

Typically, the surface layer is dark brown, very friable loamy fine sand about 12 inches thick. The subsurface layer is dark yellowish brown, very friable loamy fine sand about 11 inches thick. The subsoil is yellowish brown, very friable loamy fine sand about 10 inches thick. Below this to a depth of 60 inches are alternating bands of brownish yellow and yellowish brown, loose loamy fine sand and brown, very friable fine sandy loam.

Included with this soil in mapping are small areas of the somewhat poorly drained Roby soils on the lower parts of the landscape. Also included are low areas where the soil has less sand than the Bloomfield soil and areas of soils on short, steep slopes. Included soils make up 5 to 8 percent of the unit.

Water and air move through the Bloomfield soil at a rapid rate. Surface runoff is slow. Available water capacity is low. The subsoil is medium acid to neutral. Organic matter content is low. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content. The shrink-swell potential and the potential for frost action are low.

Most areas are used for cultivated crops. This soil is poorly suited to habitat for wildlife and to septic tank absorption fields. It is moderately suited to cultivated crops, hay, pasture, and woodland. It is well suited to dwellings. The underlying material is a probable source of sand.

If this soil is used for corn, soybeans, or small grain, erosion and soil blowing are hazards. Also, the low available water capacity and the level of fertility are limitations. Irrigation is beneficial. A source of irrigation water generally is available. Fertilizer should be applied in several small applications rather than one large application. Erosion can be controlled and moisture conserved by a conservation tillage system that leaves crop residue on the surface after planting, by contour farming, or by terraces. Field windbreaks, winter cover crops, and a tillage system that leaves the surface rough are effective in controlling soil blowing.

If this soil is used as a site for septic tank absorption fields, a poor filtering capacity can result in the pollution of ground water. Installing a sealed sand filter and a disinfection tank helps to prevent this pollution.

The land capability classification is IIIs.

53D2—Bloomfield loamy fine sand, 7 to 20 percent slopes, eroded. This strongly sloping, somewhat excessively drained soil is on the sides of terraces. Individual areas are long and narrow and range from 10 to 30 acres in size.

Typically, the surface layer is dark brown, very friable loamy fine sand about 5 inches thick. It has been thinned by erosion. Beneath the surface layer is dark yellowish brown and yellowish brown, very friable loamy fine sand having horizontal bands that have a slightly higher content of clay. A few areas are more sloping.

Included with this soil in mapping are small areas of soils that have a silt loam substratum. These soils are not so droughty as the Bloomfield soil. They are in landscape positions similar to those of the Bloomfield soil. Also included are areas of the moderately well drained St. Charles soils on the upper parts of some slopes. Included soils make up 5 to 10 percent of the unit.

Water and air move through the Bloomfield soil at a rapid rate. Surface runoff is medium. Available water capacity is low. The subsoil is medium acid to neutral. Organic matter content is low. The surface layer is very friable and can be easily tilled. The shrink-swell potential and the potential for frost action are low.

Most areas are used for pasture or support in native hardwoods. This soil is poorly suited to cultivated crops and to habitat for wildlife. It is moderately suited to hay, pasture, woodland, camp and picnic areas, and dwellings. It is poorly suited to septic tank absorption fields. The underlying material is a probable source of sand.

Adapted forage and hay plants grow well on this soil. Timely deferment of grazing helps to prevent overgrazing and thus also helps to prevent surface compaction, excessive runoff, and a greater susceptibility to erosion. Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion. Applications of fertilizer are needed. The plants should not be grazed or clipped until they are sufficiently established.

In the areas used as woodland, protection from fire and grazing is essential. Logging roads and skid trails should be established on the contour. Logs or trees can be skidded uphill with a cable and winch. Surface water can be diverted from logging roads and skid trails with water bars. Firebreaks should be the grass type and should be established on the contour if possible. Bare logging areas should be seeded to grass or to a grass-legume mixture. Operating machinery only during periods when the soil is firm enough to support the equipment helps to prevent the formation of ruts. When trees are planted in bare areas, a grass cover should be established between the rows. Also, the trees should be planted on the contour if a mechanical planter is used. The seedling mortality rate can be reduced by planting in furrows, by selecting planting stock that is larger than is typical, or by mulching. Some replanting may be needed. Competing vegetation can be controlled by chemicals.

The slope is a limitation on sites for dwellings and for local roads and streets. Cutting and filling help to overcome this limitation.

If this soil is used as a site for septic tank absorption fields, a poor filtering capacity can result in the pollution of ground water. Installing a sealed sand filter and a disinfection tank helps to prevent this pollution.

The land capability classification is IVe.

71—Darwin silty clay. This nearly level, poorly drained soil is on broad flats and in slight depressions on flood plains along the major rivers. It is protected by a levee system and is subject to only rare flooding, especially in areas adjacent to the levee. It is subject to ponding from January through June in most years. Individual areas are long and narrow or are oblong. They range from 10 to 115 acres in size.

Typically, the surface layer is very dark gray, firm silty clay about 10 inches thick. The subsoil is dark gray and gray, mottled, very firm silty clay about 49 inches thick. The substratum to a depth of 65 inches is gray, mottled silty clay. In places it contains more sand and less clay.

Included with this soil in mapping are small areas that have as much as 2 feet of silty overwash. These areas are near overflow channels. Also included are wet soils in depressional areas that are ponded during most of the growing season. Included soils make up 5 to 8 percent of the unit.

Water and air move through the Darwin soil at a very slow rate. Surface runoff is very slow or ponded. Available water capacity is moderate. The seasonal high water table is 1 foot above the surface to 2 feet below from January through June in most years. The subsoil is slightly acid to mildly alkaline. Organic matter content is high. The surface layer is hard when dry and sticky when wet. It can be easily tilled only within a narrow range in moisture content. Clods form if the soil is worked when wet. The shrink-swell potential is high, and the potential for frost action is moderate. Wide cracks form during dry periods.

Most areas are used for cultivated crops. This soil is moderately suited to cultivated crops, woodland, hay and pasture, and habitat for openland and wetland wildlife. It generally is unsuited to dwellings and conventional septic tank absorption fields because of the flooding, the ponding, the very slow permeability, and the high shrink-swell potential.

A drainage system has been installed in the areas used for soybeans, corn, or small grain. Measures that maintain the drainage system are needed. The wetness can be reduced by surface ditches. Tilling when the soil is wet causes surface cloddiness and compaction. Returning crop residue to the soil, tilling in the fall, and minimizing spring tillage improve tilth and increase the rate of water infiltration.

If this soil is used for pasture and hay, the ponding is a hazard. It can be controlled by surface drains, ditches, and surface inlet tile. The grasses and legumes that are tolerant of wetness should be selected for planting. Reed canarygrass and ladino clover are examples. Deferment of grazing when the soil is too wet helps to prevent surface compaction and deterioration of tilth. Proper stocking rates, rotation grazing, and applications of proper fertilizer help to keep the pasture in good condition.

The land capability classification is IIIw.

75C—Drury silt loam, 4 to 12 percent slopes. This sloping, well drained soil is on foot slopes along the bluffs in river valleys. Individual areas generally are fan shaped or elongated and range from 5 to 25 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 10 inches thick. The subsurface layer is dark yellowish brown, friable silt loam about 4 inches thick. The subsoil is dark yellowish brown, friable silt loam about 28 inches thick. The substratum to a depth of 60 inches also is dark yellowish brown, friable silt loam. In places the lower part of the subsoil is calcareous.

Included with this soil in mapping are small areas of gravelly or stony soils adjacent to the bluffs. These soils make up 6 to 10 percent of the unit.

Water and air move through the Drury soil at a moderate rate. Surface runoff is medium. Available water capacity is very high. The subsoil is slightly acid or neutral. Organic matter content is moderately low, and natural fertility is medium. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content. The shrink-swell potential is low, and the potential for frost action is high.

Most areas are used for cultivated crops, hay, or pasture. This soil is well suited to cultivated crops, pasture, hay, woodland, and habitat for openland and woodland wildlife. It is moderately suited to dwellings and septic tank absorption fields.

If this soil is used for corn, soybeans, or small grain, erosion is a hazard and tilth is a limitation. Soil loss can be kept within tolerable limits by a crop rotation that includes 1 or more years of forage crops, by a conservation tillage system that leaves crop residue on the surface after planting, by contour farming, by terraces, or by a combination of these. Returning crop residue to the soil and regularly adding other organic material help to maintain productivity, prevent crusting, and improve tilth.

Adapted forage and hay plants grow well on this soil. Timely deferment of grazing helps to prevent overgrazing and thus also helps to prevent surface compaction, excessive runoff, and a greater susceptibility to erosion. Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion. Applications of fertilizer are needed. The plants should not be grazed or clipped until they are sufficiently established.

If this soil is used as a site for dwellings or septic tank absorption fields, the slope is a limitation. Cutting, filling, and land shaping help to overcome this limitation on sites for dwellings. Installing the filter lines on the contour helps to overcome the slope on sites for septic tank absorption fields.

On sites for local roads and streets, low strength is a limitation and frost action is a hazard. Strengthening or replacing the base material helps to prevent road damage.

The land capability classification is IIIe.

84—Okaw silt loam. This nearly level, poorly drained soil is on broad plains on terraces near the major streams. The low areas adjacent to the streams are subject to rare flooding. Individual areas are circular and range from 10 to 200 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 4 inches thick. The subsurface layer is grayish brown and light gray, friable silt loam about 9 inches thick. The subsoil extends below a depth of 60 inches. It is mottled. The upper part is dark gray, firm silty clay loam; the next part is dark gray, very firm silty clay; and the lower part is grayish brown, very firm silty clay and firm silty clay loam. In places the lower part of the subsoil has less clay.

Included with this soil in mapping are small areas of the somewhat poorly drained Hurst soils on the slightly higher rises. Also included are small areas of soils on short, steep side slopes. Included soils make up 3 to 8 percent of the unit.

Water and air move through the Okaw soil at a very slow rate. Available water capacity is moderate. Surface runoff is very slow or ponded. The seasonal water table is 0.5 foot above the surface to 1.0 foot below from March through June in most years. The subsoil is medium acid to very strongly acid. Organic matter content is moderately low. The surface layer is friable and can be easily tilled, but it tends to puddle or crust after hard rains. The soil often remains wet until late in spring. The shrink-swell potential and the potential for frost action are high.

Most areas are used for woodland or cultivated crops. This soil is moderately suited to cultivated crops, hay, and pasture. It is poorly suited to woodland, openland and woodland wildlife habitat, and camp and picnic areas. It is well suited to wetland wildlife habitat. It generally is unsuited to dwellings and septic tank absorption fields because of the ponding, the high shrink-swell potential, the very slow permeability, and the flooding.

A drainage system has been installed in the areas used for soybeans, corn, or small grain. Measures that maintain or improve the drainage system are needed. A combination of surface ditches and land leveling reduces the wetness. Tilling when the soil is wet causes surface compaction and decreases the rate of water infiltration. Returning crop residue to the soil, adding other organic material, minimizing tillage, and altering the platy subsurface layer by occasional deep chisel plowing enhance root growth, increase the infiltration rate, and help to maintain good tilth. Winter wheat and hay crops are subject to frost heave in some years.

If this soil is used as woodland, the equipment limitation, seedling mortality, and windthrow are management concerns. They are caused by the wetness. Plant competition also is a concern. It affects the seedlings of desirable species. Machinery should be used only when the soil is firm enough to support the equipment. The seedling mortality rate can be reduced by planting on ridges, by selecting planting stock that is older and larger than is typical, or by mulching. Some replanting may be needed. Harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Only high-value trees should be removed from a strip 50 feet wide along the west and south edges of the woodland. The competing plants in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

The land capability classification is IIIw.

85—Jacob silty clay. This nearly level, poorly drained soil is on broad flats and in depressions on flood plains along the major rivers. It is protected by a levee system and is subject to only rare flooding. It is ponded in winter and spring. Individual areas are circular or are long and narrow. They range from 10 to 500 acres in size.

Typically, the surface layer is dark grayish brown, firm silty clay about 6 inches thick. The subsoil is about 49 inches thick. It is grayish brown and dark gray and is mottled. The upper part is firm silty clay, the next part is very firm clay, and the lower part is very firm silty clay. The substratum to a depth of 60 inches is light brownish gray, mottled silty clay that has thin layers of silty clay loam. In some places loamy layers are in the substratum. In other places the surface soil is darker and thicker.

Included with this soil in mapping are small areas that have as much as 24 inches of silty overwash. These areas are near overflow channels. They make up 4 to 8 percent of the unit.

Water and air move through the Jacob soil at a very slow rate. Surface runoff is very slow or ponded. Available water capacity is moderate. The seasonal high water table is within a depth of 1 foot from February through July in most years. The subsoil is dominantly strongly acid to extremely acid but ranges to neutral in the lower part. Organic matter content is moderately low. The surface layer is very firm, cannot be easily tilled, and dries out slowly in the spring. Clods form if the soil is worked when it is too wet, and wide cracks form during dry periods. The potential for frost action is moderate, and the shrink-swell potential is very high.

Most areas are used for cultivated crops or for woodland. This soil is poorly suited to cultivated crops, hay and pasture, and camp and picnic areas. It is suited to woodland and to woodland wildlife habitat. It is poorly suited to openland wildlife habitat but is well suited to wetland wildlife habitat. It generally is unsuited to dwellings and septic tank absorption fields because of the flooding, the ponding, the very high shrink-swell potential, and the very slow permeability.

A drainage system has been installed in the areas used for soybeans, corn, or small grain. Measures that maintain the drainage system are needed. The wetness can be reduced by surface ditches. Tilling when the soil is wet causes surface cloddiness and compaction. Returning crop residue to the soil, tilling in the fall, and minimizing spring tillage improve tilth and increase the rate of water infiltration.

Some areas support native vegetation and provide food and cover for woodland or wetland wildlife. Shallow water areas are available in places. They could be easily developed where they are not currently available.

The land capability classification is IVw.

113A—Oconee silt loam, 0 to 2 percent slopes. This somewhat poorly drained, nearly level soil is on low, broad ridges on upland plains. Individual areas are circular or irregular in shape and range from 5 to 45 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 9 inches thick. The subsurface layer is dark grayish brown and light brownish gray, friable silt loam about 8 inches thick. The subsoil is about 33 inches thick. The upper part is grayish brown and brown, mottled, firm silty clay loam, and the lower part is grayish brown, mottled, firm silt loam. The substratum to a depth of 60 inches is grayish brown, mottled silt loam. In some areas the dark surface layer is thicker.

Included with this soil in mapping are small areas of Coulterville soils. These soils are in the same landscape position as the Oconee soil. They contain more sodium in the lower part of the subsoil than the Oconee soil and have a lighter colored surface layer. Also included are small depressional areas of poorly drained soils that are subject to ponding. Included soils make up 8 to 12 percent of the unit.

Water and air move through the Oconee soil at a slow rate. Surface runoff also is slow. Available water capacity is high. The seasonal high water table is at a depth of 1 to 3 feet from March through June in most years. The subsoil is medium acid to very strongly acid. Natural fertility is medium, and organic matter content is moderate. The shrink-swell potential and the potential for frost action are high.

Most areas are used for cultivated crops. This soil is well suited to cultivated crops, hay, pasture, and habitat for openland wildlife. It is poorly suited to camp and picnic areas and to dwellings and septic tank absorption fields.

In the areas used for soybeans, corn, or small grain, the wetness delays planting in most years. It can be reduced, however, by surface ditches or subsurface drains. Erosion is a hazard in areas where slopes are very long. It can be controlled, however, by a system of conservation tillage that leaves crop residue on the surface after planting. Tilling when the soil is wet causes surface compaction, reduces the rate of water infiltration, and causes excessive runoff. Returning crop residue to the soil and regularly adding other organic material increase the infiltration rate and improve tilth.

The seasonal wetness and the shrink-swell potential are limitations if this soil is used as a site for dwellings. Reinforcing footings and foundations helps to prevent the structural damage caused by shrinking and swelling. Installing subsurface drains around the footings helps to lower the water table. Elevating the floor of dwellings without basements above the surrounding ground level, grading, and diverting surface water also help to overcome the wetness.

The slow permeability and the seasonal wetness are limitations if this soil is used as a septic tank absorption field. Tile drains help to lower the water table. Enlarging the absorption area helps to overcome the slow permeability. A septic tank system can function satisfactorily if a sealed sand filter and a disinfection tank or an evapotranspiration bed are installed.

On sites for local roads and streets, low strength is a limitation and frost action is a hazard. Strengthening or replacing the base material helps to prevent road damage.

The land capability classification is IIw.

113B—Oconee silt loam, 2 to 5 percent slopes. This somewhat poorly drained, gently sloping soil is on the convex crest and side slopes of ridges in the uplands. Individual areas are long and irregular in shape and range from 5 to 35 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 9 inches thick. The subsurface layer is dark grayish brown and grayish brown, friable silt loam about 7 inches thick. The subsoil is about 37 inches thick. The upper part is brown and grayish brown, mottled, firm silty clay loam. The lower part is multicolored, firm and friable silt loam. The substratum to a depth of 60 inches is light brownish gray, mottled silt loam. In a few areas, the soil is eroded and plowing has mixed the subsurface layer with the surface layer.

Included with this soil in mapping are small areas of Coulterville and Stoy soils. These soils have a surface layer that is lighter colored than that of the Oconee soil. Also, Coulterville soils have more sodium in the subsoil and Stoy soils have a dense and brittle layer in the subsoil. Coulterville soils are in landscape positions similar to those of the Oconee soil. Stoy soils are on slight rises. Included soils make up 5 to 10 percent of the unit.

Water and air move through the Oconee soil at a slow rate. Surface runoff is slow or medium. Available water capacity is high. The seasonal high water table is at a depth of 1 to 3 feet from March through June in most years. The subsoil is medium acid to very strongly acid. Organic matter content is moderate. The shrink-swell potential and the potential for frost action are high.

Most areas are used for cultivated crops. This soil is well suited to cultivated crops, hay and pasture, and habitat for openland wildlife. It is suited to paths and trails and to trees. It is poorly suited to dwellings and septic tank absorption fields.

In the areas used for corn, soybeans, or small grain, erosion is a hazard unless the surface is protected. Also, the wetness can delay planting in some years. It can be reduced by surface ditches. Erosion can be controlled by a system of conservation tillage that leaves crop residue on the surface after planting, by contour farming, or by terraces. Tilling when the soil is wet causes surface compaction and reduces the rate of water infiltration. Returning crop residue to the soil and regularly adding other organic material increase the infiltration rate and improve tilth.

Adapted forage and hay plants grow well on this soil. Overgrazing or grazing when the soil is too wet reduces forage yields, causes surface compaction and excessive runoff, and increases the susceptibility to erosion. Proper stocking rates, rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to control erosion.

If this soil is used as a site for dwellings, the seasonal high water table and the shrink-swell potential are limitations. Installing either tile drains near the foundations or interceptor drains on the higher adjacent side slopes helps to lower the water table. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

The seasonal wetness and the slow permeability are limitations if this soil is used as a septic tank absorption field. A septic tank system can function satisfactorily if a sealed sand filter and a disinfection tank or an evapotranspiration bed are installed. Sewage lagoons function well on this soil.

On sites for local roads and streets, low strength is a limitation and frost action is a hazard. Strengthening or replacing the base material can help to prevent road damage.

The land capability classification is IIe.

120—Huey silt loam. This nearly level, poorly drained, saline-alkali soil is on broad flats and in slight depressions in the uplands. It is ponded for brief periods in late winter and in spring. Individual areas are circular and range from 10 to 50 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 9 inches thick. The subsurface layer is light brownish gray, friable silt loam about 4 inches thick. The subsoil is grayish brown and light brownish gray, mottled, firm silty clay loam about 38 inches thick. The substratum to a depth of 60 inches is light brownish gray, mottled silt loam. In some areas the upper part of the subsoil is medium acid to neutral.

Included with this soil in mapping are small areas of the somewhat poorly drained Coulterville and Oconee soils on slight rises. These soils make up 3 to 8 percent of the unit.

Water and air move through the Huey soil at a very slow rate. Available water capacity is low. Surface runoff is very slow or ponded. The seasonal high water table is 0.5 foot above the surface to 2.0 feet below from March through June during most years. Natural fertility and organic matter content are low. The subsoil is mildly alkaline to strongly alkaline. It has a high content of exchangeable sodium. The surface layer tends to puddle and crust after hard rains. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are used for cultivated crops. This soil is poorly suited to cultivated crops, woodland, camp and picnic areas, and openland wildlife habitat. It is moderately suited to woodland wildlife habitat and well suited to wetland wildlife habitat. It generally is unsuited to dwellings and septic tank absorption fields because of the ponding and the very slow permeability.

A drainage system has been installed in the areas used for soybeans, corn, or small grain. Measures that maintain or improve the drainage system are needed. A combination of surface ditches and land leveling reduces the wetness. Tilling when the soil is wet causes surface compaction and decreases the rate of water infiltration. The high content of sodium in the subsoil reduces the availability and uptake of some plant nutrients and results in plant stress during most years. Yields of wheat and soybeans are usually less affected by the sodium content than are yields of corn. Returning crop residue to the soil, adding other organic material, and minimizing tillage increase the infiltration rate and help to maintain good tilth. Winter wheat and hay crops are subject to frost heave in some years.

The land capability classification is IVw.

122B—Colp silt loam, 1 to 5 percent slopes. This gently sloping, moderately well drained soil is on narrow or broad ridges on terraces. Individual areas are irregular in shape and range from 5 to 50 acres in size.

Typically, the surface layer is brown, friable silt loam about 10 inches thick. The subsurface layer is pale brown, friable silt loam about 7 inches thick. The subsoil is very firm and firm silty clay loam about 39 inches thick. It is mottled. The upper part is brown, and the lower part is pale brown. The substratum to a depth of 60 inches is pale brown, mottled silty clay loam. In places the lower part of the subsoil is less acid.

Included with this soil in mapping are a few areas of St. Charles soils and the somewhat poorly drained Hurst soils. St. Charles soils have less clay in the subsoil than the Colp soil. They are on knolls and terrace breaks. Hurst soils are at the head of drainageways. Also included are a few areas of loamy soils on the more sloping terrace breaks. Included soils make up 5 to 10 percent of the unit.

Water and air move through the Colp soil at a slow rate. Surface runoff also is slow. Available water capacity is moderate or high. The seasonal water table is at a depth of 2 to 4 feet from March through June in most years. The subsoil is very strongly acid to medium acid. Organic matter content is moderately low. The surface layer is friable but tends to puddle and crust after hard rains. The shrink-swell potential and the potential for frost action are high.

Most areas are used for cultivated crops or woodland. This soil is moderately suited to cultivated crops and well suited to hay and pasture and to habitat for openland and woodland wildlife. It is poorly suited to dwellings and septic tank absorption fields.

In the areas used for corn, soybeans, or small grain, erosion is a hazard and tilth is a limitation. A conservation tillage system that leaves crop residue on the surface after planting, contour farming, or terraces help to control erosion. Incorporation of crop residue into the soil or additions of other organic material help to prevent crusting and improve tilth. A crop rotation that includes a deep-rooted legume improves tilth and helps to prevent surface compaction.

Adapted forage and hay plants grow well on this soil. Timely deferment of grazing helps to prevent overgrazing and thus a greater susceptibility to erosion and soil blowing. The plants should not be grazed until they are sufficiently established. Applications of fertilizer are needed.

If this soil is used as a site for dwellings, the seasonal high water table and the shrink-swell potential are limitations. Installing either tile drains near the foundations or interceptor drains on the higher adjacent side slopes helps to lower the water table. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

The slow permeability and the seasonal wetness are limitations if this soil is used as a septic tank absorption field. Tile drains help to lower the water table. Enlarging the absorption area helps to overcome the slow permeability. A septic tank system can function satisfactorily if a sealed sand filter and a disinfection tank or an evapotranspiration bed are installed.

On sites for local roads and streets, low strength is a limitation and frost action is a hazard. Strengthening or replacing the base material can help to prevent road damage.

The land capability classification is IIIe.

122C2—Colp silt loam, 5 to 10 percent slopes, eroded. This sloping, moderately well drained soil is on short side slopes on terraces. Individual areas are irregular in shape and range from 5 to 35 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 5 inches thick. It has been thinned by erosion. The subsoil is about 50 inches thick. The upper part is dark brown and dark yellowish brown, very firm silty clay; the next part is brown and strong brown, firm clay loam; and the lower part is grayish brown and dark grayish brown, mottled, very firm silty clay loam and silty clay. The substratum to a depth of 60 inches is grayish brown, mottled silty clay loam. In some places, the subsoil is thinner and the substratum is calcareous within a depth of 40 inches. In other places the surface layer is less eroded. In some areas, the soil is severely eroded and the surface layer contains more clay.

Included with this soil in mapping are a few areas of soils on short, steep slopes at terrace breaks. Also included are small areas of St. Charles soils and the somewhat poorly drained Hurst and Roby soils. St. Charles soils are in landscape positions similar to those of the Colp soil. They have less clay in the subsoil than the Colp soil. Hurst soils are at the head of drainageways. Roby soils are in the less sloping areas above the Colp soil. Included soils make up 4 to 8 percent of the unit.

Water and air move through the Colp soil at a slow rate. Surface runoff is medium. Available water capacity is moderate or high. The seasonal high water table is at a depth of 2 to 4 feet from March through June in most years. Organic matter content is moderately low. The subsoil is very strongly acid to medium acid. The surface layer is firm and tends to puddle and crust after hard rains. The shrink-swell potential and the potential for frost action are high.

Most areas are used for cultivated crops. This soil is moderately suited to cultivated crops, hay, pasture, and woodland. It is well suited to habitat for openland and woodland wildlife. It is poorly suited to dwellings and septic tank absorption fields.

If this soil is used for corn, soybeans, or small grain, further erosion is a hazard and tilth is a limitation. Soil loss can be kept within tolerable limits by a crop rotation that includes 1 or more years of forage crops, by a conservation tillage system that leaves crop residue on the surface after planting, by contour farming, by terraces, or by a combination of these. Returning crop residue to the soil and regularly adding other organic material help to maintain productivity, prevent crusting, and improve tilth.

Adapted forage and hay plants grow well on this soil. Timely deferment of grazing helps to prevent overgrazing and thus also helps to prevent surface compaction, excessive runoff, and a greater susceptibility to erosion. Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion. Applications of fertilizer are needed. The plants should not be grazed or clipped until they are sufficiently established.

If this soil is used as a site for dwellings, the seasonal high water table and the shrink-swell potential are limitations. Installing either tile drains near the foundations or interceptor drains on the higher adjacent side slopes helps to lower the water table. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

The slow permeability and the seasonal wetness are limitations if this soil is used as a septic tank absorption field. Tile drains help to lower the water table. Enlarging the absorption area helps to overcome the slow permeability. A septic tank system can function satisfactorily if a sealed sand filter and a disinfection tank or an evapotranspiration bed are installed.

On sites for local roads and streets, low strength is a limitation and frost action is a hazard. Strengthening or replacing the base material can help to prevent road damage.

The land capability classification is IIIe.

122C3—Colp silty clay loam, 5 to 12 percent slopes, severely eroded. This sloping, moderately well drained soil is on short side slopes on terraces. In most areas, nearly all of the original surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. Individual areas are irregular in shape and range from 5 to 45 acres in size.

Typically, the surface layer is dark brown, friable silty clay loam about 5 inches thick. The subsoil is about 52 inches thick. The upper part is brown and dark yellowish brown, firm silty clay and silty clay loam. The lower part is pale brown, mottled, firm silty clay loam. The substratum to a depth of 60 inches is light yellowish brown, mottled silt loam. In many places the lower part of the subsoil is less acid. In some areas thin layers of loam or fine sandy loam are in the lower part of the subsoil and in the substratum. In other areas, the soil is less eroded and the surface layer is silt loam.

Included with this soil in mapping are small areas of St. Charles soils and the somewhat poorly drained Hurst soils. St. Charles soils have less clay in the subsoil than the Colp soil. They are on the upper parts of the slopes or on the steeper slopes. Hurst soils are on the lower parts of the slopes or near the head of drainageways. Included soils make up 7 to 12 percent of the unit.

Water and air move through the Colp soil at a slow rate. Surface runoff is rapid. Available water capacity is moderate. The seasonal high water table is at a depth of 2 to 4 feet from March through June in most years. The subsoil is very strongly acid to medium acid. Organic matter content is low in the surface layer. This layer is firm and can be easily tilled only within a narrow range in moisture content. Clods form if the soil is tilled when it is too wet, and a crust forms after hard rains. The shrink-swell potential and the potential for frost action are high.

Most areas are used for cultivated crops or for hay and pasture. This soil is poorly suited to cultivated crops and to dwellings and septic tank absorption fields. It is moderately suited to woodland. It is well suited to habitat for openland and woodland wildlife.

Unless the surface is protected, further erosion is a severe hazard in the areas used for soybeans, corn, or small grain. It can be controlled by a system of conservation tillage that leaves crop residue on the surface after planting, by contour farming, by terraces, and by a crop rotation that is dominated by forage crops. Tilling when the soil is wet causes surface cloddiness and compaction and excessive runoff and erosion. Returning crop residue to the soil and regularly adding other organic material increase the rate of water infiltration and help to maintain tilth.

Adapted forage and hay plants grow well on this soil. Timely deferment of grazing helps to prevent overgrazing and thus also helps to prevent surface compaction, excessive runoff, and a greater susceptibility to erosion. Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion. Applications of fertilizer are needed. The plants should not be grazed or clipped until they are sufficiently established.

If this soil is used as a site for dwellings, the seasonal high water table and the shrink-swell potential are limitations. Installing either tile drains near the foundations or interceptor drains on the higher adjacent side slopes helps to lower the water table. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

The seasonal wetness and the slow permeability are limitations if this soil is used as a septic tank absorption field. A septic tank system can function satisfactorily if a sealed sand filter and a disinfection tank or an evapotranspiration bed are installed. Sewage lagoons function well on this soil.

On sites for local roads and streets, low strength is a limitation and frost action is a hazard. Strengthening or replacing the base material can help to prevent road damage.

The land capability classification is IVe.

123—Riverwash. This map unit consists of gently undulating sandbars along river shorelines and around islands. The sandbars are exposed at the lower river stages but are frequently flooded and are covered by water for long periods during the higher river stages. They are mainly 300 feet to 1,200 feet wide. Many have groins built to deflect the current of the river. Individual areas are long and narrow and generally are parallel to the river. They range from 15 to 140 acres in size.

In a typical area the upper 60 inches is pale brown fine sand that has a few discontinuous bands of fine gravel. Included in mapping are areas that have discontinuous layers of loam and silty clay loam. Also included, particularly on the shoreline, are scattered areas of debris.

Shrubby willow trees grow on some of the higher points and along the shoreline, but most areas are barren. Because of the hazards of flooding and stream cutting, this unit generally is not suitable for recreational uses. At low water stages, some areas are used as resting sites for migrating waterfowl, as sites for hiking or fishing, and as a source of gravel. The unit is a possible source of sand.

This map unit is not assigned to a land capability classification.

164A—Stoy silt loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on broad ridgetops or at the head of drainageways in the uplands. Individual areas are irregular in shape or are circular. They range from 5 to 50 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 7 inches thick. The subsurface layer is brown, friable silt loam about 5 inches thick. The subsoil is about 41 inches thick. The upper part is yellowish brown, mottled, friable and firm silt loam and silty clay loam; the next part is grayish brown, mottled, very firm silty clay loam; and the lower part is yellowish brown, mottled, firm silty clay loam. The substratum to a depth of 60 inches is yellowish brown, mottled silt loam. In some areas the surface layer and subsurface layer are thicker.

Included with this soil in mapping are small areas of the poorly drained Rushville soils in depressions. These soils are ponded for brief periods. Also included are small areas of the moderately well drained Hosmer soils on slight rises. Included soils make up 7 to 12 percent of the unit.

Water and air move through the Stoy soil at a slow rate. Surface runoff is slow or very slow. Available water capacity is high. The seasonal high water table is at a depth of 1 to 3 feet from February through April in most years. Natural fertility is low, and organic matter content is moderately low. The subsoil is very strongly acid to medium acid. The surface layer tends to puddle and crust after hard rains. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated or are used for hay and pasture. This soil is well suited to cultivated crops (fig. 9), to pasture and hay, and to habitat for openland and woodland wildlife. It is moderately suited to woodland and is poorly suited to dwellings and septic tank absorption fields.

In the areas used for soybeans, corn, or small grain, the wetness delays planting in most years. It can be reduced, however, by surface ditches or subsurface drains. Erosion is a hazard in areas where slopes are very long. It can be controlled, however, by a system of conservation tillage that leaves crop residue on the

Figure 9.—An area of Stoy silt loam, 0 to 2 percent slopes, which is well suited to garden crops, such as green beans.

surface after planting. Tilling when the soil is wet causes surface compaction and excessive runoff and reduces the rate of water infiltration. Returning crop residue to the soil and regularly adding other organic material increase the infiltration rate and improve tilth.

The seasonal wetness and the shrink-swell potential are limitations if this soil is used as a site for dwellings. Reinforcing footings and foundations helps to prevent the structural damage caused by shrinking and swelling. Installing subsurface drains around the footings helps to lower the water table. Elevating the floor of dwellings without basements above the surrounding ground level, grading, and diverting surface water also help to overcome the wetness.

The seasonal wetness and the slow permeability are limitations if this soil is used as a septic tank absorption field. A septic tank system can function satisfactorily if a sealed sand filter and a disinfection tank or an evapotranspiration bed are installed. Sewage lagoons function well on this soil.

On sites for local roads and streets, low strength is a limitation and frost action is a hazard. Strengthening or replacing the base material helps to prevent road damage.

The land capability classification is IIw.

164B—Stoy silt loam, 2 to 5 percent slopes. This gently sloping, somewhat poorly drained soil is on broad ridgetops and on side slopes adjacent to drainageways. Individual areas are long and irregular in shape and range from 5 to 75 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 9 inches thick. The subsurface layer is yellowish brown, friable silt loam about 7 inches thick. The subsoil is about 31 inches thick. The upper part is yellowish brown, firm silt loam; the next part is brown and yellowish brown, mottled, firm silty clay loam; and the lower part is grayish brown, light brownish gray, and brown, mottled, very firm, brittle silt loam. The substratum to a depth of 60 inches is grayish brown, mottled silt loam. In places the firm and brittle zone extends into the substratum.

Included with this soil in mapping are a few areas of the poorly drained Rushville soils at the head of drainageways and areas of the moderately well drained Hosmer soils on some side slopes. Also included are small areas of severely eroded soils. Included soils make up 5 to 8 percent of the unit.

Water and air move through the Stoy soil at a slow rate. Surface runoff also is slow. Available water capacity is high. The seasonal high water table is at a depth of 1 to 3 feet from February through April in most years. The subsoil is medium acid to very strongly acid. Natural fertility is low, and organic matter content is moderately low in the surface layer. This layer is friable and can be easily tilled, but it tends to puddle and crust after hard rains. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are used for cultivated crops or for hay and pasture. Farmsteads and residential areas are common on this soil. The soil is well suited to cultivated crops, hay, pasture, and habitat for woodland and openland wildlife. It is moderately suited to woodland and poorly suited to dwellings and septic tank absorption fields.

In the areas used for corn, soybeans, or small grain, erosion is a hazard unless the surface is protected (fig. 10). Also, the wetness can delay planting in some years. It can be reduced by surface ditches. Erosion can be controlled by a system of conservation tillage that leaves crop residue on the surface after planting, by contour farming, or by terraces. Tilling when the soil is wet causes surface compaction and reduces the rate of water infiltration. Returning crop residue to the soil and regularly adding other organic material increase the infiltration rate and improve tilth.

Adapted forage and hay plants grow well on this soil. Overgrazing or grazing when the soil is too wet reduces forage yields, causes surface compaction and excessive runoff, and increases the susceptibility to erosion. Proper stocking rates, rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to control erosion.

If this soil is used as a site for dwellings, the seasonal high water table and the shrink-swell potential are limitations. Installing either tile drains near the foundations or interceptor drains on the higher adjacent side slopes helps to lower the water table. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

The seasonal wetness and the slow permeability are limitations if this soil is used as a septic tank absorption field. A septic tank system can function satisfactorily if a sealed sand filter and a disinfection tank or an evapotranspiration bed are installed. Sewage lagoons function well on this soil.

On sites for local roads and streets, low strength is a limitation and frost action is a hazard. Strengthening or replacing the base material can help to prevent road damage.

The land capability classification is IIe.

164C2—Stoy silt loam, 5 to 10 percent slopes, eroded. This sloping, somewhat poorly drained soil is on side slopes in the uplands. Individual areas are long and irregular in shape and range from 5 to 35 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 6 inches thick. It has been thinned by erosion. The subsoil is about 35 inches thick. The upper part is brown and yellowish brown, mottled, firm silty clay loam, and the lower part is grayish brown and brown, mottled, firm, brittle silt loam. The substratum to a depth of 60 inches is brown, mottled silt loam. In some areas the soil is severely eroded and has more clay in the surface layer.

Included with this soil in mapping are a few areas of Blair soils at the head of drainageways and the moderately well drained Hosmer soils along some side slopes. Blair soils contain more sand and pebbles in the subsoil than the Stoy soil. Included soils make up 5 to 10 percent of the unit.

Water and air move through the Stoy soil at a slow rate. Surface runoff is medium. Available water capacity is high. The seasonal high water table is at a depth of 1 to 3 feet from February through April in most years. The subsoil is medium acid to very strongly acid. Organic matter content is moderately low. The surface layer is friable and can be easily tilled, but it tends to puddle and crust after hard rains. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are used for cultivated crops or for hay and pasture. This soil is moderately suited to cultivated crops and well suited to hay, pasture, and habitat for woodland and openland wildlife. It is moderately suited to woodland and is poorly suited to dwellings and septic tank absorption fields.

If this soil is used for corn, soybeans, or small grain, further erosion is a hazard and tilth is a limitation. Soil loss can be kept within tolerable limits by a crop rotation that includes 1 or more years of forage crops, by a conservation tillage system that leaves crop residue on

Figure 10.—Sheet and rill erosion in a cultivated area of Stoy silt loam, 2 to 5 percent slopes.

the surface after planting, by contour farming, by terraces, or by a combination of these. Returning crop residue to the soil and regularly adding other organic material help to maintain productivity, prevent crusting, and improve tilth.

Adapted forage and hay plants grow well on this soil. Timely deferment of grazing helps to prevent overgrazing and thus also helps to prevent surface compaction, excessive runoff, and a greater susceptibility to erosion. Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion. Applications of fertilizer are needed. The plants should not be grazed or clipped until they are sufficiently established.

If this soil is used as a site for dwellings, the seasonal high water table and the shrink-swell potential are limitations. Installing either tile drains near the foundations or interceptor drains on the higher adjacent side slopes helps to lower the water table. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

The seasonal wetness and the slow permeability are limitations if this soil is used as a septic tank absorption field. A septic tank system can function satisfactorily if a sealed sand filter and a disinfection tank or an evapotranspiration bed are installed. Sewage lagoons function well on this soil.

On sites for local roads and streets, low strength is a limitation and frost action is a hazard. Strengthening or replacing the base material can help to prevent road damage.

The land capability classification is IIIe.

180—Dupo silt loam. This nearly level, somewhat poorly drained soil is on flood plains and alluvial fans where recent silty overwash overlies a clayey buried soil. The soil is protected by a levee system, but it is occasionally flooded for brief periods in the winter and early spring. Individual areas are irregular in shape and range from 5 to 80 acres in size.

Typically, the surface layer is dark brown, very friable silt loam about 9 inches thick. The substratum is brown, mottled, very friable silt loam about 16 inches thick. Below this to a depth of 60 inches is a buried soil that is very dark gray and dark gray, mottled, very firm silty clay. In some places the depth to the clayey buried soil is less than 20 inches. In other places it is more than 40 inches.

Included with this soil in mapping are small areas of the poorly drained Darwin soils in depressions. These soils are clayey throughout. They make up 5 to 10 percent of the unit.

Water and air move through the upper part of the Dupo soil at a moderate rate and through the clayey lower part at a slow rate. Available water capacity is high. Surface runoff is slow. The seasonal high water table is at a depth of 1.5 to 3.5 feet from January through June in most years. The surface layer and substratum are medium acid to moderately alkaline. Organic matter content is moderately low. The surface layer is friable and can be easily tilled. The potential for frost action and the shrink-swell potential are high.

Most areas are cultivated. This soil is moderately suited to cultivated crops, hay, pasture, and habitat for openland, wetland, and woodland wildlife. It is poorly suited to camp and picnic areas. It generally is unsuited to dwellings and septic tank absorption fields because of the flooding, the wetness, the slow permeability, and the shrink-swell potential.

If this soil is used for corn, soybeans, or small grain, the flooding is a hazard and the wetness is a limitation. The flooding occurs less often than once every 2 years during the growing season. A drainage system has been installed in the areas used for crops. Measures that maintain or improve the drainage system are needed. Subsurface tile drains function satisfactorily if suitable outlets are available. Dikes or diversions can reduce the extent of the crop damage caused by floodwater. A conservation tillage system that leaves crop residue on the surface after planting improves tilth, helps to prevent surface compaction and crusting, and increases the rate of water intake.

A cover of pasture grasses improves tilth and helps to control erosion and scouring during floods. Selection of suitable species for planting, proper stocking rates, applications of fertilizer, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is IIIw.

184B—Roby fine sandy loam, 1 to 5 percent slopes. This gently sloping, somewhat poorly drained soil is on broad ridges on terraces. Individual areas are irregular in shape or are circular. They range from 10 to 100 acres in size.

Typically, the surface layer is dark grayish brown, very friable fine sandy loam about 9 inches thick. The subsurface layer is dark brown, very friable fine sandy loam about 4 inches thick. The subsoil is about 36 inches thick. The upper part is dark brown and brown, mottled, very friable fine sandy loam; the next part is brown, mottled, friable loam and firm clay loam; and the lower part is grayish brown, mottled fine sandy loam. The substratum to a depth of 60 inches is stratified grayish brown fine sandy loam and dark brown loamy fine sand.

Included with this soil in mapping are small areas of poorly drained soils on the lower parts of the landscape. These soils have more clay in the subsoil than the Roby soil. Also included are areas of the well drained Bloomfield soils on the higher ridges. Included soils make up 5 to 10 percent of the unit.

Water and air move through the upper part of the Roby soil at a moderate rate and through the lower part at a moderately rapid rate. Surface runoff is slow. Available water capacity is moderate or high. The subsoil is medium acid to mildly alkaline. Organic matter content is low. The seasonal high water table is at a depth of 1 to 3 feet from March through June in most years. The shrink-swell potential is low, and the potential for frost action is high.

Most areas are used for cultivated crops. This soil is well suited to cultivated crops, hay, pasture, woodland, and habitat for openland and woodland wildlife. It is moderately suited to picnic areas. It is poorly suited to dwellings and septic tank absorption fields.

In the areas used for corn, soybeans, or small grain, erosion is a hazard unless the surface is protected. Also, the wetness can delay planting in some years. It can be reduced by surface ditches. Erosion can be controlled by a system of conservation tillage that leaves crop residue on the surface after planting, by contour farming, or by terraces. Tilling when the soil is wet causes surface compaction and reduces the rate of water infiltration. Returning crop residue to the soil and regularly adding other organic material increase the infiltration rate and improve tilth.

Adapted forage and hay plants grow well on this soil. Overgrazing or grazing when the soil is too wet reduces forage yields, causes surface compaction and excessive runoff, and increases the susceptibility to erosion. Proper stocking rates, rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to control erosion.

If this soil is used as a site for dwellings, the seasonal high water table is a limitation. Installing subsurface tile drains near the foundation helps to overcome this limitation.

If this soil is used as a site for septic tank absorption fields, the seasonal wetness is a limitation. It can be overcome by adding several feet of suitable fill material, which increases the depth to the water table, and by installing curtain drains, which help to lower the water table. Also, a buried sand filter system is an alternative.

Frost action is a hazard on sites for local roads and streets. Strengthening or replacing the base material helps to prevent road damage.

The land capability classification is IIe.

214B—Hosmer silt loam, 1 to 5 percent slopes. This gently sloping, moderately well drained soil is on ridges in the uplands. Individual areas are irregular in shape and range from 10 to 200 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 6 inches thick. The subsurface layer is yellowish brown, friable silt loam about 6 inches thick. The subsoil is about 38 inches thick. It is yellowish brown. The upper part is firm silt loam and silty clay loam; the next part is firm, mottled silty clay loam; and the lower part is very firm, slightly brittle, mottled silty clay loam. The substratum to a depth of 60 inches is yellowish brown, mottled silt loam. In some places the subsoil is less acid. In other places the slope is more than 5 percent. In some areas the subsoil does not have a brittle layer.

Included with this soil in mapping are small areas of the somewhat poorly drained Stoy soils. These soils are in the less sloping areas on broad ridges and near the head of drainageways. Also included are small areas of severely eroded soils in which tilth is poor. Included soils make up 5 to 10 percent of the unit.

Water and air move through the upper part of the Hosmer soil at a moderate rate and through the lower part at a very slow rate. Surface runoff is slow. Available water capacity is moderate or high. The seasonal high water table is at a depth of 2.5 to 3.0 feet during March and April in most years. The subsoil is very strongly acid to medium acid. Organic matter content is moderately low. The surface layer tends to puddle and crust after hard rains. The potential for frost action is high, and the shrink-swell potential is moderate in the subsoil.

Most areas are used for cultivated crops or for hay and pasture. Rural homesites and farmsteads are common on this soil. The soil is well suited to cultivated crops, orchards, small fruits and vegetables, hay and pasture, woodland, and habitat for openland and woodland wildlife. It is moderately suited to dwellings and poorly suited to septic tank absorption fields.

In the areas used for corn, soybeans, or small grain, erosion is a hazard and tilth is a limitation. A conservation tillage system that leaves crop residue on the surface after planting, contour farming, and terraces help to control erosion. Incorporation of crop residue into the soil or additions of organic material help to prevent crusting and improve tilth. A crop rotation that includes a deep-rooted legume improves tilth and helps to prevent surface compaction.

Adapted forage and hay plants grow well on this soil. Timely deferment of grazing helps to prevent overgrazing and thus a greater susceptibility to erosion and soil blowing. The plants should not be grazed until they are sufficiently established. Applications of fertilizer are needed.

If this soil is used as woodland, seedling mortality and windthrow are management concerns. Plant competition also is a concern. It affects the seedlings of desirable species. The seedling mortality rate can be reduced by selecting planting stock that is older and larger than is typical or by mulching. Some replanting may be needed. Harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Only high-value trees should be removed from a strip 50 feet wide along the west and south edges of the woodland. Plant competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

The seasonal wetness and the shrink-swell potential are limitations if this soil is used as a site for dwellings. The wetness is a more severe limitation on sites for dwellings with basements than on sites for dwellings without basements. Reinforcing footings and foundations helps to prevent the structural damage caused by shrinking and swelling. Installing subsurface drains around the foundations lowers the water table.

The seasonal wetness and the very slow permeability are limitations if this soil is used as a septic tank absorption field. A septic tank system can function satisfactorily if a sealed sand filter and a disinfection tank or an evapotranspiration bed are installed. Sewage lagoons function well on this soil.

On sites for local roads and streets, frost action is a hazard and low strength is a limitation. Strengthening or replacing the base material helps to prevent road damage.

The land capability classification is IIe.

214C2—Hosmer silt loam, 5 to 10 percent slopes, eroded. This sloping, moderately well drained soil is on short, uneven side slopes in the uplands. Individual areas generally are irregular in shape and range from 8 to 30 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 5 inches thick. It has been thinned by erosion. The subsoil is about 42 inches thick. The upper part is yellowish brown and pale brown, friable silty clay loam, and the lower part is pale brown and yellowish brown, mottled, very firm, brittle silt loam. The substratum to a depth of 60 inches is pale brown and yellowish brown, mottled silt loam. In some places the subsoil is less acid. In other places the soil is severely eroded and has more clay in the surface layer. In some areas the subsoil does not have a brittle layer.

Included with this soil in mapping are small areas of the somewhat poorly drained Blair soils at the head of drainageways. Also included are small areas of alluvial soils along drainageways and small streams. Included soils make up 4 to 9 percent of the unit.

Water and air move through the upper part of the Hosmer soil at a moderate rate and through the lower part at a very slow rate. Surface runoff is medium. Available water capacity is moderate or high. The seasonal high water table is at a depth of 2.5 to 3.0 feet during March and April in most years. The subsoil is very strongly acid to medium acid. Organic matter content is moderately low. The potential for frost action is high, and the shrink-swell potential is moderate.

Most areas are used for cultivated crops or for hay and pasture. This soil is moderately suited to cultivated crops and to small fruits and vegetables. It is well suited to hay, pasture, orchards, woodland, and habitat for openland and woodland wildlife. It is moderately suited to dwellings and poorly suited to septic tank absorption fields.

If this soil is used for corn, soybeans, or small grain, erosion is a hazard and tilth is a limitation. Soil loss can be kept within tolerable limits by a crop rotation that includes 1 or more years of forage crops (fig. 11), by a conservation tillage system that leaves crop residue on the surface after planting, by contour farming, by terraces, or by a combination of these. Returning crop residue to the soil and regularly adding other organic material help to maintain productivity, prevent crusting, and improve tilth.

Adapted forage and hay plants grow well on this soil. Timely deferment of grazing helps to prevent overgrazing and thus also helps to prevent surface compaction, excessive runoff, and a greater susceptibility to erosion. Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion. Applications of fertilizer are needed. The plants should not be grazed or clipped until they are sufficiently established.

If this soil is used as woodland, seedling mortality and windthrow are management concerns. Plant competition also is a concern. It affects the seedlings of desirable species. The seedling mortality rate can be reduced by selecting planting stock that is older and larger than is typical or by mulching. Some replanting may be needed. Harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Only high-value trees should be removed from a strip 50 feet wide along the west and south edges of the woodland. Plant competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

The seasonal wetness and the shrink-swell potential are limitations if this soil is used as a site for dwellings. The wetness is a more severe limitation on sites for dwellings with basements than on sites for dwellings without basements. Reinforcing footings and foundations helps to prevent the structural damage caused by shrinking and swelling. Installing subsurface drains around the foundations lowers the water table.

The seasonal wetness and the very slow permeability are limitations if this soil is used as a septic tank absorption field. A septic tank system can function satisfactorily if a sealed sand filter and a disinfection tank or an evapotranspiration bed are installed. Sewage lagoons can function satisfactorily if the site is leveled.

On sites for local roads and streets, low strength is a limitation and frost action is a hazard. Strengthening or replacing the base material can help to prevent road damage.

The land capability classification is IIIe.

214C3—Hosmer silt loam, 5 to 10 percent slopes, severely eroded. This sloping, moderately well drained soil is mainly on short, uneven side slopes in the uplands. In most areas, nearly all of the original surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. Individual areas generally are long and narrow and range from 5 to 40 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 3 inches thick. The subsoil is about 41 inches thick. The upper part is yellowish brown, friable silt loam and firm silty clay loam; the next part is dark yellowish brown, mottled, firm, brittle silty clay loam; and the lower part is brown, mottled, firm silt loam. The substratum to a depth of 60 inches is grayish brown and yellowish brown silt loam. In some places the subsoil is less acid. In other places it contains more sand in the lower part. In some areas it does not have a brittle layer.

Included with this soil in mapping are small areas of the somewhat poorly drained Blair soils at the head of drainageways. These Blair soils have more sand than the Hosmer soil. Also included are small areas of alluvial soils along drainageways and small streams. Included soils make up 6 to 11 percent of the unit.

Figure 11.—A protective cover of hay in an area of Hosmer silt loam, 5 to 10 percent slopes, eroded, on a long slope.

Water and air move through the upper part of the Hosmer soil at a moderate rate and through the lower part at a very slow rate. Surface runoff is medium or rapid. Available water capacity is moderate. The seasonal high water table is at a depth of 2.5 to 3.0 feet during March and April in most years. The subsoil is very strongly acid to medium acid. Organic matter content is low. Tilth is poor in the surface layer. A surface crust tends to form after hard rains. The potential for frost action is high, and the shrink-swell potential is moderate.

Most areas are used for hay and pasture or are cultivated. Some idle areas have reverted to forbs and shrubs. This soil is poorly suited to cultivated crops. It is moderately suited to hay and pasture and well suited to woodland and to habitat for openland and woodland wildlife. It is moderately suited to dwellings and poorly suited to septic tank absorption fields.

Unless the surface is protected, further erosion is a severe hazard in the areas used for soybeans, corn, or small grain (fig. 12). It can be controlled by a system of conservation tillage that leaves crop residue on the surface after planting, by contour farming, by terraces, and by a crop rotation that is dominated by forage crops. Tilling when the soil is wet causes surface cloddiness and compaction and excessive runoff and erosion. Returning crop residue to the soil and regularly adding other organic material increase the rate of water infiltration and improve tilth.

Adapted forage and hay plants grow well on this soil. Timely deferment of grazing helps to prevent overgrazing and thus also helps to prevent surface compaction, excessive runoff, and a greater susceptibility to erosion. Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion. Applications of fertilizer are needed. The plants should not be grazed or clipped until they are sufficiently established.

If this soil is used as woodland, seedling mortality and windthrow are management concerns. Plant competition also is a concern. It affects the seedlings of desirable species. The seedling mortality rate can be reduced by selecting planting stock that is older and larger than is typical or by mulching. Some replanting may be needed. Harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Only high-value trees should be removed from a strip 50 feet wide along the west and south edges of the woodland. Plant competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

The seasonal wetness and the shrink-swell potential are limitations if this soil is used as a site for dwellings. The wetness is a more severe limitation on sites for dwellings with basements than on sites for dwellings without basements. Reinforcing footings and foundations helps to prevent the structural damage caused by shrinking and swelling. Installing subsurface drains around the foundations lowers the water table.

The seasonal wetness and the very slow permeability are limitations if this soil is used as a septic tank absorption field. A septic tank system can function satisfactorily if a sealed sand filter and a disinfection tank or an evapotranspiration bed are installed. Sewage lagoons can function satisfactorily if the site is leveled.

On sites for local roads and streets, low strength is a limitation and frost action is a hazard. Strengthening or replacing the base material can help to prevent road damage.

Figure 12.—Rills in an area where conventional tillage has been used on Hosmer silt loam, 5 to 10 percent slopes, severely eroded.

The land capability classification is IVe.

214D—Hosmer silt loam, 10 to 18 percent slopes. This strongly sloping, moderately well drained soil is on side slopes and hillsides in the uplands. Individual areas generally are irregular in shape and range from 5 to 35 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 5 inches thick. The subsoil is about 46 inches thick. The upper part is yellowish brown, friable silt loam and strong brown, firm silty clay loam; the next part is brown and yellowish brown, mottled, firm, brittle silt loam; and the lower part is brown, mottled, firm silt loam. The upper part of the substratum is yellowish brown, mottled silt loam. The lower part to a depth of 60 inches is yellowish brown and grayish brown clay loam. In some places the subsoil is less acid. In other places it contains more sand in the lower part. In some areas it does not have a brittle layer. In a few areas the soil is severely eroded and has more clay in the surface layer.

Included with this soil in mapping are small areas of the somewhat poorly drained Blair soils at the head of drainageways. Also included are small areas of alluvial soils along drainageways and small streams. Included soils make up 5 to 10 percent of the unit.

Water and air move through the upper part of the Hosmer soil at a moderate rate and through the lower part at a very slow rate. Surface runoff is medium or rapid. Available water capacity is moderate. The seasonal high water table is at a depth of 2.5 to 3.0 feet during March and April in most years. The subsoil is very strongly acid to medium acid. Organic matter content is moderately low. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are used for hay and pasture or for woodland. This soil is poorly suited to cultivated crops. It is well suited to hay and pasture, orchards, woodland, and habitat for openland and woodland wildlife. It is moderately suited to dwellings and poorly suited to septic tank absorption fields.

Unless the surface is protected, erosion is a severe hazard in the areas used for corn, soybeans, or small grain. It can be controlled by a system of conservation tillage that leaves crop residue on the surface after planting, by contour farming, or by a cropping sequence that is dominated by forage crops. Tilling when the soil is wet causes surface cloddiness and compaction and excessive runoff and erosion. Returning crop residue to the soil and regularly adding other organic material increase the rate of water infiltration and improve tilth.

Adapted forage and hay plants grow well on this soil. Timely deferment of grazing helps to prevent overgrazing and thus also helps to prevent surface compaction, excessive runoff, and a greater susceptibility to erosion. Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion. Applications of fertilizer are needed. The plants should not be grazed or clipped until they are sufficiently established.

If this soil is used as woodland, seedling mortality and windthrow are management concerns. Plant competition also is a concern. It affects the seedlings of desirable species. The seedling mortality rate can be reduced by selecting planting stock that is older and larger than is typical or by mulching. Some replanting may be needed. Harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Only high-value trees should be removed from a strip 50 feet wide along the west and south edges of the woodland. Plant competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

If this soil is used as a site for dwellings without basements, the seasonal high water table, the shrink-swell potential, and the slope are limitations. Installing subsurface tile drains near the foundations lowers the water table. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling. Cutting, filling, and land shaping help to overcome the slope.

The seasonal wetness, the very slow permeability, and the slope are limitations if this soil is used as a septic tank absorption field. A septic tank system can function satisfactorily if a sealed sand filter and a disinfection tank or an evapotranspiration bed are installed and the site is leveled.

On sites for local roads and streets, frost action is a hazard and the slope and low strength are limitations. Strengthening or replacing the base material can help to prevent road damage. Grading may be needed during construction. During periods before a plant cover is established in disturbed areas, additions of mulch are needed to control erosion.

The land capability classification is IVe.

214D3—Hosmer silt loam, 10 to 18 percent slopes, severely eroded. This strongly sloping, moderately well drained soil is mainly on side slopes and hillsides in the uplands. In most areas, nearly all of the original surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. Individual areas are generally long and irregular in shape and range from 5 to 45 acres in size.

Typically, the surface layer is dark yellowish brown, friable silt loam about 4 inches thick. The subsoil is silt loam about 45 inches thick. The upper part is yellowish brown and strong brown and is firm, the next part is brown and mottled and is firm and brittle, and the lower part is brown and mottled and is firm. The substratum to a depth of 60 inches is brown, mottled silt loam. In some places it is less acid. In other places it has a higher content of sand. In some areas it does not have a brittle layer.

Included with this soil in mapping are small areas of the somewhat poorly drained Blair soils at the head of drainageways. These soils contain more sand than the Hosmer soil. Also included are small areas of alluvial soils along drainageways and small streams. Included soils make up 6 to 12 percent of the unit.

Water and air move through the upper part of the Hosmer soil at a moderate rate and through the lower part at a very slow rate. Surface runoff is rapid. The available water capacity is moderate. The seasonal high water table is at a depth of 2.5 to 3.0 feet during March and April in most years. The subsoil is very strongly acid to medium acid. Organic matter content is low. Tilth is poor in the surface layer. A surface crust tends to form after hard rains. The potential for frost action is high, and the shrink-swell potential is moderate.

Most areas are cultivated or recently have been cultivated. Because of the erosion hazard, this soil generally is unsuited to cultivated crops. It is well suited to hay and pasture, orchards, woodland, and habitat for openland and woodland wildlife. It is moderately suited to dwellings and poorly suited to septic tank absorption fields.

Establishing pasture plants or hay helps to keep soil loss within tolerable limits. Seedbed preparation is difficult on severely eroded side slopes where the subsoil is exposed. A no-till method of pasture renovation or seeding helps to establish forage species and control further erosion. The plants should not be grazed until they are sufficiently established. Proper stocking rates, rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to prevent surface compaction and excessive runoff.

If this soil is used as woodland, seedling mortality and windthrow are management concerns. Plant competition also is a concern. It affects the seedlings of desirable species. The seedling mortality rate can be reduced by selecting planting stock that is older and larger than is typical or by mulching. Some replanting may be needed. Harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Only high-value trees should be removed from a strip 50 feet wide along the west and south edges of the woodland. Plant competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

If this soil is used as a site for dwellings without basements, the seasonal high water table, the shrink-swell potential, and the slope are limitations. Installing subsurface tile drains near the foundations lowers the water table. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling. Cutting, filling, and land shaping help to overcome the slope.

The seasonal wetness, the very slow permeability, and the slope are limitations if this soil is used as a septic tank absorption field. A septic tank system can function satisfactorily if a sealed sand filter and a disinfection tank or an evapotranspiration bed are installed and the site is leveled.

On sites for local roads and streets, frost action is a hazard and the slope and low strength are limitations. Strengthening or replacing the base material can help to prevent road damage. Grading may be needed during construction. During periods before a plant cover is established in disturbed areas, additions of mulch are needed to control erosion.

The land capability classification is VIe.

242A—Kendall silt loam, 0 to 3 percent slopes. This nearly level, somewhat poorly drained soil is on broad terrace ridges near the major streams. Individual areas are irregular in shape or are circular. They range from 5 to 115 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 10 inches thick. The subsurface layer is brown, friable silt loam about 3 inches thick. The subsoil is about 32 inches thick. The upper part is brown, mottled, friable silty clay loam; the next part is grayish brown, mottled, friable and firm silty clay loam; and the lower part is grayish brown, mottled, firm clay loam. The substratum to a depth of 60 inches is brown, mottled, stratified silty clay loam and loam. In some areas the subsoil and substratum contain less sand and more clay.

Included with this soil in mapping are small areas of poorly drained soils in shallow depressions that are subject to ponding and areas of the moderately well drained St. Charles soils on the slightly higher rises. Also included, in low areas adjacent to streams, are soils that are subject to rare flooding. Included soils make up 5 to 10 percent of the unit.

Water and air move through the Kendall soil at a moderate rate. Surface runoff is slow. Available water capacity is high. The seasonal high water table is at a depth of 1 to 3 feet from March through June in most years. The subsoil is strongly acid to slightly acid. Organic matter content is moderately low. The surface layer is friable and can be easily tilled, but it tends to puddle and crust after hard rains. The potential for frost action is high, and the shrink-swell potential is moderate.

Most areas are used for cultivated crops. This soil is well suited to cultivated crops, hay, pasture, woodland, and habitat for openland and woodland wildlife. It is poorly suited to dwellings and septic tank absorption fields.

In the areas used for corn, soybeans, or small grain, the wetness delays planting in some years. It can be reduced, however, by surface ditches. Unless the surface is protected, erosion is a hazard in the more sloping areas. It can be controlled by a system of conservation tillage that leaves crop residue on the surface after planting. Tilling when the soil is wet causes surface cloddiness and compaction and excessive runoff and erosion. Returning crop residue to the soil and regularly adding other organic material help to maintain tilth and fertility.

The seasonal wetness and the shrink-swell potential are limitations if this soil is used as a site for dwellings. Reinforcing footings and foundations helps to prevent the structural damage caused by shrinking and swelling. Installing subsurface drains around the footings helps to lower the water table. Elevating the floor of dwellings without basements above the surrounding ground level, grading, and diverting surface water also help to overcome the wetness.

If this soil is used as a site for septic tank absorption fields, the seasonal high water table and the moderate permeability are limitations. Subsurface tile drains lower the water table. Increasing the size of the absorption field or replacing the soil with more permeable material helps to overcome the moderate permeability.

On sites for local roads and streets, low strength is a limitation and frost action is a hazard. Strengthening or replacing the base material helps to prevent road damage.

The land capability classification is IIw.

243B—St. Charles silt loam, 1 to 7 percent slopes. This gently sloping, moderately well drained soil is on broad and narrow terrace ridges. Areas are irregular in shape and range from 5 to 75 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 7 inches thick. The subsurface layer is yellowish brown, firm silt loam about 4 inches thick. The subsoil is about 45 inches thick. It is yellowish brown and firm. The upper part is silt loam, the next part is silty clay loam, and the lower part is mottled silty clay loam and silt loam. The substratum to a depth of 60 inches is yellowish brown, mottled silt loam that has strata of very fine sandy loam. In some places the upper part of the subsoil has more sand. In other places the substratum has less sand.

Included with this soil in mapping are small areas of the somewhat poorly drained Kendall soils. These soils are along drainageways and in nearly level areas below the St. Charles soil. They make up 4 to 8 percent of the unit.

Water and air move through the St. Charles soil at a moderate rate. Surface runoff is slow or medium. Available water capacity is high. The seasonal high water table is at a depth of 3 to 6 feet from February through June in most years. Organic matter content is moderately low. The subsoil is very strongly acid to slightly acid. The surface layer is friable and can be easily tilled, but it tends to puddle and crust after hard rains. The potential for frost action is high, and the shrink-swell potential is moderate.

Most areas are used for cultivated crops. This soil is well suited to cultivated crops, hay, pasture, woodland, and habitat for openland and woodland wildlife. It is moderately suited to dwellings and poorly suited to septic tank absorption fields.

In the areas used for corn, soybeans, or small grain, erosion is a hazard and tilth is a limitation. A conservation tillage system that leaves crop residue on the surface after planting (fig. 13), contour farming, and terraces help to control erosion. Incorporation of crop residue into the soil or additions of organic material help to prevent crusting and improve tilth. A crop rotation that includes a deep-rooted legume improves tilth and helps to prevent surface compaction.

Adapted forage and hay plants grow well on this soil. Timely deferment of grazing helps to prevent overgrazing and thus a greater susceptibility to erosion and soil blowing. The plants should not be grazed until they are sufficiently established. Applications of fertilizer are needed.

If this soil is used as woodland, plant competition is a management concern. It affects the seedlings of desirable species. The competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

The seasonal wetness and the shrink-swell potential are limitations if this soil is used as a site for dwellings. The wetness is a more severe limitation on sites for dwellings with basements than on sites for dwellings without basements. Reinforcing footings and foundations helps to prevent the structural damage caused by shrinking and swelling. Installing subsurface drains around the foundations lowers the water table.

If this soil is used as a site for septic tank absorption fields, the seasonal high water table and the moderate permeability are limitations. Subsurface tile drains lower the water table. Increasing the size of the absorption field or replacing the soil with more permeable material helps to overcome the moderate permeability.

On sites for local roads and streets, frost action is a hazard and low strength and the shrink-swell potential are limitations. Strengthening or replacing the base material helps to prevent road damage.

The land capability classification is IIe.

Figure 13.—No-till planting of corn into clover in an area of St. Charles silt loam, 1 to 7 percent slopes.

243D—St. Charles silt loam, 7 to 15 percent slopes. This strongly sloping, moderately well drained soil is on the sides of terraces. Slopes are about 75 to 250 feet long. Individual areas are irregular in shape and range from 5 to 20 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 6 inches thick. The subsurface layer is brown, friable silt loam about 4 inches thick. The subsoil is about 41 inches thick. The upper part is dark yellowish brown, firm silty clay loam. The lower part is yellowish brown, mottled, firm silty clay loam and silt loam. It has thin strata of fine sandy loam. The substratum to a depth of 60 inches is yellowish brown, mottled silt loam that has thin strata of fine sandy loam. In places the subsoil and substratum contain more sand.

Included with this soil in mapping are small areas of the somewhat poorly drained Hurst soils. These soils are lower on the landscape than the St. Charles soil. They make up 4 to 8 percent of the unit.

Water and air move through the St. Charles soil at a moderate rate. Surface runoff is medium or rapid. Available water capacity is high. The seasonal high water table is at a depth of 3 to 6 feet from February through June in most years. The subsoil is slightly acid to strongly acid. Organic matter content is moderately low. The surface layer is friable and can be easily tilled. The potential for frost action is high, and the shrink-swell potential is moderate.

Most areas are used as woodland or pasture. This soil is moderately suited to cultivated crops. It is well suited to hay, pasture, woodland, and habitat for openland and woodland wildlife. It is moderately suited to dwellings and poorly suited to septic tank absorption fields.

Further erosion is a hazard if this soil is used for corn, soybeans, or small grain. Also, tilth is a limitation. Soil loss can be kept within tolerable limits by a crop rotation dominated by forage crops and by a combination of contour farming and a conservation tillage system that leaves crop residue on the surface after planting. Stripcropping also helps to control erosion. Returning crop residue to the soil and regularly adding other organic material help to maintain productivity, prevent crusting, and improve tilth.

Adapted forage and hay plants grow well on this soil. Timely deferment of grazing helps to prevent overgrazing and thus also helps to prevent surface compaction, excessive runoff, and a greater susceptibility to erosion. Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion. Applications of fertilizer are needed. The plants should not be grazed or clipped until they are sufficiently established.

If this soil is used as woodland, plant competition is a management concern. It affects the seedlings of desirable species. The competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

If this soil is used as a site for dwellings without basements, the seasonal high water table, the shrink-swell potential, and the slope are limitations. Installing subsurface tile drains near the foundations lowers the water table. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling. Cutting, filling, and land shaping help to overcome the slope.

If this soil is used as a site for septic tank absorption fields, the seasonal high water table, the moderate permeability, and the slope are limitations. Subsurface tile drains lower the water table. Increasing the size of the absorption field or replacing the soil with more permeable material helps to overcome the moderate permeability. Installing the filter lines on the contour or cutting and filling help to overcome the slope.

On sites for local roads and streets, frost action is a hazard and the slope and low strength are limitations. Strengthening or replacing the base material can help to prevent road damage. Grading may be needed during construction. During periods before a plant cover is established in disturbed areas, additions of mulch are needed to control erosion.

The land capability classification is IIIe.

243D3—St. Charles silty clay loam, 7 to 15 percent slopes, severely eroded. This strongly sloping, moderately well drained soil is on the sides of terraces. In most areas, nearly all of the original surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. Individual areas are long and irregular in shape and range from 5 to 35 acres in size.

Typically, the surface layer is dark yellowish brown, friable silty clay loam about 7 inches thick. The subsoil is about 48 inches thick. The upper part is yellowish brown, firm silty clay loam, and lower part is yellowish brown and brownish yellow, mottled, firm silt loam that has a noticeable content of sand. The substratum to a depth of 60 inches is brownish yellow, mottled silt loam that has a noticeable content of sand. In some places the subsoil has more sand. In other places the soil is less eroded and has a surface layer of silt loam.

Included with this soil in mapping are small areas of the somewhat poorly drained Hurst soils on the lower slopes. These soils have more clay in the subsoil than the St. Charles soil. They make up 4 to 8 percent of the unit.

Water and air move through the St. Charles soil at a moderate rate. Surface runoff is rapid. Available water capacity is high. The seasonal high water table is at a depth of 3 to 6 feet from February through June in most years. The subsoil is slightly acid to strongly acid. Organic matter content is low. The surface layer tends to puddle and crust after hard rains. The potential for frost action is high, and the shrink-swell potential is moderate.

Most areas are used for cultivated crops or for hay and pasture. This soil is poorly suited to cultivated crops. It is well suited to hay, pasture, woodland, and habitat for openland and woodland wildlife. It is moderately suited to dwellings and poorly suited to septic tank absorption fields.

Unless the surface is protected, further erosion is a severe hazard in the areas used for soybeans, corn, or small grain. It can be controlled by a system of conservation tillage that leaves crop residue on the surface after planting, by contour farming, by terraces, and by a crop rotation that is dominated by forage crops. Tilling when the soil is wet causes surface cloddiness and compaction and excessive runoff and erosion. Returning crop residue to the soil and regularly adding other organic material increase the rate of water infiltration and help to maintain tilth.

Establishing pasture plants or hay helps to keep soil loss within tolerable limits. Seedbed preparation is difficult on severely eroded side slopes where the subsoil is exposed. A no-till method of pasture renovation or seeding helps to establish forage species and control further erosion. The plants should not be grazed until they are sufficiently established. Proper stocking rates, rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to prevent surface compaction and excessive runoff.

If this soil is used as woodland, plant competition is a management concern. It affects the seedlings of desirable species. The competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

If this soil is used as a site for dwellings without basements, the seasonal high water table, the shrink-swell potential, and the slope are limitations. Installing subsurface tile drains near the foundations lowers the water table. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling. Cutting, filling, and land shaping help to overcome the slope.

If this soil is used as a site for septic tank absorption fields, the seasonal high water table, the moderate permeability, and the slope are limitations. Subsurface tile drains lower the water table. Increasing the size of the absorption field or replacing the soil with more permeable material helps to overcome the moderate permeability. Installing the filter lines on the contour or cutting and filling help to overcome the slope.

On sites for local roads and streets, frost action is a hazard and the slope and low strength are limitations. Strengthening or replacing the base material can help to prevent road damage. Grading may be needed during construction. During periods before a plant cover is established in disturbed areas, additions of mulch are needed to control erosion.

The land capability classification is IVe.

284A—Tice silt loam, 0 to 3 percent slopes. This very gently sloping, somewhat poorly drained soil is on flood plains along the major streams. It is protected by a levee system and is subject to only rare flooding. Individual areas are circular or irregular in shape and range from 50 to 300 acres in size.

Typically, the surface soil is very dark grayish brown, friable silt loam about 15 inches thick. The subsoil is about 37 inches of dark grayish brown, mottled, firm silt loam and silty clay loam. The substratum to a depth of 60 inches is dark grayish brown, mottled silty clay loam. In places it contains more sand.

Included with this soil in mapping are small areas of the poorly drained Darwin and moderately well drained Haynie and Raddle soils. Darwin soils are clayey. They are on the lower parts of the landscape. Haynie and Raddle soils are on the higher parts of the landscape. Also included are small areas of soils that are occasionally flooded. Included soils make up 5 to 8 percent of the unit.

Water and air move through the Tice soil at a moderate rate. Surface runoff is slow. Available water capacity is high. The seasonal high water table is at a depth of 1.5 to 3.0 feet from March through June in most years. The subsoil is slightly acid to mildly alkaline. Organic matter content is moderate. The shrink-swell potential also is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops, hay, pasture, woodland, and habitat for openland and woodland wildlife. It is poorly suited to picnic and camp areas. It generally is unsuited to dwellings and septic tank absorption fields because of the flooding.

No major limitations affect the use of this soil for corn, soybeans, or small grain. The seasonal high water table can delay planting in some years. Subsurface tile drains function satisfactorily if suitable outlets are available. A conservation tillage system that leaves crop residue on the surface after planting helps to maintain tilth and fertility.

The land capability classification is I.

304B—Landes very fine sandy loam, 1 to 5 percent slopes. This gently sloping, well drained soil is on ridges and natural levees on the flood plains along the major rivers. It is protected by a levee system and is subject to only rare flooding. Individual areas are long and narrow and range from 5 to 100 acres in size.

Typically, the surface soil is very dark grayish brown, very friable very fine sandy loam about 12 inches thick. The subsoil is about 25 inches of dark grayish brown and brown, very friable very fine sandy loam and loam. The substratum to a depth of 60 inches is brown loamy fine sand and very fine sandy loam. In some places the soil has less sand throughout. In other places the slope is more than 5 percent.

Included with this soil in mapping are small areas of the somewhat excessively drained Rocher soils. These soils are droughty and contain more sand throughout than the Landes soil. Also, they are higher on the landscape. They make up 4 to 8 percent of the unit.

Water and air move through the upper part of the Landes soil at a moderately rapid rate and through the substratum at a rapid rate. Surface runoff is slow. Available water capacity is moderate. The subsoil is slightly acid to mildly alkaline. Natural fertility is medium, and organic matter content is moderately low. The surface layer is very friable, can be easily tilled, and is susceptible to soil blowing. The shrink-swell potential is low, and the potential for frost action is moderate.

Most areas are used for cultivated crops. This soil is well suited to cultivated crops, hay, pasture, most specialty crops, woodland, and habitat for openland and woodland wildlife. It generally is unsuited to dwellings and septic tank absorption fields because of the flooding.

If this soil is used for corn, soybeans, or small grain, erosion and soil blowing are hazards. Also, the moderate available water capacity and the level of fertility are limitations. Erosion can be controlled and moisture conserved by a conservation tillage system that leaves crop residue on the surface after planting, by contour farming, or by terraces. Field windbreaks and a tillage system that leaves the surface rough are effective in controlling soil blowing.

The land capability classification is IIe.

308B—Alford silt loam, 1 to 5 percent slopes. This gently sloping, well drained soil is on ridgetops and knolls in the uplands. Individual areas are long and narrow or are irregular in shape. They range from 5 to 120 acres in size.

Typically, the surface layer is dark yellowish brown, friable silt loam about 9 inches thick. The subsoil is about 49 inches of yellowish brown and strong brown, firm and friable silty clay loam and silt loam. The substratum to a depth of 60 inches is strong brown silt loam. In places a thin layer of dense, brittle material is in the lower part of the subsoil.

Water and air move through this soil at a moderate rate. Surface runoff is slow. Available water capacity is high. The subsoil is medium acid to very strongly acid. Organic matter content is moderately low. The surface layer is friable and can be easily tilled, but it tends to puddle and crust after hard rains. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are used for cultivated crops or for hay and pasture. In rural areas, homesites and farmsteads are common on this soil. The soil is well suited to cultivated crops, orchards, vegetable crops, hay and pasture, woodland, and habitat for openland and woodland wildlife. It is moderately suited to dwellings and well suited to septic tank absorption fields.

In the areas used for corn, soybeans, or small grain, erosion is a hazard and tilth is a limitation. A conservation tillage system that leaves crop residue on the surface after planting, contour farming, and terraces help to control erosion. Incorporation of crop residue into the soil or additions of organic material help to prevent crusting and improve tilth. A crop rotation that includes a deep-rooted legume improves tilth and helps to prevent surface compaction.

Adapted forage and hay plants grow well on this soil. Timely deferment of grazing helps to prevent overgrazing and thus a greater susceptibility to erosion and soil blowing. The plants should not be grazed until they are sufficiently established. Applications of fertilizer are needed.

If this soil is used as woodland, plant competition is a management concern. It affects the seedlings of desirable species. The competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

Trees and shrubs can be easily established on this soil. The existing stands of trees provide good habitat for woodland wildlife. This soil can be used for the grain and seed crops and grasses and legumes grown as food and cover for openland wildlife. Examples of suitable grasses and legumes are bromegrass, orchardgrass, ladino clover, alsike clover, and red clover. Protection from fire and grazing helps to prevent the depletion of the shrubs and sprouts that provide food for wildlife.

If this soil is used as a site for dwellings, the shrink-swell potential is a limitation. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

On sites for local roads and streets, low strength is a limitation and frost action is a hazard. Strengthening or replacing the base material helps to prevent road damage.

The land capability classification is IIe.

308C2—Alford silt loam, 5 to 10 percent slopes, eroded. This sloping, well drained soil is on convex ridgetops and side slopes in the uplands. Individual areas are irregular in shape and range from 5 to 100 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 8 inches thick. It has been thinned by erosion. The subsoil is about 51 inches thick. The upper part is yellowish brown, friable silt loam; the next part is strong brown, firm silty clay loam; and the lower part is strong brown, firm silt loam. The substratum to a depth of 65 inches is yellowish brown silt loam. In some areas the lower part of the subsoil is dense and brittle. In other areas very severe erosion has exposed the silty clay loam in the subsoil.

Included with this soil in mapping are small areas of alluvial soils along drainageways and in a few depressions. These soils make up 4 to 9 percent of the unit.

Water and air move through the Alford soil at a moderate rate. Surface runoff is medium. Available water capacity is high. The subsoil is medium acid to very strongly acid. Organic matter content is moderately low. The surface layer is friable and can be easily tilled, but it tends to puddle and crust after hard rains. The shrink-swell potential is moderate, and the potential for frost action is high.

Most of the broader ridgetops are used for cultivated crops. The narrower ridgetops are used for hay and pasture or for woodland. This soil is moderately suited to cultivated crops. It is well suited to hay, pasture, orchards, woodland, and habitat for openland and woodland wildlife. It is moderately suited to dwellings and well suited to septic tank absorption fields.

If this soil is used for corn, soybeans, or small grain, erosion is a hazard and tilth is a limitation. Soil loss can be kept within tolerable limits by a crop rotation that includes 1 or more years of forage crops, by a conservation tillage system that leaves crop residue on the surface after planting, by contour farming, by terraces and grassed waterways, or by a combination of these. Returning crop residue to the soil and regularly adding other organic material help to maintain productivity, prevent crusting, and improve tilth.

Adapted forage and hay plants grow well on this soil. Timely deferment of grazing helps to prevent overgrazing and thus also helps to prevent surface compaction, excessive runoff, and a greater susceptibility to erosion. Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion. Applications of fertilizer are needed. The plants should not be grazed or clipped until they are sufficiently established.

If this soil is used as woodland, plant competition is a management concern. It affects the seedlings of desirable species. The competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

Trees and shrubs can be easily established on this soil. The existing stands of trees provide good habitat for woodland wildlife. This soil can be used for the grain and seed crops and grasses and legumes grown as food and cover for openland wildlife. Examples of suitable grasses and legumes are bromegrass, orchardgrass, ladino clover, alsike clover, and red clover. Protection from fire and grazing helps to prevent depletion of the shrubs and sprouts that provide food for wildlife.

Most areas are on ridges or knolls, and some are adjacent to steep hillsides that commonly are wooded. This setting favors such activities as picnicking, camping, and hiking. Cutting and filling are needed in some areas. Measures that keep concentrated runoff from forming gullies on the adjacent side slopes are needed.

If this soil is used as a site for dwellings, the shrink-swell potential is a limitation. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

On sites for local roads and streets, low strength is a limitation and frost action is a hazard. Strengthening or replacing the base material helps to prevent road damage.

The land capability classification is IIe.

308C3—Alford silty clay loam, 5 to 10 percent slopes, severely eroded. This sloping, well drained soil is on side slopes and hillsides in the uplands. In most areas, nearly all of the original surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. Individual areas are irregular in shape and range from 5 to 65 acres in size.

Typically, the surface layer is dark brown, friable silty clay loam about 8 inches thick. The subsoil is about 47 inches thick. The upper part is strong brown and yellowish brown, firm silty clay loam, and the lower part is dark brown, firm silt loam. The substratum to a depth of 60 inches is dark brown silt loam. In some places a seasonal high water table is at a depth of 4 to 6 feet in the spring. In other places the soil is less eroded and has a surface layer of silt loam. In some areas the lower part of the subsoil is dense and brittle.

Included with this soil in mapping are small areas of alluvial soils along drainageways and in a few depressions. These soils make up 5 to 10 percent of the unit.

Water and air move through the Alford soil at a moderate rate. Surface runoff is medium or rapid. Available water capacity is high. The subsoil is medium acid to very strongly acid. Organic matter content is low, and natural fertility is medium. The surface layer is hard when dry and can be easily tilled only within a narrow range in moisture content. Clods tend to form if the soil is tilled when it is too wet. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are used for cultivated crops or for hay and pasture. This soil is poorly suited to cultivated crops. It is well suited to hay, pasture, orchards, woodland, and habitat for openland and woodland wildlife. It is moderately suited to dwellings and well suited to septic tank absorption fields.

Unless the surface is protected, further erosion is a severe hazard in the areas used for soybeans, corn, or small grain. It can be controlled by a system of conservation tillage that leaves crop residue on the surface after planting, by contour farming, by terraces, and by a crop rotation that is dominated by forage crops. Tilling when the soil is wet causes surface cloddiness and compaction and excessive runoff and erosion. Returning crop residue to the soil and regularly adding other organic material increase the rate of water infiltration and help to maintain tilth.

Establishing pasture plants or hay helps to keep soil loss within tolerable limits. Seedbed preparation is difficult on severely eroded side slopes where the subsoil is exposed. A no-till method of pasture renovation or seeding helps to establish forage species and control further erosion. The plants should not be grazed until they are sufficiently established. Proper stocking rates, rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to prevent surface compaction and excessive runoff.

If this soil is used as woodland, plant competition is a management concern. It affects the seedlings of desirable species. The competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

If this soil is used as a site for dwellings, the shrink-swell potential is a limitation. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

On sites for local roads and streets, low strength is a limitation and frost action is a hazard. Strengthening or replacing the base material helps to prevent road damage.

The land capability classification is IVe.

308D—Alford silt loam, 10 to 18 percent slopes. This strongly sloping, well drained soil is on side slopes and hillsides in the uplands. Individual areas are circular or irregular in shape and range from 5 to 50 acres in size.

Typically, the surface layer is very dark brown, very friable silt loam about 2 inches thick. The subsurface layer is brown, friable silt loam about 3 inches thick. The subsoil to a depth of 60 inches is dark yellowish brown, brown, and strong brown, firm silty clay loam. In some places a seasonal high water table is at a depth of 4 to 6 feet in the spring. In other places the lower part of the subsoil is dense and brittle. In some areas the soil has a higher content of sand throughout.

Included with this soil in mapping are small areas of Wellston and Westmore soils on the lower part of some side slopes. These soils formed partly in material weathered from bedrock and have rock fragments below the surface. Also included are small areas of alluvial soils along drainageways and small streams. Included soils make up 6 to 12 percent of the unit.

Water and air move through the Alford soil at a moderate rate. Surface runoff is medium or rapid. Available water capacity is high. The subsoil is medium acid to very strongly acid. Organic matter content is moderately low. The surface layer is friable and can be easily tilled, but it tends to puddle and crust after hard rains if the surface is bare. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are used for pasture or woodland. This soil is poorly suited to cultivated crops. It is well suited to hay, pasture, orchards, woodland, and habitat for woodland wildlife. It is moderately suited to dwellings and septic tank absorption fields.

Unless the surface is protected, erosion is a severe hazard in the areas used for corn, soybeans, or small grain. It can be controlled by a system of conservation tillage that leaves crop residue on the surface after planting, by contour farming, or by a cropping sequence that is dominated by forage crops. Tilling when the soil is wet causes surface cloddiness and compaction and excessive runoff and erosion. Returning crop residue to the soil and regularly adding other organic material increase the rate of water infiltration and improve tilth.

Adapted forage and hay plants grow well on this soil. Timely deferment of grazing helps to prevent overgrazing and thus also helps to prevent surface compaction, excessive runoff, and a greater susceptibility to erosion. Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion. Applications of fertilizer are needed. The plants should not be grazed or clipped until they are sufficiently established.

If this soil is used as woodland, plant competition is a management concern. It affects the seedlings of desirable species. The competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

If this soil is used as a site for dwellings, the slope is a limitation. Cutting, filling, and land shaping help to overcome this limitation. On sites for dwellings without basements, the shrink-swell potential is a limitation. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

The slope is a limitation if this soil is used as a site for septic tank absorption fields. Installing the filter lines on the contour or cutting and land shaping help to overcome this limitation.

On sites for local roads and streets, frost action is a hazard and the slope and low strength are limitations. Strengthening or replacing the base material can help to prevent road damage. Grading may be needed during construction. During periods before a plant cover is established in disturbed areas, additions of mulch are needed to control erosion.

The land capability classification is IVe.

308D3—Alford silty clay loam, 10 to 18 percent slopes, severely eroded. This strongly sloping, well drained soil is on side slopes and hillsides in the uplands. In most areas, nearly all of the original surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. Individual areas are long and narrow or irregular in shape and range from 5 to 65 acres in size.

Typically, the surface layer is dark yellowish brown, firm silty clay loam about 8 inches thick. The subsoil is about 37 inches of dark yellowish brown and strong brown, firm silty clay loam and silt loam. It is mottled in the lower part. The substratum to a depth of 60 inches is strong brown, mottled silt loam. In uneroded areas the surface layer is silt loam. In some places the lower part of the subsoil is dense and brittle. In other places the subsoil has more sand.

Included with this soil in mapping are small areas of Wellston and Westmore soils on the lower side slopes. These soils formed partly in material weathered from bedrock and have rock fragments below the surface. Also included are a few areas where large gullies have formed and small areas of alluvial soils along drainageways and small streams. Included soils make up 6 to 12 percent of the unit.

Water and air move through the Alford soil at a moderate rate. Surface runoff is rapid. Available water capacity is high. The subsoil ranges from medium acid to very strongly acid. Organic matter content is low. The surface layer can be easily tilled only within a narrow range in moisture content. Clods form if the soil is tilled when it is too wet. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are used for hay, pasture, or cultivated crops. Because of the erosion hazard, this soil generally is unsuited to cultivated crops. It is moderately suited to hay, pasture, orchards, and habitat for openland wildlife. It is well suited to woodland and to habitat for woodland wildlife. It is moderately suited to dwellings and septic tank absorption fields.

Establishing pasture plants or hay helps to keep soil loss within tolerable limits. Seedbed preparation is difficult on severely eroded side slopes where the subsoil is exposed. A no-till method of pasture renovation or seeding helps to establish forage species and control further erosion. The plants should not be grazed until they are sufficiently established. Proper stocking rates, rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to prevent surface compaction and excessive runoff.

If this soil is used as woodland, plant competition is a management concern. It affects the seedlings of desirable species. The competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

Some areas that have naturally revegetated provide food and cover for openland or woodland wildlife. This soil can be used for the grain and seed crops and grasses and legumes grown as food and cover for openland wildlife. Examples of suitable grasses and legumes are bromegrass, orchardgrass, ladino clover, alsike clover, and red clover. Trees and shrubs can be easily established on this soil. Existing stands of trees provide good habitat for woodland wildlife. Measures that protect the habitat from grazing are needed.

If this soil is used as a site for dwellings, the slope is a limitation. Cutting, filling, and land shaping help to overcome this limitation. On sites for dwellings without basements, the shrink-swell potential is a limitation. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

The slope is a limitation if this soil is used as a site for septic tank absorption fields. Installing the filter lines on the contour or cutting and land shaping help to overcome this limitation.

On sites for local roads and streets, frost action is a hazard and the slope and low strength are limitations. Strengthening or replacing the base material can help to prevent road damage. Grading may be needed during construction. During periods before a plant cover is established in disturbed areas, additions of mulch are needed to control erosion.

The land capability classification is VIe.

308E—Alford silt loam, 18 to 30 percent slopes. This steep, well drained soil is on hillsides in the uplands. Individual areas are circular or irregular in shape and range from 5 to 40 acres in size.

Typically, the surface layer is dark brown, very friable silt loam about 9 inches thick. The subsurface layer is dark yellowish brown, friable silt loam about 4 inches thick. The subsoil is about 40 inches of yellowish brown and brown, firm silty clay loam and friable silt loam. The substratum to a depth of 60 inches is brown silt loam. In places a seasonal high water table is at a depth of 4 to 6 feet in the spring. In some areas the subsoil has a higher content of sand. In other areas it is dense and brittle in lower part.

Included with this soil in mapping are small areas of Wellston and Westmore soils on the lower side slopes. These soils formed partly in material weathered from bedrock and have rock fragments below the surface.

Also included are small areas of alluvial soils along drainageways and small streams. Included soils make up 6 to 12 percent of the unit.

Water and air move through the Alford soil at a moderate rate. Surface runoff is rapid. Available water capacity is high. The subsoil ranges from medium acid to very strongly acid. Organic matter content is moderately low. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are used as woodland or pasture. This soil is well suited to pasture, woodland, and habitat for openland and woodland wildlife. It generally is unsuited to cultivated crops, hay, dwellings, and septic tank absorption fields because of the steep slope and the erosion hazard.

Establishing pasture plants or hay helps to control erosion. Overgrazing causes surface compaction, excessive runoff, and a greater susceptibility to erosion. Proper stocking rates and timely deferment of grazing help to prevent overgrazing. Applications of fertilizer are needed. The plants should not be grazed or clipped until they are sufficiently established. Tilling on the contour when a seedbed is prepared or the pasture is renovated help to keep the pasture in good condition and help to control erosion.

If this soil is used as woodland, the erosion hazard and the equipment limitation are management concerns. They are caused by the slope. Plant competition also is a management concern. It affects the seedlings of desirable species. The competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Logging roads and skid trails should be established on the contour if possible. On the steeper slopes, the logs or trees should be skidded uphill with a cable and winch. Firebreaks should be the grass type. Bare logging areas should be seeded to grass or to a grass-legume mixture. Machinery should be used only when the soil is firm enough to support the equipment. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots.

The land capability classification is VIe.

308E3—Alford silty clay loam, 18 to 30 percent slopes, severely eroded. This steep, well drained soil is on hillsides in the uplands. In most areas, nearly all of the original surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. Individual areas are long and narrow or irregular in shape and range from 5 to 40 acres in size.

Typically, the surface layer is mixed yellowish brown and brown, friable silty clay loam about 8 inches thick. The subsoil is about 38 inches thick. It is brown and strong brown and is firm. The upper part is silty clay loam, and the lower part is silt loam. The substratum to a depth of 60 inches is brown and strong brown silt loam. In places the subsoil has a higher content of sand.

Included with this soil in mapping are small areas of Wellston and Westmore soils on the lower slopes. These soils formed partly in material weathered from bedrock and have rock fragments below the surface. Also included are small areas of alluvial soils along drainageways and small streams. Included soils make up 8 to 15 percent of the unit.

Water and air move through the Alford soil at a moderate rate. Surface runoff is very rapid. Available water capacity is high. The subsoil is medium acid to very strongly acid. Organic matter content is low. Tilth is poor. Clods form if the soil is tilled when it is too wet. The shrink-swell potential is moderate, and the potential frost action is high.

Most areas recently have been cultivated and are now used for pasture. Some areas are wooded. This soil is moderately suited to pasture and to habitat for openland wildlife. It is well suited to woodland and to habitat for woodland wildlife. It generally is unsuited to cultivated crops and to dwellings and septic tank absorption fields because of the steep slope and the erosion hazard.

Establishing pasture plants and hay helps to keep soil loss within tolerable limits. Seedbed preparation is difficult on severely eroded side slopes where the subsoil is exposed. A no-till method of pasture renovation or seeding helps to establish forage species and control further erosion. The plants should not be grazed until they are sufficiently established. Proper stocking rates, rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to prevent surface compaction and excessive runoff.

If this soil is used as woodland, the erosion hazard and the equipment limitation are management concerns. They are caused by the slope. Plant competition also is a management concern. It affects the seedlings of desirable species. The competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Logging roads and skid trails should be established on the contour if possible. On the steeper slopes, the logs or trees should be skidded uphill with a cable and winch. Firebreaks should be the grass type. Bare logging areas should be seeded to grass or to a grass-legume mixture. Machinery should be used only when the soil is firm enough to support the equipment. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots.

The land capability classification is VIe.

308G—Alford silt loam, 30 to 50 percent slopes. This very steep, well drained soil is on convex side slopes on bluffs along river valleys. Individual areas are long and irregular in shape and range from 10 to 80 acres in size.

Typically, the surface layer is very dark grayish brown and brown, friable silt loam about 5 inches thick. The subsurface layer is yellowish brown, friable silt loam about 8 inches thick. The subsoil is friable silt loam about 34 inches thick. The upper part is yellowish brown and dark brown, and the lower part is strong brown. The substratum to a depth of 60 inches is strong brown silt loam. In a few areas, mainly on ridges, the slope is less than 30 percent.

Included with this soil in mapping are stony soils along drainageways and on the lower part of the slopes. Also included are small areas of the calcareous Hamburg soils along the crest of the ridges. Included soils make up 4 to 6 percent of the unit.

Water and air move through the Alford soil at a moderate rate. Surface runoff is very rapid. Available water capacity is high. The subsoil is medium acid or strongly acid. Organic matter content is low or moderate. The potential for frost action is high.

Most areas are used as woodland. This soil is well suited to woodland and to habitat for woodland wildlife. It is poorly suited to pasture and to habitat for openland wildlife. It generally is unsuited to cultivated crops, hay, dwellings, and septic tank absorption fields because of the very steep slope and a severe erosion hazard.

If this soil is used as woodland, the erosion hazard and the equipment limitation are management concerns. They are caused by the slope. Plant competition also is a management concern. It affects the seedlings of desirable species. The competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Logging roads and skid trails should be established on the contour if possible. On the steeper slopes, the logs or trees should be skidded uphill with a cable and winch. Firebreaks should be the grass type. Bare logging areas should be seeded to grass or to a grass-legume mixture. Machinery should be used only when the soil is firm enough to support the equipment. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots.

The high linear crests of the slopes overlook the generally wooded hillsides and the valleys. This setting favors scenic overlooks. Measures that keep concentrated runoff from forming gullies are needed.

The land capability classification is VIIe.

331—Haymond silt loam. This nearly level, well drained soil is on flood plains along streams. It is occasionally flooded for brief periods in winter and spring. Individual areas are long and narrow and range from 5 to 45 acres in size.

Typically, the surface layer is mixed dark brown and yellowish brown, very friable silt loam about 9 inches thick. The subsoil is brown, dark brown, and yellowish brown, very friable silt loam about 34 inches thick. The substratum to a depth of 60 inches is stratified brown loam and silt loam and pale brown fine sandy loam. In some areas the soil contains more sand throughout. In other areas the surface layer is darker. In areas adjacent to streams, a water table is at a depth of 4 to 6 feet when the water level in the streams is high for a long period.

Included with this soil in mapping are small areas of the somewhat poorly drained Wakeland soils. These soils are in lower areas and are frequently flooded. Also included are soils that are gravelly or channery within a depth of 40 inches. Included soils make up 5 to 12 percent of the unit.

Water and air move through the Haymond soil at a moderate rate. Surface runoff is slow. Available water capacity is very high. Reaction is medium acid to neutral throughout the profile. Organic matter content is moderately low. The surface layer is very friable and can be easily tilled throughout a wide range in moisture content. The potential for frost action is high.

Most broad areas are used for cultivated crops. Many of the narrower areas are used for pasture or woodland. This soil is well suited to cultivated crops, hay, pasture, woodland, and habitat for openland and woodland wildlife. It generally is unsuited to dwellings and conventional septic tank absorption fields because of the flooding.

If this soil is used for corn, soybeans, or small grain, the flooding is a hazard. Dikes or diversions can reduce the extent of the crop damage caused by floodwater. Selecting crop varieties adapted to a short growing season and to wet conditions also reduces the extent of this damage. Keeping tillage to a minimum and returning crop residue to the soil help to maintain tilth and productivity.

If this soil is used as woodland, plant competition is a management concern. It affects the seedlings of desirable species. The competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

Stream channels are in many areas of this soil. These areas generally are bordered by strongly sloping to very steep areas on wooded hillsides. This setting favors picnicking, hiking, and sightseeing. Flash flooding is a hazard affecting overnight camping and similar activities.

The land capability classification is IIw.

333—Wakeland silt loam. This nearly level, somewhat poorly drained soil is on bottom land, along overflow channels, and on alluvial fans. It is occasionally flooded for brief periods in winter and spring. Individual areas are long and irregular in shape or are circular. They range from 5 to 200 acres in size.

Typically, the surface layer is brown, very friable silt loam about 8 inches thick. The substratum to a depth of 60 inches is brown and grayish brown, mottled, friable silt loam. In some areas it is more acid. In other areas the surface layer is darker. In places a dark, clayey buried soil is within a depth of 40 inches.

Included with this soil in mapping are small areas of the well drained Haymond soils on slight rises and areas of the poorly drained Birds soils in depressions. Also included, in low areas adjacent to the larger streams, are soils that are frequently flooded. Included soils make up 8 to 12 percent of the unit.

Water and air move through the Wakeland soil at a moderate rate. Surface runoff is slow. Available water capacity is very high. The seasonal high water table is at a depth of 1 to 3 feet from January through April in most years. The substratum is medium acid to neutral. Natural fertility is medium, and organic matter content is moderately low. The surface layer is friable or very friable and can be easily tilled. The potential for frost action is high.

Most of the broader areas are cultivated. The narrower areas are used as woodland or pasture. This soil is well suited to cultivated crops, hay, pasture, and habitat for woodland wildlife. It is moderately suited to habitat for openland and wetland wildlife. It is poorly suited to camp and picnic areas. It generally is unsuited to dwellings and septic tank absorption fields because of the flooding and the wetness.

If this soil is used for corn, soybeans, or small grain, the flooding is a hazard and the wetness is a limitation. This flooding occurs less often than once every 2 years during the growing season. A drainage system has been installed in the areas used for crops. Measures that maintain or improve the drainage system are needed. Subsurface tile drains function satisfactorily if suitable outlets are available. Dikes or diversions can reduce the extent of the crop damage caused by floodwater. A conservation tillage system that leaves crop residue on the surface after planting improves tilth, helps to prevent surface compaction and crusting, and increases the rate of water intake.

A cover of pasture grasses improves tilth and helps to control erosion or scouring during floods. Selection of suitable species for planting, proper stocking rates, applications of fertilizer, and restricted use during wet periods help to keep the pasture in good condition.

Stream channels are in many areas of this soil. These areas generally are bordered by strongly sloping to very steep areas on wooded hillsides. This setting favors picnicking, hiking, and sightseeing. Seed crops, grasses, wild herbaceous plants, and shrubs provide food and cover for wildlife. Flooding is a hazard affecting overnight camping and similar activities.

The land capability classification is IIw.

334—Birds silt loam. This nearly level, poorly drained soil is in low areas on flood plains along small streams and the major rivers. It is frequently flooded or ponded for long periods during the spring of most years. Individual areas are long and irregular in shape or are circular. They range from 5 to 40 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 9 inches thick. Below this is gray, mottled, friable silt loam about 7 inches thick. The substratum to a depth of 60 inches is light brownish gray, gray, and dark gray, mottled, friable silt loam. In places thin layers of silty clay loam are in the substratum.

Included with this soil in mapping are areas of the somewhat poorly drained Wakeland soils on slight rises. These soils make up 5 to 10 percent of the unit.

Water and air move through the Birds soil at a moderately slow rate. Available water capacity is high. Surface runoff is very slow or ponded. The seasonal high water table is 0.5 foot above the surface to 1.0 foot below from March through June in most years. The soil is dominantly medium acid to mildly alkaline, but some layers are strongly acid. Organic matter content is moderately low. The surface layer is friable and can be easily tilled, but it tends to remain wet until late in spring. The potential for frost action is high.

Most areas are used for cultivated crops or for woodland. This soil is moderately suited to cultivated crops, hay, and pasture. It is well suited to woodland and to habitat for openland, woodland, and wetland wildlife. It generally is unsuited to dwellings and septic tank absorption fields because of the flooding, the ponding, low strength, and the moderately slow permeability.

A drainage system has been installed in the areas used for soybeans and corn. Measures that maintain or improve the drainage system are needed. Surface ditches or subsurface drains reduce the wetness. The flooding is a hazard, but it occurs only occasionally during the growing season. Diversions can intercept surface runoff from the higher adjacent areas. Tilling when the soil is wet causes surface cloddiness and compaction. Minimizing tillage and returning crop residue to the soil improve tilth and increase the rate of water infiltration.

If this soil is used as woodland, the equipment limitation, seedling mortality, and windthrow are management concerns. They are caused by the wetness. Plant competition also is a concern. It affects the seedlings of desirable species. Machinery should be used only when the soil is firm enough to support the equipment. The seedling mortality rate can be reduced by planting on ridges, by selecting planting stock that is older and larger than is typical, or by mulching. Some replanting may be needed. Harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Only high-value trees should be removed from a strip 50 feet wide along the west and south edges of the woodland. Plant competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

The land capability classification is IIIw.

338A—Hurst silt loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on broad terrace ridges. Individual areas are circular or irregular in shape and range from 5 to 80 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 8 inches thick. The subsurface layer is light gray, friable silt loam about 3 inches thick. The subsoil is about 37 inches thick. The upper part is brown, mottled, firm silty clay loam; the next part is brown, mottled, very firm silty clay; and the lower part is light brownish gray, mottled, firm silty clay loam. The substratum to a depth of 60 inches is dark grayish brown, mottled silty clay loam. In some places it contains more clay. In other places the seasonal high water table is below a depth of 3 feet.

Included with this soil in mapping are small areas of Okaw and other poorly drained soils in slight depressions and along drainageways. These soils are ponded for brief periods. They make up 5 to 9 percent of the unit.

Water and air move through the Hurst soil at a very slow rate. Surface runoff is slow. Available water capacity is moderate. The seasonal high water table is at a depth of 1 to 3 feet from February through April in most years. The subsoil is extremely acid to medium acid. Organic matter content and natural fertility are moderately low. The surface layer can be easily tilled, but it tends to puddle and crust after hard rains and dries out slowly in the spring. The potential for frost action is moderate, and the shrink-swell potential is high.

Most areas are cultivated or wooded. This soil is moderately suited to cultivated crops and to habitat for woodland and wetland wildlife. It is poorly suited to camp and picnic areas and to dwellings and septic tank absorption fields.

A drainage system has been installed in the areas used for soybeans, corn, and small grain. Measures that maintain or improve the drainage system are needed. A combination of surface ditches and land leveling reduces the wetness. Tilling when the soil is wet causes surface compaction and decreases the rate of water infiltration. Returning crop residue to the soil, adding other organic material, minimizing tillage, and altering the platy subsurface layer by occasional deep chisel plowing increase the infiltration rate and help to maintain good tilth. Winter wheat and hay crops are subject to frost heave in some years.

The seasonal wetness and the shrink-swell potential are limitations if this soil is used as a site for dwellings. Reinforcing footings and foundations helps to prevent the structural damage caused by shrinking and swelling. Installing subsurface drains around the footings helps to lower the water table. Elevating the floor of dwellings without basements above the surrounding ground level, grading, and diverting surface water also help to overcome the wetness.

The seasonal wetness and the very slow permeability are limitations if this soil is used as a septic tank absorption field. A septic tank system can function satisfactorily if a sealed sand filter and a disinfection tank or an evapotranspiration bed are installed. Sewage lagoons function well on this soil.

On sites for local roads and streets, low strength is a limitation and frost action is a hazard. Strengthening or replacing the base material helps to prevent road damage.

The land capability classification is IIIw.

338B—Hurst silt loam, 2 to 5 percent slopes. This gently sloping, somewhat poorly drained soil is on broad terrace ridges and side slopes. Individual areas are long and irregular in shape and range from 6 to 200 acres in size.

Typically, the surface layer is grayish brown, friable silt loam about 5 inches thick. The subsurface layer is light brownish gray, firm silt loam about 6 inches thick. The subsoil is about 44 inches thick. It is grayish brown and mottled. The upper part is very firm silty clay, and the lower part is firm silty clay loam. The substratum to a depth of 60 inches is light brownish gray, mottled silty clay loam. In some places it contains more sand. In some areas the soil is eroded and has more clay in the surface layer.

Included with this soil in mapping are small areas of the moderately well drained Markland soils on the more sloping parts of the landscape. These soils are calcareous in the lower part of the subsoil and have more sand in the substratum than the Hurst soil. They make up 4 to 9 percent of the unit.

Water and air move through the Hurst soil at a very slow rate. Surface runoff is medium. Available water capacity is moderate. The seasonal high water table is at a depth of 1 to 3 feet from February through April in most years. The subsoil is extremely acid to medium acid. Organic matter content is moderately low. The surface soil can be easily tilled, but it dries out slowly in the spring and tends to puddle and crust after hard rains. The shrink-swell potential is high, and the potential for frost action is moderate.

Most areas are used for cultivated crops or for woodland. This soil is moderately suited to row crops, hay, pasture, and woodland. It is well suited to habitat for openland and woodland wildlife. It is poorly suited to dwellings and septic tank absorption fields.

In the areas used for corn, soybeans, or small grain, erosion is a hazard unless the surface is protected. Also, the wetness can delay planting in some years. It can be reduced by surface ditches. Erosion can be controlled by a system of conservation tillage that leaves crop residue on the surface after planting, by contour farming, or by terraces. Tilling when the soil is wet causes surface compaction and reduces the rate of water infiltration. Returning crop residue to the soil and regularly adding other organic material increase the infiltration rate and improve tilth.

Adapted forage and hay plants grow well on this soil. Overgrazing or grazing when the soil is too wet reduces forage yields, causes surface compaction and excessive runoff, and increases the susceptibility to erosion. Proper stocking rates, rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to control erosion.

If this soil is used as woodland, seedling mortality and windthrow are management concerns. The seedling mortality rate can be reduced by selecting planting stock that is older and larger than is typical and by mulching. Some replanting may be needed. Harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Only high-value trees should be removed from a strip 50 feet wide along the west and south edges of the woodland. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

If this soil is used as a site for dwellings, the seasonal high water table and the shrink-swell potential are limitations. Installing either tile drains near the foundations or interceptor drains on the higher adjacent side slopes helps to lower the water table. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

The seasonal wetness and the very slow permeability are limitations if this soil is used as a septic tank absorption field. A septic tank system can function satisfactorily if a sealed sand filter and a disinfection tank or an evapotranspiration bed are installed. Sewage lagoons function well on this soil.

On sites for local roads and streets, frost action is a hazard and low strength and the shrink-swell potential are limitations. Strengthening or replacing the base material helps to prevent road damage.

The land capability classification is IIIe.

391A—Blake silty clay loam, 0 to 3 percent slopes. This very gently sloping, somewhat poorly drained soil is on ridges and in swales on flood plains along the major rivers. It is occasionally flooded for very brief periods in the spring. Individual areas are long and narrow and are parallel to river or overflow channels. They range from 5 to 140 acres in size.

Typically, the surface layer is very dark grayish brown, firm silty clay loam about 6 inches thick. The upper part of the substratum is dominantly very dark grayish brown and dark grayish brown, firm silty clay loam. The next part is stratified dark brown, mottled, friable silt loam and very dark grayish brown, mottled, friable silty clay loam. The lower part to a depth of 60 inches is brown and dark grayish brown, mottled, friable, stratified silt loam, loam, and very fine sandy loam. In some places the surface layer is silt loam. In other places the substratum is sandy below a depth of 40 inches.

Included with this soil in mapping are small areas of the poorly drained Darwin and moderately well drained Haynie soils. Darwin soils have more clay throughout than the Blake soil. Also, they are lower on the flood plains. Haynie soils are on the higher ridges. Included soils make up 8 to 12 percent of the unit.

Water and air move through the upper part of the Blake soil at a moderate rate and through the lower part at a moderately rapid rate. Surface runoff is slow. Available water capacity is very high. The seasonal high water table is at a depth of 2 to 4 feet from November through July in most years. The soil is mildly alkaline or moderately alkaline throughout. Organic matter content is moderate. The surface layer can be easily tilled only within a narrow range in moisture content. It is cloddy if it is tilled when too wet. The potential for frost action is high.

Most areas are used for cultivated crops. This soil is well suited to row crops; to specialty crops, such as pumpkins and sunflowers; and to habitat for openland, woodland, and wetland wildlife. It generally is unsuited to dwellings and septic tank absorption fields because of the flooding.

In the areas used for cultivated crops, floodwater standing on the lower parts of the landscape may delay planting or damage crops in some years. Surface ditches or subsurface drains help to remove this water. Where a drain line extends to a sandy layer, a cradle may be needed to support the line. If the outlet for the ditch or drain line is to the river, measures that prevent stream cutting are needed. Minimum tillage and crop residue management improve tilth.

The land capability classification is IIw.

394B—Haynie silt loam, 1 to 5 percent slopes. This gently sloping, moderately well drained soil is on ridges and natural levees on flood plains along the major streams. It is commonly adjacent to sloughs or overflow channels. It is protected by a levee system and is subject to only rare flooding. Individual areas are long and narrow or crescent shaped and range from 5 to 1,100 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 8 inches thick. The upper part of the substratum is brown and grayish brown, very friable very fine sandy loam. The next part is grayish brown and dark grayish brown, mottled, very friable very fine sandy loam. The lower part to a depth of 60 inches is dark grayish brown, mottled, friable silt loam. In some areas the substratum contains less sand and more clay. In other areas the dark surface layer is thinner.

Included with this soil in mapping are small areas of the somewhat excessively drained Rocher and somewhat poorly drained Blake and Parkville soils. Rocher soils are droughty and contain more sand throughout than the Haynie soil. Also, they are higher on the landscape. Blake and Parkville soils have more clay in the upper part than the Haynie soil. Also, they are lower on the flood plains. Included soils make up 5 to 10 percent of the unit.

Water and air move through the Haynie soil at a moderate rate. Surface runoff is slow. Available water capacity is high. Most of the profile is mildly alkaline or moderately alkaline and is calcareous. Natural fertility is high. Organic matter content is moderately low. The potential for frost action is high.

Most areas are used for cultivated crops. This soil is well suited to row crops, hay, pasture, woodland, and habitat for openland and woodland wildlife. It generally is unsuited to dwellings and septic tank absorption fields because of the flooding.

If this soil is used for corn, soybeans, or small grain, erosion and soil blowing are hazards. Erosion can be controlled and moisture conserved by a conservation tillage system that leaves crop residue on the surface after planting, by contour farming, or by terraces. Field windbreaks and a tillage system that leaves the surface rough are effective in controlling soil blowing.

The land capability classification is IIe.

408—Aquents, loamy. These nearly level or depressional, very poorly drained soils are in borrow pits, in areas of dredged sediments along the Kaskaskia River, and in areas of stratified sediments adjacent to overflow channels. The landscape has been modified by construction. Most areas are frequently flooded or ponded. Individual areas are long and narrow or rectangular and range from 10 to 200 acres in size.

In a typical area, the surface layer is dark grayish brown, firm silty clay loam about 4 inches thick. The substratum to a depth of 60 inches occurs as layers of friable and firm silty clay loam and clay loam. The layers are mainly loamy but range from fine sand to clay. They vary greatly in thickness.

Included with these soils in mapping are small areas of soils that are dominantly sandy or clayey. Also included are a few areas of stones and debris. Included areas make up 5 to 10 percent of the unit.

Water and air move through the Aquents at a moderately slow to moderately rapid rate. Available water capacity is moderate or high. Surface runoff is very slow or ponded. The seasonal high water table is 0.5 foot above the surface to 1.0 foot below for extended periods in most years. The soil layers range from medium acid to mildly alkaline. Organic matter content is low. The potential for frost action is high or moderate.

Most areas support recently established willows, cottonwoods, or cattails. Many provide habitat for wetland wildlife. Because of the flooding and the ponding, these soils generally are unsuited to cultivated crops, hay and pasture, camp and picnic areas, septic tank absorption fields, local roads and streets, and dwellings. They are suited to habitat for wetland wildlife. Some shallow water areas are available, and others could be developed. In most places the wetness limits the kinds of plants that can be grown as food for wildlife, but the adjacent soils generally are suited to grain and seed crops. Measures that protect the habitat from fire and grazing are essential.

These soils are not assigned to a land capability classification.

428—Coffeen silt loam. This nearly level, somewhat poorly drained soil is on bottom land and alluvial fans. It is occasionally flooded for brief periods in the spring. Individual areas are long and narrow or circular and range from 10 to 40 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 10 inches thick. The subsoil is dark grayish brown, grayish brown, and light brownish gray, mottled, friable and firm silt loam about 37 inches thick. The substratum to a depth of 60 inches is gray, mottled silt loam. In some places layers of loam or very fine sandy loam are in the substratum. In other places the surface layer is not so dark. In some areas a clayey buried soil is within a depth of 40 inches.

Included with this soil in mapping are a few areas of the well drained Haymond soils in the slightly higher landscape positions. These soils make up 5 to 10 percent of the unit.

Water and air move through the Coffeen soil at a moderate rate. Surface runoff is slow. Available water capacity is high. The seasonal high water table is at a depth of 1 to 3 feet from January through May in most years. The soil is medium acid to neutral throughout. Organic matter content is moderate. The surface layer is friable and can be easily tilled. The potential for frost action is high.

Most areas are used for cultivated crops. This soil is well suited to cultivated crops, hay, pasture, woodland, and habitat for openland and woodland wildlife. It generally is unsuited to dwellings and septic tank absorption fields because of the flooding and the wetness.

If this soil is used for corn, soybeans, or small grain, the flooding is a hazard. Also, the seasonal high water table can delay planting in some years. The flooding occurs less frequently than once every 2 years during the growing season. Dikes or diversions reduce the extent of the crop damage caused by floodwater. Selecting crop varieties adapted to a short growing season and to wet conditions also reduces the extent of this damage. Subsurface tile drains function satisfactorily if suitable outlets are available. Keeping tillage to a minimum and returning crop residue to the soil help to maintain tilth and productivity.

A cover of pasture grasses improves tilth and helps to control erosion or scouring during floods. Selection of suitable species for planting, proper stocking rates, applications of fertilizer, and restricted use during wet periods help to keep the pasture in good condition.

The land capability classification is IIw.

430A—Raddle silt loam, 0 to 3 percent slopes. This very gently sloping, moderately well drained soil is on low terraces and on ridges and natural levees along sloughs and overflow channels. It is protected by a levee system and is subject to only rare flooding. Individual areas are broad and circular or are long and narrow. They range from 10 to 200 acres in size.

Typically, the surface soil is very dark grayish brown, very friable silt loam about 20 inches thick. The subsoil extends below a depth of 60 inches. The upper part is dark brown, friable silt loam; the next part is dark yellowish brown, mottled, friable silt loam; and the lower part is dark grayish brown, mottled, firm silty clay loam. In some areas the subsoil contains more sand. A few areas are more sloping.

Included with this soil in mapping are small areas of the poorly drained Darwin and Fults and somewhat poorly drained Tice soils. These soils have more clay throughout than the Raddle soil. Also, they generally are lower on the flood plains. Also included are areas that are subject to occasional overflow from nearby upland slopes. Included soils make up about 10 to 15 percent of the unit.

Water and air move through the Raddle soil at a moderate rate. Surface runoff is slow. Available water capacity is very high. The seasonal high water table is at a depth of 4 to 6 feet from February through May in most years. The subsoil is slightly acid to mildly alkaline. Organic matter content is moderate. The potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops, hay, pasture, woodland, and habitat for openland and woodland wildlife. It generally is unsuited to dwellings and septic tank absorption fields because of the flooding.

No major limitations affect the use of this soil for corn, soybeans, or small grain. The seasonal high water table can delay planting in some years. Subsurface tile drains function satisfactorily if suitable outlets are available. A conservation tillage system that leaves crop residue on the surface after planting helps to maintain tilth and fertility.

The land capability classification is I.

453B—Muren silt loam, 1 to 5 percent slopes. This gently sloping, moderately well drained soil is on narrow or broad ridgetops. Individual areas are irregular in shape and range from 5 to 60 acres in size.

Typically, the surface layer is dark yellowish brown, friable silt loam about 10 inches thick. The subsurface layer is yellowish brown, friable silt loam about 5 inches thick. The subsoil is yellowish brown, mottled, firm silty clay loam about 38 inches thick. The substratum to a depth of 60 inches is yellowish brown, mottled silt loam. In some eroded areas the surface layer contains more clay.

Included with this soil in mapping are small areas of Hosmer soils and the somewhat poorly drained Stoy soils, both of which have a dense and brittle layer in the subsoil. Hosmer soils are in the more sloping areas at the edges of the unit. Stoy soils are at the head of drainageways. Included soils make up 5 to 9 percent of the unit.

Water and air move through the Muren soil at a moderate rate. Surface runoff is slow. Available water capacity is high. The seasonal high water table is at a depth of 2 to 6 feet during March and April in most years. The subsoil is strongly acid or medium acid. Organic matter content is moderately low. The surface layer tends to puddle and crust after hard rains. The potential for frost action is high, and the shrink-swell potential is moderate.

Most areas are cultivated. This soil is well suited to cultivated crops, pasture, hay, woodland, and habitat for openland and woodland wildlife. It is moderately suited to dwellings and poorly suited to septic tank absorption fields.

In the areas used for corn, soybeans, or small grain, erosion is a hazard and tilth is a limitation. A conservation tillage system that leaves crop residue on the surface after planting, contour farming, and terraces help to control erosion. Incorporation of crop residue into the soil or additions of other organic material help to prevent crusting and improve tilth. A crop rotation that includes a deep-rooted legume improves tilth and helps to prevent surface compaction.

Adapted forage and hay plants grow well on this soil. Timely deferment of grazing helps to prevent overgrazing and thus a greater susceptibility to erosion. The plants should not be grazed until they are sufficiently established. Applications of fertilizer are needed.

The seasonal wetness and the shrink-swell potential are limitations if this soil is used as a site for dwellings. The wetness is a more severe limitation on sites for dwellings with basements than on sites for dwellings without basements. Reinforcing footings and foundations helps to prevent the structural damage caused by shrinking and swelling. Installing subsurface drains around the foundations lowers the water table.

If this soil is used as a site for septic tank absorption fields, the seasonal high water table and the moderate permeability are limitations. Subsurface tile drains lower the water table. Increasing the size of the absorption field or replacing the soil with more permeable material helps to overcome the moderate permeability.

On sites for local roads and streets, frost action is a hazard and low strength is a limitation. Strengthening or replacing the base material can help to prevent road damage.

The land capability classification is IIe.

453C2—Muren silt loam, 5 to 10 percent slopes, eroded. This sloping, moderately well drained soil is on side slopes, mainly adjacent to drainageways in the uplands. Slopes generally are 50 to 200 feet long. Individual areas are long and irregular in shape and range from 5 to 80 acres in size.

Typically, the surface layer is about 9 inches of mixed brown, friable silt loam and yellowish brown, firm silty clay loam. It has been thinned by erosion. The subsoil is about 35 inches thick. The upper part is yellowish brown, mottled, firm silty clay loam, and the lower part is brown and yellowish brown, mottled, friable silt loam. The substratum to a depth of 60 inches is pale brown and yellowish brown, mottled silt loam. In some of the more eroded areas, the surface layer is thinner and contains more clay. Some areas are less sloping.

Included with this soil in mapping are small areas of Hosmer soils and the somewhat poorly drained Stoy soils, both of which have a dense and brittle layer in the subsoil. Hosmer soils are on slope breaks at the edge of the mapped areas. Stoy soils are along drainageways. Also included are scald spots, which have a high content of sodium at or near the surface. Included soils make up 7 to 12 percent of the unit.

Water and air move through the Muren soil at a moderate rate. Surface runoff is medium. Available water capacity is high. The seasonal high water table is at a depth of 2 to 6 feet during March and April in most years. The subsoil is strongly acid or medium acid. Organic matter content is low. The surface layer tends to puddle and crust after hard rains. The potential for frost action is high, and the shrink-swell potential is moderate.

Most areas are cultivated. This soil is moderately suited to cultivated crops and to dwellings. It is well suited to woodland and to habitat for openland and woodland wildlife. It is poorly suited to septic tank absorption fields.

If this soil is used for corn, soybeans, or small grain, further erosion is a hazard and tilth is a limitation. Soil loss can be kept within tolerable limits by a crop rotation that includes 1 or more years of forage crops, by a conservation tillage system that leaves crop residue on the surface after planting, by contour farming, by terraces, or by a combination of these. Returning crop residue to the soil and regularly adding other organic material help to maintain productivity, prevent crusting, and improve tilth.

Adapted forage and hay plants grow well on this soil. Timely deferment of grazing helps to prevent overgrazing and thus also helps to prevent surface compaction, excessive runoff, and a greater susceptibility to erosion. Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion. Applications of fertilizer are needed. The plants should not be grazed or clipped until they are sufficiently established.

The seasonal wetness and the shrink-swell potential are limitations if this soil is used as a site for dwellings. The wetness is a more severe limitation on sites for dwellings with basements than on sites for dwellings without basements. Reinforcing footings and foundations helps to prevent the structural damage caused by shrinking and swelling. Installing subsurface drains around the foundations lowers the water table.

If this soil is used as a site for septic tank absorption fields, the seasonal high water table and the moderate permeability are limitations. Subsurface tile drains lower the water table. Increasing the size of the absorption field or replacing the soil with more permeable material helps to overcome the moderate permeability.

On sites for local roads and streets, low strength is a limitation and frost action is a hazard. Strengthening or replacing the base material can help to prevent road damage.

The land capability classification is IIIe.

457—Booker silty clay. This nearly level, very poorly drained soil is on broad flats and in low areas on flood plains along the major rivers. It is protected by a levee system and is subject to only rare flooding. It is subject to ponding during winter and spring. Individual areas are circular or are long and irregular. They range from 60 to 400 acres in size.

Typically, the surface layer is very dark gray, firm silty clay about 7 inches thick. The subsurface layer is very dark gray, very firm clay about 10 inches thick. The subsoil is very dark gray, dark gray, and gray, mottled, very firm clay about 41 inches thick. The substratum to a depth of 60 inches is dark gray, mottled clay. In some areas it contains more sand and less clay. In other areas the soil contains less clay and more silt throughout.

Included with this soil in mapping are small areas of soils along overflow channels. These soils have received as much as 20 inches of silty overwash. They make up 2 to 5 percent of the unit.

Water and air move through the Booker soil at a very slow rate. Available water capacity is moderate. Surface runoff is very slow or ponded. The seasonal high water table is 0.5 foot above the surface to 1.0 foot below from November through May in most years. The subsoil is medium acid to neutral. Organic matter content is moderate. The surface layer is very sticky when wet and very hard when dry. Large cracks form during dry periods, and clods form if the soil is tilled when it is too wet. The shrink-swell potential is very high, and the potential for frost action is moderate.

Most areas are used for cultivated crops. This soil is moderately suited to cultivated crops, hay, and pasture. It is poorly suited to woodland and moderately suited to habitat for wetland wildlife. It generally is unsuited to dwellings and septic tank absorption fields because of the ponding and the flooding.

A drainage system has been installed in the areas used for soybeans, corn, or small grain. Measures that maintain the drainage system are needed. The wetness can be reduced by surface ditches. Tilling when the soil is wet causes surface cloddiness and compaction. Returning crop residue to the soil, tilling in the fall, and minimizing spring tillage improve tilth and increase the rate of water infiltration.

If this soil is used for pasture and hay, the ponding is a hazard. It can be controlled by surface drains, ditches, and surface inlet tile. Deferment of grazing when the soil is too wet helps to prevent surface compaction and deterioration of tilth. Proper stocking rates, rotation grazing, and applications of fertilizer help to keep the pasture in good condition.

The land capability classification is IIIw.

465—Montgomery silty clay loam. This nearly level, very poorly drained soil is in slight depressions on terraces near the major streams. It is ponded for brief periods. Individual areas are circular or are long and narrow. They range from 8 to 40 acres in size.

Typically, the surface soil is black and very dark gray, firm silty clay loam about 13 inches thick. The subsoil is very dark gray, dark grayish brown, and grayish brown, mottled, very firm and firm silty clay about 35 inches thick. It commonly has lime nodules in the lower part. The substratum to a depth of 60 inches is grayish brown, mottled silty clay loam. In a few areas the surface layer is lighter in color.

Included with this soil in mapping are small areas of soils that have recently received as much as 20 inches of silt loam overwash. These soils make up 3 to 8 percent of the unit.

Water and air move through the Montgomery soil at a slow rate. Available water capacity is high. Surface runoff is very slow or ponded. The seasonal high water table is 1 foot above the surface to 1 foot below from December through May in most years. The subsoil is slightly acid to mildly alkaline, and the substratum is calcareous. Organic matter content is moderate. The surface layer is firm and can be easily tilled only within a narrow range in moisture content. The shrink-swell potential is high, and the potential for frost action is moderate.

Most areas of this soil are used for cultivated crops. This soil is moderately suited to cultivated crops and well suited to hay, pasture, woodland, and habitat for wetland wildlife. It generally is unsuited to dwellings and septic tank absorption fields because of the ponding, the slow permeability, and the high shrink-swell potential.

A drainage system has been installed in the areas used for soybeans, corn, and small grain. Measures that maintain or improve the drainage system are needed. A combination of surface ditches and land leveling reduces the wetness. Tilling when the soil is wet causes surface compaction and decreases the rate of water infiltration. Returning crop residue to the soil, adding other organic material, tilling in the fall, and minimizing spring tillage increase the infiltration rate and help to maintain good tilth. Winter wheat and hay crops are subject to frost heave in some years.

If this soil is used for pasture and hay, the ponding is a hazard. It can be controlled by surface drains, ditches, and surface inlet tile. Deferment of grazing when the soil is too wet helps to prevent surface compaction and deterioration of tilth. Proper stocking rates, rotation grazing, and applications of fertilizer help to keep the pasture in good condition.

The land capability classification is IIIw.

467D2—Markland silty clay loam, 7 to 20 percent slopes, eroded. This strongly sloping, moderately well drained soil is on short side slopes on terraces adjacent to the major streams. Individual areas are long and irregular in shape and range from 5 to 45 acres in size.

Typically, the surface layer is dark brown, firm silty clay loam about 5 inches thick. It has been thinned by erosion. The subsoil is about 32 inches thick. The upper part is brown, very firm clay; the next part is light olive brown, mottled, very firm clay; and the lower part is grayish brown, mottled, firm silty clay. The substratum to a depth of 60 inches is weak red and dark grayish brown, mottled silty clay loam that has thin lenses of loamy fine sand. In places the slope is more than 20 percent.

Included with this soil in mapping are small areas of somewhat poorly drained soils on the less sloping parts of the landscape. These soils make up 4 to 8 percent of the unit.

Water and air move through the Markland soil at a slow rate. Surface runoff is rapid. Available water capacity is moderate. The seasonal high water table is at a depth of 3 to 6 feet during March and April in most years. The subsoil ranges from strongly acid in the upper part to neutral in the lower part. Organic matter content is low. The surface layer is firm and clayey and can be easily tilled only within a narrow range in moisture content. Clods form if the soil is tilled when it is too wet. The shrink-swell potential is high, and the potential for frost action is moderate.

Most areas are used for cultivated crops or for woodland. Because of the erosion hazard, this soil generally is unsuited to cultivated crops. It is poorly suited to hay and pasture and to dwellings and septic tank absorption fields. It is moderately suited to habitat for openland wildlife and is well suited to woodland and to habitat for woodland wildlife.

Establishing pasture plants or hay helps to keep soil loss within tolerable limits. Seedbed preparation is difficult on the eroded side slopes where the subsoil is mixed with the surface soil. A no-till method of pasture renovation or seeding helps to establish forage species and control further erosion. The plants should not be grazed until they are sufficiently established. Proper stocking rates, rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to prevent surface compaction and excessive runoff.

If this soil is used as woodland, seedling mortality and windthrow are management concerns. They are caused by the high content of clay in the soil. Plant competition also is a concern. It affects the seedlings of desirable species. The seedling mortality rate can be reduced by planting on ridges, by selecting planting stock that is older and larger than is typical, and by mulching. Some replanting may be needed. Harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Only high-value trees should be removed from a strip 50 feet wide along the west and south edges of the woodland. Competing vegetation can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

If this soil is used as a site for dwellings without basements, the seasonal high water table, the shrink-swell potential, and the slope are limitations. Installing subsurface tile drains near the foundations lowers the water table. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling. Cutting, filling, and land shaping help to overcome the slope.

The seasonal wetness, the slow permeability, and the slope are limitations if this soil is used as a septic tank absorption field. A septic tank system can function satisfactorily if a sealed sand filter and a disinfection tank or an evapotranspiration bed are installed and the site is leveled.

Low strength, the shrink-swell potential, and the slope are limitations on sites for local roads and streets. Strengthening or replacing the base material can help to prevent road damage. Grading may be needed during construction. During periods before a plant cover is established in disturbed areas, additions of mulch are needed to control erosion.

The land capability classification is VIe.

474—Piasa silt loam. This nearly level, poorly drained, saline-alkali soil is on broad drainage divides and in slight depressions on till plains. It is ponded for brief periods in late winter and in spring. Individual areas are circular or irregular in shape and range from about 5 to 20 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 9 inches thick. The subsurface layer is grayish brown, friable silt loam about 3 inches thick. The subsoil is grayish brown, mottled, firm and friable silty clay loam about 39 inches thick. It has a high content of exchangeable sodium. The substratum to a depth of 60 inches is dominantly grayish brown and gray silt loam. In some places the upper part of the subsoil does not have a concentration of sodium. In other places the surface layer is not so dark.

Included with this soil in mapping are small areas of the somewhat poorly drained Coulterville and Oconee soils on slight rises. These soils make up about 5 to 10 percent of the unit.

Water and air move through the Piasa soil at a very slow rate. Available water capacity is moderate. Surface runoff is slow. The seasonal high water table is 0.5 foot above the surface to 2.0 feet below from February through May in most years. The subsoil is dominantly mildly alkaline to strongly alkaline, but some layers in the upper part are medium acid to neutral. Organic matter content is moderate. The shrink-swell potential and the potential for frost action are high.

Most areas are used for cultivated crops. This soil is moderately suited to cultivated crops, hay, and pasture. It is well suited to habitat for wetland wildlife. It generally is unsuited to dwellings and septic tank absorption fields because of the ponding, the very slow permeability, and the high shrink-swell potential.

A drainage system has been installed in the areas used for soybeans, corn, and small grain. Measures that maintain or improve the drainage system are needed. A combination of surface ditches and land leveling reduces the wetness. The high content of sodium in the subsoil restricts the availability and uptake of some plant nutrients, especially phosphorus. Yields of wheat and soybeans usually are less affected by the sodium content than are yields of corn. Tilling when the soil is wet causes surface compaction and decreases the rate of water infiltration. Returning crop residue to the soil, adding other organic material, and minimizing tillage increase the infiltration rate and help to maintain good tilth. Winter wheat and hay crops are subject to frost heave in some years.

The land capability classification is IIIw.

517A—Marine silt loam, 0 to 3 percent slopes. This very gently sloping, somewhat poorly drained soil is on broad, low ridges and in concave areas on till plains. Individual areas are circular or irregular in shape and range from 5 to 80 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is light brownish gray, friable silt loam about 3 inches thick. The subsoil is about 35 inches thick. The upper part is yellowish brown, firm silty clay loam that has light brownish gray silt coatings; the next part is yellowish brown and brown, mottled, very firm silty clay; and the lower part is grayish brown and light brownish gray, mottled, firm silty clay loam. The substratum to a depth of 60 inches is grayish brown, gray, and light brownish gray, mottled silt loam. In some areas the surface layer and subsurface layer are thicker. In other areas the surface layer is darker. In places the lower part of the subsoil and the substratum have a higher content of sand.

Included with this soil in mapping are small areas of Rushville and Coulterville soils. The poorly drained Rushville soils are in drainageways and depressions and are ponded for brief periods. Coulterville soils are in positions on the landscape similar to those of the Marine soil. They have a high content of sodium in the lower part of the subsoil. Included soils make up 7 to 12 percent of the unit.

Water and air move through the Marine soil at a slow rate. Surface runoff also is slow. Available water capacity is high. The seasonal high water table is at a depth of 1 to 2 feet from January through May in most years. The subsoil is dominantly very strongly acid to medium acid. Organic matter content is low in the surface soil. The surface layer can be easily tilled but often puddles and crusts after hard rains. The shrink-swell potential and the potential for frost action are high.

Most areas are cultivated. This soil is well suited to cultivated crops, hay, pasture, and habitat for openland and woodland wildlife. It is moderately suited to woodland and is poorly suited to dwellings and septic tank absorption fields.

A drainage system has been installed in the areas used for cultivated crops. Wetness delays planting in some years. It can be reduced by surface ditches or a combination of subsurface drains and surface inlets. Erosion is a hazard in areas where slopes are very long. It can be controlled, however, by a system of conservation tillage that leaves crop residue on the surface after planting. Tilling when the soil is wet causes surface compaction and excessive runoff and reduces the rate of water infiltration. Returning crop residue to the soil and regularly adding other organic material increase the infiltration rate and improve tilth.

The seasonal wetness and the shrink-swell potential are limitations if this soil is used as a site for dwellings. Reinforcing footings and foundations helps to prevent the structural damage caused by shrinking and swelling. Installing subsurface drains around the footings helps to lower the water table. Elevating the floor of dwellings without basements above the surrounding ground level, grading, and diverting surface water also help to overcome the wetness.

The seasonal wetness and the slow permeability are limitations if this soil is used as a septic tank absorption field. A septic tank system can function satisfactorily if a sealed sand filter and a disinfection tank or an evapotranspiration bed are installed. Sewage lagoons function well on this soil.

On sites for local roads and streets, low strength is a limitation and frost action is a hazard. Strengthening or replacing the base material helps to prevent road damage.

The land capability classification is IIw.

536—Dumps, mine. This map unit occurs as mounds or dumps of coarse refuse from coal preparation plants and as large stockpiles of coal. Individual areas are circular and range from 10 to 120 acres in size.

In a typical area, the refuse, commonly called "gob," contains varying amounts of coal, sandstone, shale, clay particles, and pyrite. After weathering for several years, the material generally has a high content of aluminum, iron, and zinc, which are toxic to most plants. In places acid leachate seeps from the base of the refuse pile during wet periods. In some areas gullies have formed. In other areas spontaneous combustion has left thick layers of reddish material.

Included in this unit in mapping are areas of abandoned machinery, decayed timber, and other debris associated with mining. Also included are a few small areas of Orthents, loamy, which support vegetation. Included areas make up less than 10 percent of the unit.

Most areas are abandoned, but some are used for the storage of equipment or materials. This unit generally is only sparsely vegetated with broom sedge, three-awn, dewberry, and wild rose. In seepy areas reedgrass is common. A few areas are suited to mining for the recovery of coal. The unit generally is not suitable for recreational uses.

This map unit is not assigned to a land capability classification.

570B—Martinsville silt loam, 1 to 7 percent slopes. This gently sloping, well drained soil is on terrace ridges. Individual areas are irregularly shaped or oblong and range from 15 to 75 acres in size.

Typically, the surface layer is very dark grayish brown and dark brown, very friable and friable silt loam about 8 inches thick. The subsurface layer is light yellowish brown, friable silt loam about 2 inches thick. The subsoil is about 39 inches thick. The upper part is yellowish brown, friable silt loam and strong brown, yellowish brown, and brown, firm silty clay loam that has common sand grains. The lower part is brown, firm clay loam and friable loam. The substratum to a depth of 60 inches is brown fine sandy loam. In places the lower part of the subsoil contains less sand.

Included with this soil in mapping are small areas of the somewhat excessively drained Bloomfield soils on slight rises. These soils have more sand throughout than the Martinsville soil and are droughty. They make up 3 to 8 percent of the unit.

Water and air move through the Martinsville soil at a moderate rate. Surface runoff is slow. Available water capacity is high. The subsoil is strongly acid to slightly acid. Organic matter content is moderately low, and natural fertility is medium. The shrink-swell potential and the potential for frost action are moderate.

Most areas are used for cultivated crops or for hay and pasture. This soil is well suited to row crops, small grain, vegetable crops, hay, pasture, habitat for openland and woodland wildlife, and septic tank absorption fields. It is moderately suited to dwellings.

In the areas used for corn, soybeans, or small grain, erosion is a hazard and tilth is a limitation. A conservation tillage system that leaves crop residue on the surface after planting, contour farming, and terraces help to control erosion. Incorporation of crop residue into the soil or additions of other organic material help to prevent crusting and improve tilth. A crop rotation that includes a deep-rooted legume improves tilth and helps to prevent surface compaction.

Adapted forage and hay plants grow well on this soil. Timely deferment of grazing helps to prevent overgrazing and thus a greater susceptibility to erosion and soil blowing. The plants should not be grazed until they are sufficiently established. Applications of fertilizer are needed.

If this soil is used as a site for dwellings, the shrink-swell potential is a limitation. Reinforcing foundations helps to overcome this limitation.

On sites for local roads and streets, low strength is a limitation and frost action is a hazard. Strengthening or replacing the base material can help to prevent road damage.

The land capability classification is IIe.

570D2—Martinsville fine sandy loam, 7 to 18 percent slopes, eroded. This sloping and strongly sloping, well drained soil is on side slopes on terraces and on terrace breaks adjacent to drainageways. Slopes generally are 75 to 150 feet long. Individual areas are long and narrow or irregular in shape and range from 5 to 35 acres in size.

Typically, the surface layer is dark brown, friable fine sandy loam about 6 inches thick. It has been thinned by erosion. The subsoil is about 32 inches thick. The upper part is dark yellowish brown and strong brown, friable loam, and the lower part is yellowish brown, firm fine sandy loam. The substratum to a depth of 60 inches is stratified loam and fine sandy loam. The upper part is yellowish brown, and the lower part is grayish brown and mottled. In some areas the subsoil contains more clay and less sand.

Included with this soil in mapping are small areas of the somewhat excessively drained Bloomfield soils on the upper part of the side slopes and somewhat poorly drained soils on the less sloping parts of the landscape. Bloomfield soils have more sand than the Martinville soil and are droughty. Also included, along drainageways, are a few areas of shallow soils. Included soils make up 5 to 10 percent of the unit.

Water and air move through the Martinsville soil at a moderate rate. Surface runoff is medium or rapid. Available water capacity is high. The subsoil is strongly acid to slightly acid. Organic matter content is moderately low. The surface layer is friable and can be easily tilled. The shrink-swell potential is low, and the potential for frost action is moderate.

Most areas are cultivated. A few areas support native hardwoods. This soil is poorly suited to cultivated crops. It is well suited to hay, pasture, woodland, and habitat for openland and woodland wildlife. It is moderately suited to dwellings and septic tank absorption fields.

Unless the surface is protected, further erosion is a hazard in the areas used for corn, soybeans, or small grain. It can be controlled by a system of conservation tillage that leaves crop residue on the surface after planting, by contour farming, or by a cropping sequence that is dominated by forage crops. Tilling when the soil is wet causes surface cloddiness and compaction and excessive runoff and erosion. Returning crop residue to the soil and regularly adding other organic material increase the rate of water infiltration and improve tilth.

Adapted forage and hay plants grow well on this soil. Timely deferment of grazing helps to prevent overgrazing and thus also helps to prevent surface compaction, excessive runoff, and a greater susceptibility to erosion. Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion. Applications of fertilizer are needed. The plants should not be grazed or clipped until they are sufficiently established.

If this soil is used as woodland, plant competition is a management concern. It affects the seedlings of desirable species. The competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

If this soil is used as a site for dwellings, the slope is a limitation. Cutting, filling, and land shaping help to overcome this limitation. On sites for dwellings without basements, the shrink-swell potential is a limitation. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

The slope is a limitation if this soil is used as a site for septic tank absorption fields. Installing the filter lines on the contour or cutting and land shaping help to overcome this limitation.

On sites for local roads and streets, frost action is a hazard and the slope and low strength are limitations. Strengthening or replacing the base material can help to prevent road damage. Grading may be needed during construction. During periods before a plant cover is established in disturbed areas, additions of mulch are needed to control erosion.

The land capability classification is IVe.

571B—Whitaker silt loam, 1 to 5 percent slopes. This gently sloping, somewhat poorly drained soil is on broad terrace ridges near the major streams. Individual areas are irregularly shaped or circular and range from 5 to 35 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 10 inches thick. The subsurface layer is grayish brown, friable silt loam about 5 inches thick. The subsoil is about 36 inches thick. The upper part is light yellowish brown and pale brown, mottled, firm silty clay loam, and the lower part is pale brown, mottled, firm and friable clay loam. The substratum to a depth of 60 inches is light brownish gray, mottled loam.

Included with this soil in mapping are small areas of the moderately well drained St. Charles soils on the slightly higher rises. Also included are poorly drained soils in shallow depressions and drainageways that are subject to rare flooding. Included soils make up 3 to 8 percent of the unit.

Water and air move through the Whitaker soil at a moderate rate. Surface runoff is slow. Available water capacity is high. The seasonal high water table is at a depth of 1 to 3 feet from January through April in most years. Natural fertility is medium, and organic matter content is moderately low. The subsoil is strongly acid to slightly acid. The surface layer tends to puddle and crust after hard rains. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are cultivated. This soil is well suited to cultivated crops, hay, pasture, woodland, and habitat for openland and woodland wildlife. It is poorly suited to dwellings and septic tank absorption fields.

In the areas used for corn, soybeans, or small grain, erosion is a hazard unless the surface is protected. Also, the wetness can delay planting in some years. It can be reduced by surface ditches. Erosion can be controlled by a system of conservation tillage that leaves crop residue on the surface after planting, by contour farming, or by terraces. Tilling when the soil is wet causes surface compaction and reduces the rate of water infiltration. Returning crop residue to the soil and regularly adding other organic material increase the infiltration rate and improve tilth.

Adapted forage and hay plants grow well on this soil. Overgrazing or grazing when the soil is too wet reduces forage yields, causes surface compaction and excessive runoff, and increases the susceptibility to erosion. Proper stocking rates, rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to control erosion.

If this soil is used as a site for dwellings, the seasonal high water table and the shrink-swell potential are limitations. Installing either tile drains near the foundations or interceptor drains on the higher adjacent side slopes helps to lower the water table. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

If this soil is used as a site for septic tank absorption fields, the seasonal high water table and the moderate permeability are limitations. Subsurface tile drains lower the water table. Increasing the size of the absorption field or replacing the soil with more permeable material helps to overcome the moderate permeability.

On sites for local roads and streets, low strength is a limitation and frost action is a hazard. Strengthening or replacing the base material can help to prevent road damage.

The land capability classification is IIe.

591—Fults silty clay. This nearly level, poorly drained soil is on broad flats and low ridges on flood plains along the major rivers. It is protected by a levee system and is subject to only rare flooding. Individual areas are long and narrow or are circular. They range from 20 to 200 acres in size.

Typically, the surface soil is very dark gray, firm silty clay about 10 inches thick. The subsoil is about 32 inches thick. The upper part is dark gray and dark grayish brown, mottled, very firm clay and silty clay. The lower part is grayish brown, mottled, firm silty clay loam and friable and very friable silt loam. The substratum to a depth of 60 inches is dark grayish brown fine sand. In some places, the clayey material is thinner and the loamy and sandy material is nearer the surface. In other places the clayey material extends below a depth of 60 inches.

Included with this soil in mapping are small areas of the somewhat poorly drained Parkville and moderately well drained Raddle soils on the slightly higher parts of the landscape. Raddle soils contain less clay in the upper part than the Fults soil. Included soils make up 8 to 12 percent of the unit.

Water and air move through the upper part of the Fults soil at a very slow rate and through the lower part at a moderately rapid rate. Surface runoff is slow. Available water capacity is moderate or high. The seasonal high water table is within a depth of 2 feet from March through June in most years. The subsoil is medium acid to mildly alkaline. Organic matter content is moderate. The surface layer is very firm and can be easily tilled only within a narrow range in moisture content. Clods form if the soil is tilled when it is too wet. Large cracks form during dry periods. The potential for frost action is high.

Most areas are used for cultivated crops. This soil is moderately suited to cultivated crops, hay, pasture, woodland, and habitat for openland, woodland, and wetland wildlife. It generally is unsuited to dwellings and septic tank absorption fields because of the flooding.

A drainage system has been installed in the areas used for soybeans, corn, or small grain. Measures that maintain the drainage system are needed. The wetness can be reduced by surface ditches. Tilling when the soil is wet causes surface cloddiness and compaction. Returning crop residue to the soil, tilling in the fall, and minimizing spring tillage improve tilth and increase the rate of water infiltration.

If this soil is used for pasture and hay, the ponding is a hazard. It can be controlled by surface drains, ditches, and surface inlet tile. Deferment of grazing when the soil is too wet helps to prevent surface compaction and deterioration of tilth. Proper stocking rates, rotation grazing, and applications of fertilizer help to keep the pasture in good condition.

The land capability classification is IIw.

619A—Parkville silty clay, 0 to 3 percent slopes. This very gently sloping, somewhat poorly drained soil is on slight rises adjacent to sloughs and overflow channels on flood plains along the major streams. It is protected by a levee system and is subject to only rare flooding. Individual areas are long and narrow or are circular. They range from 7 to 150 acres in size.

Typically, the surface soil is very dark grayish brown, firm and very firm silty clay about 14 inches thick. The upper part of the substratum is dark brown, mottled, friable silt loam. The next part is brown and pale brown, mottled, very friable very fine sandy loam and silt loam. The lower part to a depth of 60 inches is light brownish gray very fine sandy loam. In some areas the upper and middle parts of the substratum contain more clay and less sand.

Included with this soil in mapping are small areas of the well drained Landes and poorly drained Fults soils. Landes soils have less clay in the surface layer than the Parkville soil. They are on the higher ridges. Fults soils are in slight depressions and swales. Also included are areas of soils on short, steep slopes along old channels. Included soils make up 8 to 12 percent of the unit.

Water and air move through the upper part of the Parkville soil at a very slow rate and through the lower part at a moderately rapid rate. Surface runoff is slow. Available water capacity is moderate. The seasonal high water table is at a depth of 1 to 2 feet from November through April in most years. Most layers of the soil are neutral to moderately alkaline and are calcareous. Organic matter content is moderate. The surface soil is firm and can be easily tilled only within a narrow range in moisture content. Clods form if the soil is tilled when it is too wet. Cracks form during dry periods. The potential for frost action is moderate.

Most areas are used for cultivated crops. This soil is well suited to cultivated crops, hay, pasture, and woodland. It generally is unsuited to dwellings and septic tank absorption fields because of the flooding and the wetness.

A drainage system has been installed in the areas used for soybeans, corn, and small grain. Measures that maintain or improve the drainage system are needed. A combination of surface ditches and land leveling reduces the wetness. Tilling when the soil is wet causes surface compaction and decreases the rate of water infiltration. Returning crop residue to the soil, adding other organic material, performing primary tillage in the fall, and minimizing spring tillage increase the infiltration rate and improve tilth. Winter wheat and hay crops are subject to frost heave in some years.

The land capability classification is IIw.

621A—Coulterville silt loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on broad plains and slight rises in the uplands. Individual areas are circular or irregular in shape and range from 5 to 300 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 9 inches thick. The subsurface layer is light brownish gray, friable silt loam about 5 inches thick. The subsoil is about 27 inches thick. It is mottled. The upper part is pale brown, firm silty clay. The next part is brown and light brownish gray, firm silty clay loam. The lower part is grayish brown, friable silty clay loam and silt loam. It has a high content of exchangeable sodium. The substratum to a depth of 60 inches is light gray, mottled silt loam. In a few places the subsoil contains less clay. In some areas the surface layer is darker. In other areas the high content of sodium is in the upper part of the profile.

Included with this soil in mapping are small areas of Marine and Oconee soils. These soils do not have a high content of sodium. They are in landscape positions similar to those of the Coulterville soil. Oconee soils have a surface layer that is darker than that of the Coulterville soil. Included soils make up 7 to 12 percent of the unit.

Water and air move through the Coulterville soil at a very slow rate. Surface runoff is slow. Available water capacity is moderate. The seasonal high water table is at a depth of 1 to 3 feet from February through June of most years. The subsoil is neutral to medium acid in the upper part and mildly alkaline or moderately alkaline in the lower part. Organic matter content is moderately low. Tilth is poor in the surface layer. The high content of sodium in the lower part of the subsoil restricts the availability and uptake of some plant nutrients and causes plant stress during dry periods. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are used for cultivated crops. This soil is well suited to cultivated crops, hay, pasture, and habitat for openland wildlife. It is poorly suited to dwellings and septic tank absorption fields.

A drainage system has been installed in the areas used for corn, soybeans, and small grain. Measures that maintain or improve the drainage system are needed. Surface drains and surface inlet tile function satisfactorily if suitable outlets are available. Land grading helps to control surface water. Applying a conservation tillage system that leaves crop residue on the surface after planting and returning crop residue to the soil improve tilth, help to prevent surface compaction and crusting, and increase the rate of water intake.

The seasonal wetness and the shrink-swell potential are limitations if this soil is used as a site for dwellings. Reinforcing footings and foundations helps to prevent the structural damage caused by shrinking and swelling. Installing subsurface drains around the footings helps to lower the water table. Elevating the floor of dwellings without basements above the surrounding ground level, grading, and diverting surface water also help to overcome the wetness.

The seasonal wetness and the very slow permeability are limitations if this soil is used as a septic tank absorption field. A septic tank system can function satisfactorily if a sealed sand filter and a disinfection tank or an evapotranspiration bed are installed. Sewage lagoons function well on this soil.

On sites for local roads and streets, low strength is a limitation and frost action is a hazard. Strengthening or replacing the base material can help to prevent road damage.

The land capability classification is IIw.

621B2—Coulterville silt loam, 2 to 5 percent slopes, eroded. This gently sloping, somewhat poorly drained soil is on rises, knolls, and side slopes in the uplands. Individual areas are irregular in shape and range from 5 to 350 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 8 inches thick. It has been thinned by erosion. The subsoil is about 25 inches thick. It is mottled. The upper part is brown, firm silty clay. The next part is pale brown and grayish brown, firm silty clay loam. The lower part is grayish brown, friable silt loam. It has a high content of exchangeable sodium. The substratum to a depth of 60 inches is gray, mottled silt loam. In some places the upper part of the subsoil has no mottles. In other places the subsoil contains less clay. In some areas the surface layer is darker.

Included with this soil in mapping are small areas of the poorly drained Huey and somewhat poorly drained Marine and Oconee soils. Huey soils are shallower to a high content of sodium than the Coulterville soil. They are in drainageways below the Coulterville soil. Marine and Oconee soils do not have a high content of sodium. They are in positions on the landscape similar to those of the Coulterville soil. Included soils make up 8 to 12 percent of the unit.

Water and air move through the Coulterville soil at a very slow rate. Surface runoff is medium. Available water capacity is moderate. The seasonal high water table is at a depth of 1 to 3 feet from February through June in most years. The subsoil is neutral to medium acid in the upper part and mildly alkaline or moderately alkaline in the lower part. Organic matter content is low. Tilth is poor in the surface layer. The high content of sodium in the lower part of the subsoil restricts the availability and uptake of some plant nutrients and causes plant stress during dry periods. The potential for frost action is high, and the shrink-swell potential is moderate.

Most areas are used for cultivated crops or for hay and pasture. This soil is well suited to cultivated crops, hay, pasture, and habitat for openland wildlife. It is poorly suited to dwellings and septic tank absorption fields.

A drainage system has been installed in the areas used for corn, soybeans, and small grain. In most years, however, the wetness delays planting. Also, further erosion is a hazard. It can be controlled by a system of conservation tillage that leaves crop residue on the surface after planting and by contour farming or terraces. Tilling when the soil is wet causes surface cloddiness and compaction and excessive runoff and erosion. Returning crop residue to the soil and regularly adding other organic material increase the rate of water infiltration and improve tilth.

Adapted forage and hay plants grow well on this soil. Overgrazing or grazing when the soil is too wet reduces forage yields, causes surface compaction and excessive runoff, and increases the susceptibility to erosion. Proper stocking rates, rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to control erosion.

If this soil is used as a site for dwellings, the seasonal high water table and the shrink-swell potential are limitations. Installing either tile drains near the foundations or interceptor drains on the higher adjacent side slopes helps to lower the water table. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

The seasonal wetness and the very slow permeability are limitations if this soil is used as a septic tank absorption field. A septic tank system can function satisfactorily if a sealed sand filter and a disinfection tank or an evapotranspiration bed are installed. Sewage lagoons function well on this soil.

On sites for local roads and streets, low strength is a limitation and frost action is a hazard. Strengthening or replacing the base material can help to prevent road damage.

The land capability classification is IIe.

621C3—Coulterville silty clay loam, 5 to 10 percent slopes, severely eroded. This sloping, somewhat poorly drained soil is on side slopes adjacent to drainageways in the uplands. In most areas, nearly all of the original surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. Individual areas are long and irregular in shape and range from 5 to 70 acres in size.

Typically, the surface layer is brown, mottled, firm silty clay loam about 4 inches thick. The subsoil is about 34 inches thick. It is mottled. The upper part is brown and grayish brown, firm silty clay loam. The next part is light brownish gray, firm silty clay loam. The lower part is gray, friable silt loam. It has a high content of exchangeable sodium. The substratum to a depth of 60 inches is gray and light brownish gray, mottled silt loam. In some areas the upper part of the subsoil has no mottles. In other areas the subsoil is silt loam throughout. In places the surface layer is darker.

Included with this soil in mapping are small areas of the somewhat poorly drained Blair and Stoy soils and small areas of silty alluvial soils on narrow flood plains. None of the included soils have concentrations of sodium. Blair soils have more sand throughout than the Coulterville soil. Stoy soils have a dense and brittle layer in the lower part of the subsoil. Included soils make up 8 to 12 percent of the unit.

Water and air move through the Coulterville soil at a very slow rate. Surface runoff is rapid. Available water capacity is moderate or low. The seasonal high water table is at a depth of 1 to 3 feet from February through June in most years. The subsoil is mildly alkaline or moderately alkaline. Organic matter content is low. The high content of sodium in the lower part of the subsoil restricts the availability and uptake of some plant nutrients and causes plant stress during dry periods. The surface layer is firm and is sticky when wet and cloddy when dry. The shrink-swell potential is moderate, and the potential for frost action is high.

Most areas are used for hay, pasture, or cultivated crops. This soil is moderately suited to cultivated crops, hay, pasture, and habitat for openland wildlife. It is poorly suited to dwellings and septic tank absorption fields.

Unless the surface is protected, further erosion is a severe hazard in the areas used for soybeans, corn, or small grain. It can be controlled by a system of conservation tillage that leaves crop residue on the surface after planting, by contour farming, and by a crop rotation that is dominated by forage crops. Tilling when the soil is wet causes surface cloddiness and compaction and excessive runoff and erosion. Returning crop residue to the soil and regularly adding other organic material increase the rate of water infiltration and help to maintain tilth.

Establishing pasture plants or hay helps to keep soil loss within tolerable limits. Seedbed preparation is difficult on severely eroded side slopes where the subsoil is exposed. A no-till method of pasture renovation or seeding helps to establish forage species and control further erosion. The plants should not be grazed until they are sufficiently established. Proper stocking rates, rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to prevent surface compaction and excessive runoff.

If this soil is used as a site for dwellings, the seasonal high water table and the shrink-swell potential are limitations. Installing either tile drains near the foundations or interceptor drains on the higher adjacent side slopes helps to lower the water table. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

The seasonal wetness and the very slow permeability are limitations if this soil is used as a septic tank absorption field. A septic tank system can function satisfactorily if a sealed sand filter and a disinfection tank or an evapotranspiration bed are installed. Sewage lagoons can function satisfactorily if the site is leveled.

On sites for local roads and streets, low strength is a limitation and frost action is a hazard. Strengthening or replacing the base material can help to prevent road damage.

The land capability classification is IVe.

690F—Brookside stony silty clay loam, 20 to 30 percent slopes. This steep, moderately well drained soil is on foot slopes in hilly areas. Slopes generally are 50 to 200 feet long. Scattered stones cover as much as 15 percent of the surface. Individual areas are long and irregular in shape and range from 5 to 30 acres in size.

Typically, the surface layer is yellowish brown, friable silty clay loam about 4 inches thick. The subsoil is about 38 inches of brown and grayish brown, mottled, firm silty clay that has common chert pebbles and rock fragments of limestone and siltstone. The substratum to a depth of 60 inches is grayish brown and strong brown, mottled channery silty clay. In some areas the slope is less than 20 percent. In other areas the soil has a lower content of pebbles, stones, and channers.

Included with this soil in the mapping are small areas of the well drained Alford soils. These soils have less clay in the subsoil and substratum than the Brookside soil and have no rock fragments. They are in the higher areas. Also included are small areas of alluvial soils on narrow flood plains and a few rock outcrops on the lower parts of some slopes. Included areas make up 8 to 12 percent of the unit.

Water and air move through the Brookside soil at a moderately slow rate. Surface runoff is rapid. Available water capacity is moderate. The seasonal high water table is at a depth of 2.5 to 4.0 feet from February through June in most years. The subsoil is medium acid to mildly alkaline. Organic matter content is low. Tilth is poor in the surface layer, and the content of stones hinders the use of equipment. The potential for frost action is moderate.

Most areas of this soil are used for pasture or woodland. This soil is well suited to woodland and moderately suited to pasture and to habitat for openland and woodland wildlife. It generally is unsuited to cultivated crops and to dwellings and septic tank absorption fields because of the steep slope and the erosion hazard.

Erosion control is needed when grasses and legumes are becoming established in the pastured areas. In most areas the surface stones must be removed before mowing equipment can be used. A permanent cover of pasture plants helps to control erosion and maintains tilth. Selection of suitable species for planting, proper stocking rates, rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition. In areas where the pasture is established, seeding legumes on the contour improves forage quality and helps to control erosion.

If this soil is used as woodland, the erosion hazard, the equipment limitation, and seedling mortality are management concerns. They are caused by the slope and by the stones on and below the surface. Plant competition also is a management concern. It affects the seedlings of desirable species. The competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Logging roads and skid trails should be established on the contour if possible. On the steeper slopes, the logs or trees should be skidded uphill with a cable and winch. Firebreaks should be the grass type. Bare logging areas should be seeded to grass or to a grass-legume mixture. Machinery should be used only when the soil is firm enough to support the equipment. The seedling mortality rate can be reduced by planting in furrows, by selecting planting stock that is larger than is typical, or by mulching. Some replanting may be needed. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots.

The land capability classification is VIIs.

690G—Brookside bouldery silty clay loam, 30 to 50 percent slopes. This very steep, moderately well drained soil is on side slopes and foot slopes on bluffs along river valleys. Slopes generally are 50 to 800 feet long. Scattered stones and boulders cover as much as 15 percent of the surface. Individual areas are long and narrow or irregular in shape and range from 50 to 400 acres in size.

Typically, the surface layer is very dark gray, firm bouldery silty clay loam about 4 inches thick. The subsoil is about 46 inches of very firm flaggy silty clay, silty clay, and channery silty clay. The upper part is very dark grayish brown and dark yellowish brown, and the lower part is dark brown, grayish brown, and light olive brown and is mottled. The substratum to a depth of 60 inches is light olive brown, mottled channery silty clay. Pebbles, stones, and boulders of limestone and siltstone are throughout the profile. In some places the slope is less than 30 percent. In other places the soil has no stones. In some areas bedrock is within a depth of 60 inches.

Included with this soil in mapping are small areas of rock ledges and bedrock outcrops. In most places a prominent rock ledge is on the upper part of the slope, but in some places the rock ledge is at about mid slope. A few areas have a succession of smaller rock ledges. Included areas make up 9 to 15 percent of the unit.

Water and air move through the Brookside soil at a moderately slow rate. Surface runoff is very rapid. Available water capacity is moderate. The seasonal high water table is at a depth of 2.5 to 4.0 feet from February through June in most years. The subsoil is medium acid to mildly alkaline. Organic matter content is moderate. The potential for frost action also is moderate.

Most areas are used as woodland. This soil is moderately suited to woodland and to habitat for woodland wildlife. It generally is unsuited to cultivated crops, hay, pasture, dwellings, and septic tank absorption fields because of the very steep slope.

If this soil is used as woodland, the erosion hazard, the equipment limitation, and seedling mortality are management concerns. They are caused by the slope and by the stones on and below the surface. Plant competition also is a management concern. It affects the seedlings of desirable species. The competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Logging roads and skid trails should be established on the contour if possible. On the steeper slopes, the logs or trees should be skidded uphill with a cable and winch. Firebreaks should be the grass type. Bare logging areas should be seeded to grass or to a grass-legume mixture. Machinery should be used only when the soil is firm enough to support the equipment. The seedling mortality rate can be reduced by planting in furrows, by selecting planting stock that is larger than is typical, or by mulching. Some replanting may be needed. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots.

The rugged landscape in areas of this soil is esthetically appealing. Carefully planned trails or paths can be constructed for hiking and sightseeing. Control of erosion is essential.

The land capability classification is VIIe.

787A—Banlic silt loam, 0 to 3 percent slopes. This very gently sloping, somewhat poorly drained soil is on low terraces and on slight rises on flood plains. It is subject to rare flooding. Individual areas are oblong or irregular in shape and range from 5 to 50 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The subsurface layer is dark brown and brown, friable silt loam about 10 inches thick. The subsoil is light brownish gray and grayish brown, mottled, firm silt loam about 37 inches thick. It is brittle in the lower part. The substratum to a depth of 60 inches is dark grayish brown, mottled silt loam.

Included with this soil in mapping are small areas of Wakeland soils and the poorly drained Birds soils. Both of the included soils are lower on the flood plains than the Banlic soil and are more frequently flooded. They make up 4 to 12 percent of the unit.

Water and air move through the Banlic soil at a slow rate. Surface runoff also is slow. Available water capacity is moderate. The seasonal high water table is at a depth of 1 to 3 feet from January through June in most years. The subsoil is very strongly acid to medium acid. Organic matter content is low. The surface layer tends to puddle and crust after hard rains. The potential for frost action is high.

Most areas are used for hay or pasture. This soil is well suited to cultivated crops, hay, pasture, woodland, and habitat for openland and woodland wildlife. It generally is unsuited to dwellings and septic tank absorption fields because of the flooding.

A drainage system has been installed in the areas used for corn, soybeans, and small grain. Measures that maintain or improve the drainage system are needed. Surface drains and surface inlet tile function satisfactorily if suitable outlets are available. Applying a conservation tillage system that leaves crop residue on the surface after planting and returning crop residue to the soil improve tilth, help to prevent surface compaction and crusting, and increase the rate of water intake.

Adapted forage and hay plants grow well on this soil. Overgrazing or grazing when the soil is too wet reduces forage yields, causes surface compaction and excessive runoff, and increases the susceptibility to erosion. Proper stocking rates, rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to control erosion.

The land capability classification is IIw.

802B—Orthents, loamy, undulating. These nearly level to sloping, somewhat poorly drained to well drained soils are in cut and filled areas, in borrow areas, on berms, on industrial sites, and in surface-mined areas. The landscape has been modified by construction. Areas where surface mining is active have graded cast overburden derived from a mixture of glacial till and bedrock. Slope ranges from 1 to 5 percent. Individual areas are rectangular, long and narrow, or irregular in shape and range from 5 to 200 acres in size.

Typically, the soils consist of a mixture of silty and loamy material derived from former soil layers or dredged from the rivers. In a representative profile, the surface layer is mixed brown, yellowish brown, and light brownish gray, friable silt loam about 6 inches thick. The substratum to a depth of 60 inches is pale brown and light brownish gray, mottled, firm silty clay loam. Layers of loam, clay loam, and silty clay are in some areas. Layers of fine sandy loam and loamy fine sand are common in areas of dredged material. The thickness and texture of individual soil layers vary greatly both within the profile and across the landscape. In some cut areas the natural subsoil is at the surface.

Included with these soils in mapping are areas where buildings, roads and streets, railroads, parking lots, and stockpiles cover as much as 65 percent of the surface. Also included are some steep sidewalls in cut areas, a few areas that have rock fragments, and small areas that have cinders, bricks, and other debris.

Water and air move through the Orthents at a slow to moderate rate. Surface runoff generally is slow but ranges from ponded to medium. Available water capacity generally is moderate. In most areas the seasonal high water table is at a depth of 2 to 4 feet in late winter and in spring. Individual layers range from strongly acid to mildly alkaline. Organic matter content is low or very low. Commonly, at least one layer is compacted. The compacted layers formed when equipment placed the material. The potential for frost action is high or moderate, and the shrink-swell potential generally is moderate.

Most areas have a cover of grasses and forbs. Many are areas where land use is restricted. These soils generally are suited to cultivated crops, hay, pasture, woodland, camp and picnic areas, habitat for openland and woodland wildlife, and dwellings. They are poorly suited to septic tank absorption fields and to local roads and streets.

In the areas used for corn, soybeans, or small grain, erosion is a hazard unless the surface is protected. Also, the wetness can delay planting in some years. It can be reduced by surface ditches. Erosion can be controlled by a system of conservation tillage that leaves crop residue on the surface after planting, by contour farming, or by terraces. Tilling when the soil is wet causes surface compaction and reduces the rate of water infiltration. Returning crop residue to the soil and regularly adding other organic material increase the infiltration rate and improve tilth.

Onsite investigation is needed to determine the limitations or hazards affecting the use of specific areas for urban development.

These soils are not assigned to a land capability classification.

802E—Orthents, loamy, rolling. These sloping to steep, moderately well drained and well drained soils are on embankments and stockpiles, in borrow areas, and in surface-mined areas. The landscape has been modified by construction. Areas where surface mining is active have cast overburden derived from a mixture of glacial till and bedrock. Slope ranges from 7 to 20 percent. Individual areas are long and narrow or rectangular and range from 30 to 150 acres in size.

A typical area consists of silty or loamy material derived from the upper part of former soils or from the underlying layers of former soils. In a representative profile, the surface layer is dark yellowish brown, friable silt loam about 2 inches thick. The substratum to a depth of 60 inches is dark yellowish brown and dark brown, firm and friable silt loam. Layers of very fine sandy loam, loam, clay loam, or silty clay loam are in some areas. In places there are one or more compacted layers or traffic pans, which formed when equipment placed the material. Gullies have formed in some borrow areas.

Included with these soils in mapping are areas of sandy soils and areas of soils that have clayey layers. Also included are a few areas that have ledges of bedrock; a few areas where roads, railroads, or other structures cover as much as 25 percent of the surface; and some small lakes.

Water and air move through the Orthents at a moderately slow to moderately rapid rate. Surface runoff generally is rapid but is medium in the less sloping areas. Available water capacity is moderate or high. Layers in the substratum are mainly medium acid to neutral but range from strongly acid to mildly alkaline. Organic matter content is low or very low. Generally, the potential for frost action is high or moderate, and the shrink-swell potential is moderate.

Most areas have a cover of grasses and legumes. They generally are fish and wildlife conservation areas or are mining company property. Land use is restricted. These soils are moderately suited to grasses and legumes and to openland and woodland wildlife habitat. They generally are unsuited to cultivated crops, camp and picnic areas, dwellings and septic tank absorption fields, and local roads and streets because of the slope, the erosion hazard, and the shape and size of the mapped areas.

Establishing pasture plants or hay helps to control erosion. Overgrazing causes surface compaction, excessive runoff, and a greater susceptibility to erosion. Proper stocking rates and timely deferment of grazing help to prevent overgrazing. Applications of fertilizer are needed. The plants should not be grazed or clipped until they are sufficiently established. Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to keep the pasture in good condition and helps to control erosion.

Trees and shrubs can be easily established on these soils. The existing stands of trees provide good habitat for woodland wildlife. The soils can be used for the grain and seed crops and grasses and legumes grown as food and cover for openland wildlife. Examples of suitable grasses and legumes are bromegrass, orchardgrass, ladino clover, alsike clover, and red clover. Protection from fire and grazing helps to prevent the depletion of the shrubs and sprouts that provide food for wildlife.

These soils are not assigned to a land capability classification.

807—Aquents-Orthents complex. These soils are on flood plains along the Mississippi River. They are in areas of a levee system built for flood control. The landscape has been modified by construction. The soils consist of loamy to clayey layers of former soils or material taken from former soils. The depressional, very poorly drained Aquents are in borrow areas. They are flooded or ponded for long periods. The sloping to steep, well drained Orthents are on the crest, side slopes, and aprons of the levees. Individual areas are long and narrow and range from 100 to 250 acres in size. They are about 45 to 65 percent Aquents and 35 to 55 percent Orthents.

Typically, the surface layer of the Aquents is very dark grayish brown, firm silty clay loam about 10 inches thick. The substratum to a depth of 60 inches occurs as layers of grayish brown and dark grayish brown, mottled, very firm to friable silty clay, silty clay loam, silt loam, and fine sandy loam. Some areas are intermittently covered by water.

Typically, the surface layer of the Orthents is very dark grayish brown silty clay loam about 5 inches thick. The substratum to a depth of 60 inches occurs as dark brown, black, and yellowish brown layers of clay loam, silty clay loam, silty clay, and loam. In places roads are on top of the levee.

Water and air move through both soils at a slow to moderate rate. Surface runoff is ponded on the Aquents and medium or rapid on the Orthents. Available water capacity is moderate or high in both soils. The Aquents have a seasonal high water table 0.5 foot above the surface to 1.0 foot below for extended periods in most years. Reaction ranges from medium acid to mildly alkaline in both soils. Organic matter content generally is moderate. The shrink-swell potential and the potential for frost action are moderate or high. The Orthents are subject to slumping during wet periods.

Most areas of the Aquents have stands of cottonwoods or support recently established willows and cattails. The Orthents have a cover of grasses and legumes. Both soils are within a drainage district, and land use is restricted. The Aquents generally are unsuited to cultivated crops and to pasture because of the flooding and the ponding. They are moderately suited to water-tolerant trees and are well suited to habitat for wetland wildlife. The Orthents generally are unsuited to cultivated crops because of the slope. They are moderately suited to hay or pasture.

Many areas of the Aquents provide habitat for wetland wildlife, and the Orthents provide habitat for openland wildlife. Some shallow water areas are available, and others could be developed. The nearby soils on the higher parts of the landscape could be used for grain and seed crops. Measures that protect the habitat from fire and grazing are essential.

These soils are not assigned to a land capability classification.

821C—Morristown stony silt loam, 4 to 12 percent slopes. This sloping, well drained soil is in areas on uplands that formerly were surface mined. The landscape is gently rolling. It has been graded. Stones cover as much as 15 percent of the surface. Slopes generally are 200 to 400 feet long. Individual areas are rectangular or irregular in shape and range from 25 to 200 acres in size.

Typically, the surface layer is mixed very dark gray, dark gray, and yellowish brown, friable silt loam about 4 inches thick. The substratum to a depth of 60 inches occurs as layers of mine spoil. It is mixed yellowish brown, gray, light gray, olive brown, and dark gray, friable very channery and channery silt loam and firm very channery and channery silty clay loam. Pieces of carbolithic material are common in the soil. In a few areas the slope is less than 4 percent.

Included with this soil in mapping are small areas of the less stony Lenzburg soils, areas that have been compacted by heavy equipment, and pockets of extremely acid soil. Also included, adjacent to incline slopes, are some areas where the slope is more than 12 percent. Included soils make up 8 to 11 percent of the unit.

Water and air move through the Morristown soil at a moderately slow rate. Surface runoff is medium. Available water capacity is low. Organic matter content is very low. The soil ranges from neutral to moderately alkaline and is calcareous. The potential for frost action and the shrink-swell potential are moderate.

Most areas have been planted to grasses and legumes or to trees. Because of the stoniness, this soil generally is unsuited to cultivated crops. It is poorly suited to hay and pasture, woodland, wildlife habitat, and septic tank absorption fields. It is moderately suited to dwellings.

Establishing pasture plants or hay helps to control erosion. The stoniness hinders mowing and haying. Overgrazing causes surface compaction, excessive runoff, and a greater susceptibility to erosion. Proper stocking rates and timely deferment of grazing help to prevent overgrazing. Applications of fertilizer are needed. The plants should not be grazed or clipped until they are sufficiently established. Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to keep the pasture in good condition and helps to control erosion.

If this soil is used as a site for dwellings, the shrink-swell potential is a limitation. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

The moderately slow permeability and the slope are limitations if this soil is used as a site for septic tank absorption fields. Increasing the size of the absorption field or replacing the soil with more permeable material helps to overcome the moderately slow permeability. Installing the filter lines on the contour or cutting and land shaping help to overcome the slope.

On sites for local roads and streets, the shrink-swell potential is a limitation and frost action is a hazard. Strengthening or replacing the base material helps to prevent road damage.

The land capability classification is VIs.

821F—Morristown very stony silty clay loam, 18 to 35 percent slopes. This steep, well drained soil is on the side slopes and crests of spoil banks in upland areas that formerly were surface mined. The landscape is hilly. Many stones and scattered boulders cover as much as 25 percent of the surface. The side slopes generally are 15 to 30 feet long. Individual areas are rectangular or irregular in shape and range from 80 to 150 acres in size.

Typically, the surface layer is very dark grayish brown, friable very stony silty clay loam about 3 inches thick. The upper part of the substratum occurs as layers of mixed pale brown, very pale brown, strong brown, and brown, friable and firm very channery silt loam and firm very channery silty clay loam. The lower part to a depth of 60 inches is multicolored, firm very channery silty clay. Flagstones and stones of limestone and pieces of carbolithic material are common throughout the profile. In places the soil has a much lower content of stones.

Included with this soil in the mapping are small areas of abandoned haul roads. Included areas make up 3 to 8 percent of the unit.

Water and air move through the Morristown soil at a moderately slow rate. Surface runoff generally is rapid. Available water capacity is low. The soil is mildly alkaline or moderately alkaline and is calcareous. Organic matter content is very low. The potential for frost action is moderate.

Most areas have been seeded to grasses and legumes and are used as pasture. This soil is poorly suited to hay, pasture, woodland, and wildlife habitat. It generally is unsuited to cultivated crops and to dwellings and septic tank absorption fields because of the stoniness and the steep slope. Some areas are suitable as sites for paths and trails.

If this soil is used for pasture, erosion is the major hazard. The stoniness and the steep slope generally prohibit the use of machinery. Therefore, the only suitable method of seeding, applying fertilizer, and spraying is by airplane or by hand. Some kind of ground cover is essential to control erosion. Proper stocking rates, timely deferment of grazing, applications of fertilizer, and rotation grazing help to keep the pasture in good condition and help to control erosion.

The land capability classification is VIIe.

823B—Schuline silt loam, 1 to 5 percent slopes. This gently sloping, moderately well drained soil is in areas on uplands that formerly were surface mined. It has been excavated, reclaimed, and graded. Premined topsoil material has generally been returned to the surface. Slopes generally are 200 to 500 feet long. Individual areas are rectangular or irregular in shape and range from 30 to 260 acres in size.

Typically, the surface layer is mixed yellowish brown and strong brown, friable silt loam about 3 inches thick. Below this is mixed dark yellowish brown, grayish brown, strong brown, and light gray, firm clay loam about 10 inches thick. The substratum to a depth of 60 inches is multicolored, friable loam and firm clay loam. Pebbles generally are throughout the soil. In some places the soil has layers or pockets of loam or fine sandy loam. In other places clayey layers are below a depth of 40 inches. In many areas the movement of heavy equipment across the soil during placement of the material has resulted in one or more compacted layers or traffic pans. In some areas the substratum is silty.

Included with this soil in mapping are small areas of the more stony Lenzburg soils. Also included are areas of soils that have strongly acid layers and a few depressional areas that are subject to ponding. Included soils make up 8 to 12 percent of the unit.

Water and air move through the Schuline soil at a slow rate. Available water capacity is moderate or high. Surface runoff is slow. The soil is mainly calcareous and mildly alkaline or moderately alkaline, but some layers range to medium acid. Organic matter content is low or moderately low. In places the surface layer lacks natural soil aggregates and a crust forms after hard rains. The shrink-swell potential and the potential for frost action are moderate.

Most areas were seeded to grasses and legumes for several years after reclamation and now are used for cultivated crops. This soil is well suited to cultivated crops, pasture, hay, and habitat for openland and woodland wildlife. It is moderately suited to dwellings and poorly suited to septic tank absorption fields. Time for settling is needed before reclaimed soils can be used as sites for agronomic or urban structures, such as terraces and dwellings.

In the areas used for corn, soybeans, or small grain, erosion is a hazard and tilth is a limitation. A conservation tillage system that leaves crop residue on the surface after planting, contour farming, and terraces help to control erosion. Because of soil settling, some reshaping of slopes may be needed to achieve a uniform rate of surface runoff. Incorporation of crop residue into the soil or additions of other organic material help to prevent crusting and improve tilth. A crop rotation that includes a deep-rooted legume improves tilth and helps to prevent surface compaction. Also, it aids in the formation of soil aggregates and increases porosity in areas where the soil has compacted layers.

Adapted forage and hay plants grow well on this soil. Timely deferment of grazing helps to prevent overgrazing and thus also helps to prevent surface compaction, excessive runoff, and a greater susceptibility to erosion. Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion. Applications of fertilizer are needed. The plants should not be grazed or clipped until they are sufficiently established.

If this soil is used as a site for dwellings, the shrink-swell potential is a limitation. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

The slow permeability is a limitation if this soil is used as a site for septic tank absorption fields. A septic tank system can function satisfactorily if a sealed sand filter and a disinfection tank or an evapotranspiration bed are installed.

Low strength is a limitation on sites for local roads and streets. Strengthening or replacing the base material helps to prevent road damage.

The land capability classification is IIe.

823C—Schuline silt loam, 5 to 12 percent slopes. This sloping, moderately well drained soil is in areas on uplands that formerly were surface mined. It has been excavated, reclaimed, and graded. Premined topsoil material has generally been returned to the surface. Slopes generally are 100 to 200 feet long. Individual areas are rectangular or irregular in shape and range from 20 to 50 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 4 inches thick. Below this is strong brown, firm silty clay loam about 4 inches thick. The substratum to a depth of 60 inches is mixed strong brown, yellowish brown, and light brownish gray, firm clay loam and silty clay loam. Pebbles and a few small rock fragments are common throughout the profile. In some places the soil has layers or pockets of loam or sandy loam. In other places clayey layers are below a depth of 40 inches. In some areas the movement of heavy equipment across the soil during placement of the material has resulted in one or more compacted layers or traffic pans. In other areas the substratum is silty.

Included with this soil in mapping are small areas of Lenzburg soils. These soils have more pebbles, stones, and rock fragments throughout than the Schuline soil. They are mainly on the lower slopes. Also included are areas of soils that have strongly acid layers and a few depressional areas that are subject to ponding. Included soils make up 4 to 8 percent of the unit.

Water and air move through the Schuline soil at a slow rate. Available water capacity is moderate or high. Surface runoff is medium. The soil is dominantly calcareous and mildly alkaline or moderately alkaline, but some layers range to medium acid. Organic matter content is low or moderately low. In places the surface soil lacks natural soil aggregates and tends to puddle and crust after hard rains. The shrink-swell potential and the potential for frost action are moderate.

Most areas were seeded to grasses and legumes after reclamation and now are used for hay. This soil is well suited to hay and pasture and to habitat for openland and woodland wildlife. It is moderately suited to cultivated crops and to dwellings. It is poorly suited to septic tank absorption fields. Time for settling is needed before reclaimed soils can be used as sites for agronomic or urban structures, such as terraces and dwellings.

If this soil is used for corn, soybeans, or small grain, erosion is a hazard and tilth is a limitation. Soil loss can be kept within tolerable limits by a crop rotation that includes 1 or more years of forage crops, by a conservation tillage system that leaves crop residue on the surface after planting, by contour farming, by terraces, or by a combination of these. Some reshaping of slopes may be needed to achieve a uniform rate of surface runoff. In areas where the soil has compacted layers, growing deep-rooted legumes aids in the formation of soil aggregates and increases porosity. Returning crop residue to the soil and regularly adding other organic material help to maintain productivity, prevent crusting, and improve tilth.

Adapted forage and hay plants grow well on this soil. Timely deferment of grazing helps to prevent overgrazing and thus also helps to prevent surface compaction, excessive runoff, and a greater susceptibility to erosion. Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion. Applications of fertilizer are needed. The plants should not be grazed or clipped until they are sufficiently established.

If this soil is used as a site for dwellings, the slope is a limitation. Cutting, filling, and land shaping help to overcome this limitation. On sites for dwellings without basements, the shrink-swell potential is a limitation. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

The slow permeability and the slope are limitations if this soil is used as a site for septic tank absorption fields. A septic tank system can function satisfactorily if a sealed sand filter and a disinfection tank or an evapotranspiration bed are installed and the site is leveled.

Low strength is a limitation on sites for local roads and streets. Strengthening or replacing the base material helps to prevent road damage.

The land capability classification is IIIe.

824A—Swanwick silt loam, 0 to 3 percent slopes. This nearly level, moderately well drained soil is in formerly mined areas on uplands. It has been excavated, reclaimed, and graded. Premined topsoil material has been returned to the surface. Slopes generally are 200 to 400 feet long. Individual areas are mainly rectangular and range from 45 to 200 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 9 inches thick. Below this is multicolored, firm silty clay loam about 3 inches thick. The substratum to a depth of 60 inches is multicolored, friable to very firm silty clay loam. A few sand grains and pebbles are common throughout the profile. The movement of heavy equipment across the soil during placement of the material has resulted in one or more dense, compacted layers or in a traffic pan. In some areas the substratum has a higher content of sand.

Included with this soil in mapping are small areas of soils in depressions that are ponded for brief periods. Also included are soils that have clayey or gravelly layers. Included soils make up about 10 to 15 percent of the unit.

Water and air move through the Swanwick soil at a very slow rate. Surface runoff generally is slow. Available water capacity is high or moderate. The seasonal high water table is at a depth of 4 to 6 feet from February through April in most years. The soil is mainly medium acid to neutral, but individual layers range from strongly acid to mildly alkaline. Organic matter content is low to moderate. The surface layer lacks natural soil aggregates and tends to puddle and crust after hard rains. The shrink-swell potential is low, and the potential for frost action is high.

Most areas were seeded to grasses and legumes for several years after reclamation and now are used for cultivated crops. This soil is well suited to cultivated crops, hay, pasture, and habitat for openland and woodland wildlife. It is moderately suited to dwellings and poorly suited to septic tank absorption fields. Time for settling is needed before reclaimed soils can be used as sites for agronomic or urban structures, such as terraces and dwellings.

In the areas used for soybeans, corn, or small grain, some reshaping of slopes may be needed. Surface ditches and subsurface drains help to remove excess water. Erosion is a hazard in areas where slopes are very long. It can be controlled, however, by a system of conservation tillage that leaves crop residue on the surface after planting. Tilling when the soil is wet causes surface compaction, reduces the rate of water infiltration, and causes excessive runoff. Returning crop residue to the soil and regularly adding other organic material increase the infiltration rate and improve tilth.

Adapted forage and hay plants grow well on this soil. Overgrazing or grazing when the soil is too wet reduces forage yields, causes surface compaction and excessive runoff, and increases the susceptibility to erosion. Proper stocking rates, rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to control erosion.

If this soil is used as a site for dwellings, the seasonal high water table is a limitation. Installing subsurface tile drains near the foundation helps to overcome this limitation.

The seasonal wetness and the very slow permeability are limitations if this soil is used as a septic tank absorption field. A septic tank system can function satisfactorily if a sealed sand filter and a disinfection tank or an evapotranspiration bed are installed. Sewage lagoons function well on this soil.

On sites for local roads and streets, low strength is a limitation and frost action is a hazard. Strengthening or replacing the base material helps to prevent road damage.

The land capability classification is IIs.

824C—Swanwick silt loam, 3 to 10 percent slopes. This sloping, moderately well drained soil is in formerly mined areas on uplands. It has been excavated, reclaimed, and graded. Premined topsoil material has been returned to the surface. Individual areas are mainly rectangular and range from 15 to about 65 acres in size.

Typically, the surface layer is brown, friable silt loam about 7 inches thick. Below this is grayish brown, friable silt loam about 10 inches thick. The substratum to a depth of 60 inches is mixed brown, yellowish brown, and light brownish gray, firm silty clay loam. Sand grains and pebbles are common throughout the soil. The movement of heavy equipment across the soil during placement of the material has resulted in one or more dense, compacted layers or in a traffic pan. In some areas the substratum has a higher content of sand.

Included with this soil in mapping are small areas of soils that have clayey or gravelly layers. These soils make up 5 to 10 percent of the unit.

Water and air move through the Swanwick soil at a very slow rate. Surface runoff is medium. Available water capacity is high or moderate. The seasonal high water table is at a depth of 4 to 6 feet from February through April in most years. The soil is mainly medium acid to neutral, but individual layers range from strongly acid to mildly alkaline. Organic matter content is low to moderate. The surface layer lacks natural soil aggregates and tends to puddle and crust after hard rains. The shrink-swell potential is low, and the potential for frost action is high.

Most areas are used for hay and pasture or for cultivated crops. This soil is moderately suited to cultivated crops and well suited to hay and pasture and to habitat for woodland and openland wildlife. It is moderately suited to dwellings and poorly suited to septic tank absorption fields. Time for settling is needed before reclaimed soils can be used as sites for agronomic or urban structures, such as terraces and dwellings.

If this soil is used for corn, soybeans, or small grain, erosion is a hazard and tilth is a limitation. Soil loss can be kept within tolerable limits by a crop rotation that includes 1 or more years of forage crops, by a conservation tillage system that leaves crop residue on the surface after planting, by contour farming, by terraces, or by a combination of these. Some reshaping of slopes may be needed to achieve a uniform rate of surface runoff. In areas where the soil has compacted layers, growing deep-rooted legumes aids in the formation of soil aggregates and increases porosity. Returning crop residue to the soil and regularly adding other organic material help to maintain productivity, prevent crusting, and improve tilth.

Adapted forage and hay plants grow well on this soil. Timely deferment of grazing helps to prevent overgrazing and thus also helps to prevent surface compaction, excessive runoff, and a greater susceptibility to erosion. Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion. Applications of fertilizer are needed. The plants should not be grazed or clipped until they are sufficiently established.

If this soil is used as a site for dwellings, the seasonal high water table is a limitation. Installing subsurface tile drains near the foundation helps to overcome this limitation.

The seasonal wetness and the very slow permeability are limitations if this soil is used as a septic tank absorption field. A septic tank system can function satisfactorily if a sealed sand filter and a disinfection tank or an evapotranspiration bed are installed.

On sites for local roads and streets, low strength is a limitation and frost action is a hazard. Strengthening or replacing the base material helps to prevent road damage.

The land capability classification is IIIe.

825B—Lenzburg silt loam, acid substratum, 2 to 5 percent slopes. This gently sloping, moderately well drained soil overlies acid refuse from coal preparation plants. It is either over former slurry pits or over box cuts that have been filled with acid refuse. Individual areas are rectangular or long and narrow and range from 15 to 90 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 5 inches thick. The next 46 inches is mixed brown, strong brown, and dark grayish brown, friable silt loam and very firm silty clay loam. Pebbles and small rock fragments are common. The substratum to a depth of 60 inches is black, extremely acid, very firm very shaly loam. In places the underlying acid refuse is nearer to the surface.

Included with this soil in mapping are small areas of stony soils and a few depressional areas that are subject to ponding. Included soils make up 5 to 9 percent of the unit.

Water and air move through the Lenzburg soil at a slow or moderately slow rate. Surface runoff is slow. Available water capacity is moderate. Organic matter content is low. The upper soil layers range from strongly acid to mildly alkaline. The buried refuse layer is extremely acid. The shrink-swell potential and the potential for frost action are moderate.

Most areas have a cover of grasses and legumes. In places this soil is within active mining areas, where land use is restricted. The soil is well suited to hay and pasture and is suited to cultivated crops, woodland, habitat for openland and woodland wildlife, camp and picnic areas, and dwellings.

In the areas used for corn, soybeans, or small grain, erosion is a hazard and stoniness is a limitation. Erosion can be controlled by a conservation tillage system that leaves crop residue on the surface after planting, by contour farming, or by terraces. The larger stones in the surface layer can be removed by a stone picker. The soil can be tilled by a field cultivator or similar equipment. Some reshaping of slopes may be needed to achieve a uniform rate of surface runoff. In areas where the soil has compacted layers, growing deep-rooted legumes aids in the formation of soil aggregates and increases porosity. Returning crop residue to the soil and adding other organic material improve tilth.

Adapted forage and hay plants grow well on this soil. Removal of surface stones may be needed. Timely deferment of grazing helps to prevent overgrazing and thus also helps to prevent surface compaction, excessive runoff, and a greater susceptibility to erosion. Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion. Applications of fertilizer are needed. The plants should not be grazed or clipped until they are sufficiently established.

If this soil is used as a site for dwellings, the shrink-swell potential is a limitation. Reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling. Subsidence can be expected if a dwelling is built over a former slurry pit. A floating foundation may be needed.

The restricted permeability is a limitation if this soil is used as a septic tank absorption field. A septic tank system can function satisfactorily if a sealed sand filter and a disinfection tank or an evapotranspiration bed are installed.

Low strength is a limitation on sites for local roads and streets. Strengthening or replacing the base material helps to prevent road damage.

The land capability classification is IIe.

825D—Lenzburg silt loam, acid substratum, 7 to 20 percent slopes. This strongly sloping, moderately well drained soil is on the crest and side slopes of mounds that overlie acid refuse from coal preparation plants. Individual areas are circular and range from about 15 to 80 acres in size.

Typically, the surface layer is dark brown, firm silt loam about 11 inches thick. The next 32 inches is mixed brown, grayish brown, and dark brown, firm silty clay loam and silt loam. The substratum to a depth of 60 inches is black, extremely acid very shaly loam.

Included with this soil in mapping are small areas of scattered stones and debris. Included areas make up 3 to 8 percent of the unit.

Water and air move through the Lenzburg soil at a slow or moderately slow rate. Surface runoff is medium on the crest of the mounds and rapid on the side slopes. Available water capacity is moderate. Organic matter content is low. The soil is strongly acid to neutral in the upper part and extremely acid below a depth of about 43 inches. The shrink-swell potential and the potential for frost action are moderate.

Many areas have a cover of grasses and legumes, but this soil generally is within active mining areas, where land use is restricted. This soil is suited to meadow crops, woodland, and habitat for openland and woodland wildlife. It generally is unsuited to cultivated crops, to camp and picnic areas, and to dwellings and septic tank absorption fields because of the possible exposure of the acid mine refuse and the erosion hazard.

In areas that are to be reclaimed, a cover of soil material is placed over the mine refuse. This soil material can be a growing medium for plant roots. Liming and scorifying the surface layer of the refuse before placement of the soil material can help to prevent slippage along the contact plane. These practices also improve water percolation and root penetration into the refuse. Grading or bench terraces are needed on the steeper slopes. Seedlings should be planted on the contour and in a cover crop or mulch. Netting commonly is needed in the more sloping areas to hold the mulch and seedlings in place until the stand becomes established. On the longer slopes, terraces help to control runoff and grassed waterways or underground outlets help to convey water downslope at a nonerosive velocity. During terrace construction, particular care is needed to maintain several feet of soil over the refuse. Where seepage is a hazard, a holding basin to catch the acid leachate and additions of a sufficient amount of lime for neutralization help to prevent pollution of nearby streams.

Stands of grasses and legumes or of trees and shrubs are essential because they protect the soil and the watershed. Eroding areas should be reseeded or sodded. Establishing paths or bike trails can result in the formation of rills or gullies.

The land capability classification is IVe.

851E—Alford-Ursa silt loams, 18 to 30 percent slopes. These steep, well drained soils are on side slopes in hilly areas. The Alford soil is on the upper and middle parts of the slopes, and the Ursa soil is on the lower part. Slopes generally are 80 to 400 feet long. Individual areas are long and irregular in shape and range from 10 to 150 acres in size. They are about 45 to 60 percent Alford soil and 25 to 40 percent Ursa soil.

Typically, the Alford soil has a surface layer of dark brown, friable silt loam about 6 inches thick. The subsoil extends below a depth of 60 inches. It is strong brown and firm. The upper part is silty clay loam, and the lower part is silt loam. In some areas the lower part of the subsoil is dense and brittle.

Typically, the Ursa soil has a surface layer of very dark grayish brown, friable silt loam about 4 inches thick. The subsurface layer is grayish brown, friable loam about 2 inches thick. The subsoil extends below a depth of 60 inches. The upper part is strong brown, firm clay loam; the next part is brown and yellowish brown, mottled, very firm silty clay; and the lower part is yellowish brown, mottled, firm silty clay loam. Sand grains and pebbles are common throughout the profile. In places the subsoil has a lower content of clay.

Included with these soils in mapping are small areas of alluvial soils along drainageways and small streams and areas of stony soils on the lower part of some slopes. Included soils make up 8 to 15 percent of the unit.

Water and air move through the Alford soil at a moderate rate and through the Ursa soil at a slow rate. Surface runoff is rapid on both soils. Available water capacity is high in the Alford soil and moderate in the Ursa soil. The subsoil of Alford soil and the upper part of the Ursa soil are medium acid to very strongly acid. The lower part of the Ursa soil is medium acid to mildly alkaline. Natural fertility is medium in both soils. Organic matter content is moderately low. The potential for frost action is high in the Alford soil and moderate in the Ursa soil.

Most areas are used as pasture or woodland. These soils are moderately suited to pasture, to habitat for openland wildlife, and to woodland. They are well suited to woodland wildlife habitat. They are generally unsuited to cultivated crops and to dwellings and septic tank absorption fields because of the steep slope and the erosion hazard.

Establishing pasture plants or hay helps to control erosion. Overgrazing causes surface compaction, excessive runoff, and a greater susceptibility to erosion. Proper stocking rates and timely deferment of grazing help to prevent overgrazing. Applications of fertilizer are needed. The plants should not be grazed or clipped until they are sufficiently established. Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to keep the pasture in good condition and helps to control erosion.

If these soils are used as woodland, the erosion hazard and the equipment limitation are management concerns. They are caused by the slope. Seedling mortality on the Ursa soil and plant competition on the Alford soil also are management concerns. They affect the seedlings of desirable species. Machinery should be used only when the soils are firm enough to support the equipment. The seedling mortality rate can be reduced by planting in furrows, by selecting planting stock that is larger than is typical, or by mulching. Some replanting may be needed. Plant competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Logging roads and skid trails should be established on the contour if possible. On the steeper slopes, the logs or trees should be skidded uphill with a cable and winch. Firebreaks should be the grass type. Bare logging areas should be seeded to grass or to a grass-legume mixture. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soils, and damage to tree roots.

These soils are suitable for grain and seed crops, for wild herbaceous plants, and for hardwood trees, which are needed in areas of woodland wildlife habitat. Food plots of grain or seed crops should be established only in the less sloping areas. Also, the crops should be planted on the contour. Measures that protect the habitat from fire and grazing help to prevent depletion of the shrubs and sprouts that provide food for wildlife.

The land capability classification is VIe.

851E3—Alford-Ursa silty clay loams, 18 to 30 percent slopes, severely eroded. These steep, well drained soils are on side slopes in hilly areas. The Alford soil is on the upper part of the slopes, and the Ursa soil is on the lower part. Slopes generally are long, and gullies have formed in places. In most areas erosion has removed most of the surface layer and has exposed the subsoil. Individual areas are long and irregular in shape and range from 10 to 60 acres in size. They are about 40 to 60 percent Alford soil and 30 to 50 percent Ursa soil.

Typically, the surface layer of the Alford soil is dark brown, firm silty clay loam about 3 inches thick. The subsoil is about 37 inches thick. It is strong brown and firm. The upper part is silty clay loam, and the lower part is silt loam. The substratum to a depth of 60 inches is yellowish brown silt loam. In some areas the lower part of the subsoil is dense and brittle.

Typically, the surface layer of the Ursa soil is brown, firm silty clay loam about 6 inches thick. The subsoil extends below a depth of 60 inches. It is brown and strong brown and is mottled. The upper part is firm and very firm silty clay loam, and the lower part is firm and friable clay loam. Sand grains and pebbles are common throughout the profile. In some areas the subsoil has a lower content of clay.

Included with these soils in mapping are small areas of alluvial soils along drainageways and small streams and areas of stony soils on the lower part of some slopes. Included soils make up 8 to 12 percent of the unit.

Water and air move through the Alford soil at a moderate rate and through the Ursa soil at a slow rate. Surface runoff is rapid on both soils. Available water capacity is high in the Alford soil and moderate in the Ursa soil. The subsoil of the Alford soil and the upper part of the Ursa soil are medium acid to very strongly acid. The lower part of the Ursa soil is medium acid to mildly alkaline. Natural fertility is medium in both soils. Organic matter content is low. The potential for frost action is high in the Alford soil and moderate in the Ursa soil.

Most areas are used as pasture or woodland. These soils are moderately suited to pasture, to habitat for openland wildlife, and to woodland. They are well suited to habitat for woodland wildlife. They are generally unsuited to cultivated crops, hay, dwellings, and septic tank absorption fields because of the steep slope and the erosion hazard.

Establishing pasture plants or hay helps to keep erosion within tolerable limits. Establishing a forage crop is difficult, however, on severely eroded slopes where the subsoil is exposed. A no-till method of seeding and contour seeding help to control further erosion. The plants should not be grazed or clipped until they are sufficiently established. Proper stocking rates, rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and prevent surface compaction and excessive runoff.

If these soils are used as woodland, the erosion hazard and the equipment limitation are management concerns. They are caused by the slope. Seedling mortality on the Ursa soil and plant competition on the Alford soil also are management concerns. They affect the seedlings of desirable species. Machinery should be used only when the soils are firm enough to support the equipment. The seedling mortality rate can be reduced by planting in furrows, by selecting planting stock that is larger than is typical, or by mulching. Some replanting may be needed. Plant competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Logging roads and skid trails should be established on the contour if possible. On the steeper slopes, the logs or trees should be skidded uphill with a cable and winch. Firebreaks should be the grass type. Bare logging areas should be seeded to grass or to a grass-legume mixture. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soils, and damage to tree roots.

These soils are suitable for grain and seed crops, for wild herbaceous plants, and for hardwood trees, which are needed in areas of woodland wildlife habitat. Food plots of grain or seed crops should be established only in the less sloping areas. Also, the crops should be planted on the contour. Measures that protect the habitat from fire and grazing help to prevent depletion of the shrubs and sprouts that provide food for wildlife.

The land capability classification is VIe.

851G—Ursa-Alford silt loams, 30 to 50 percent slopes. These well drained, very steep soils are on side slopes in hilly areas. The Ursa soil is on the lower and middle parts of the slopes, and the Alford soil is on the upper part. Slopes generally are 80 to 350 feet long. Individual areas are long and irregular in shape and range from 10 to 100 acres in size. They are about 40 to 60 percent Ursa soil and 25 to 40 percent Alford soil.

Typically, the surface layer of Ursa soil is very dark grayish brown, friable silt loam about 4 inches thick. The subsurface layer is brown and yellowish brown, firm silt loam about 6 inches thick. The subsoil is about 38 inches thick. The upper part is strong brown and dark yellowish brown, very firm clay; the next part is yellowish brown and pale brown, firm silty clay loam; and the lower part is yellowish brown and pale brown, firm clay loam. The substratum to a depth of 60 inches is dark brown and light brownish gray, mottled clay loam. In some areas the subsoil has a lower content of clay. In severely eroded areas, it is exposed.

Typically, the surface layer of Alford soil is dark brown, friable silt loam about 6 inches thick. The subsurface layer is brown and dark grayish brown, friable silt loam about 5 inches thick. The subsoil is about 35 inches of yellowish brown, friable silt loam and silty clay loam. The substratum to a depth of 60 inches is yellowish brown silt loam. In places the subsoil is silt loam throughout. In severely eroded areas, it is exposed.

Included with these soils in mapping are small areas of Brookside soils and rock outcrops on the lower part of some slopes and along drainageways. Brookside soils formed in material weathered from bedrock and have a clayey subsoil. Included areas make up 10 to 15 percent of the unit.

Water and air move through the Ursa soil at a slow rate and through the Alford soil at a moderate rate. Surface runoff is rapid on both soils. Available water capacity is moderate in the Ursa soil and high in the Alford soil. The upper part of the Ursa soil and the subsoil of the Alford soil are medium acid to very strongly acid. The lower part of the Ursa soil is medium acid to mildly alkaline. Natural fertility is medium in both soils. Organic matter content is moderately low. The potential for frost action is moderate in the Ursa soil and high in the Alford soil.

Most areas are used as woodland. These soils are moderately suited to woodland and to habitat for woodland wildlife. They are generally unsuited to cultivated crops, pasture, dwellings, and septic tank absorption fields because of the very steep slope and a severe erosion hazard.

If these soils are used as woodland, the erosion hazard and the equipment limitation are management concerns. They are caused by the slope. Seedling mortality on the Ursa soil and plant competition on the Alford soil also are management concerns. They affect the seedlings of desirable species. Machinery should be used only when the soils are firm enough to support the equipment. The seedling mortality rate can be reduced by planting in furrows, by selecting planting stock that is larger than is typical, or by mulching. Some replanting may be needed. Plant competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Logging roads and skid trails should be established on the contour if possible. On the steeper slopes, the logs or trees should be skidded uphill with a cable and winch. Firebreaks should be the grass type. Bare logging areas should be seeded to grass or to a grass-legume mixture. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soils, and damage to tree roots.

Generally, these wooded slopes have a significant range in elevation. This rugged landscape is appealing. Carefully planned trails or paths can be constructed for hiking and sightseeing. Control of erosion is essential.

The land capability classification is VIIe.

852F—Alford-Wellston silt loams, 18 to 35 percent slopes. These steep, well drained soils are on long hillsides in the uplands. The Alford soil is on the upper part of side slopes and on ridges between drainageways. The Wellston soil is on the lower part of the slopes and in a few areas along rock ledges. Individual areas are circular or irregular in shape and range from 15 to 300 acres in size. They are about 45 to 65 percent Alford soil and 20 to 40 percent Wellston soil.

Typically, the surface layer of Alford soil is dark brown, friable silt loam about 8 inches thick. The subsurface layer is dark yellowish brown, friable silt loam about 4 inches thick. The subsoil extends below a depth of 60 inches. The upper part is dark yellowish brown, friable silt loam; the next part is strong brown, firm silty clay loam; and the lower part is strong brown, friable silt loam. In some places the slope is less than 18 percent. In other places the lower part of the subsoil is dense and brittle. In some areas the subsoil has a higher content of sand.

Typically, the surface layer of Wellston soil is dark brown and dark yellowish brown, very friable silt loam about 9 inches thick. The subsurface layer is yellowish brown, friable silt loam about 4 inches thick. The subsoil is about 31 inches thick. The upper part is brown, friable silt loam; the next part is strong brown, firm silty clay loam; and the lower part is yellowish brown, firm channery silt loam. The substratum is brown very channery loam about 2 inches thick. Fractured sandstone and siltstone bedrock is at a depth of about 46 inches. In some places small rock fragments are throughout the subsoil. In other places the depth to bedrock is more than 60 inches.

Included with these soils in mapping are small areas of rock ledges or escarpments and areas of soils. The stony Neotoma soils are along drainageways or adjacent to bedrock escarpments. Also included are some areas of silty alluvial soils along small streams. Included areas make up 10 to 15 percent of the unit.

Water and air move through the Alford and Wellston soils at a moderate rate. Surface runoff is rapid. Available water capacity is high. The subsoil ranges from very strongly acid to medium acid. Organic matter content is moderately low. The potential for frost action is high.

Most areas are used as pasture or woodland. These soils are moderately suited to pasture and to habitat for openland wildlife and are well suited to woodland and to habitat for woodland wildlife. They generally are unsuited to cultivated crops, hay, dwellings, and septic tank absorption fields because of the steep slope and the erosion hazard.

If these soils are used as woodland, the erosion hazard and the equipment limitation are management concerns. They are caused by the slope. Plant competition also is a management concern. It affects the seedlings of desirable species. The competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Logging roads and skid trails should be established on the contour if possible. On the steeper slopes, the logs or trees should be skidded uphill with a cable and winch. Firebreaks should be the grass type. Bare logging areas should be seeded to grass or to a grass-legume mixture. Machinery should be used only when the soils are firm enough to support the equipment. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soils, and damage to tree roots.

Most areas of these soils have contrasting relief and support native vegetation. In some areas streams cascade over stones. Species of woodland wildlife, such as bluejays and squirrels, are common. Carefully planned trails or paths can be constructed for hiking and sightseeing. The severe erosion hazard should be considered during construction. Because they are not too steep, many of the ridges between drainageways and the foot slopes can be used as sites for shelters or similar structures.

The land capability classification is VIe.

853F—Alford-Westmore silt loams, 18 to 35 percent slopes. These steep, well drained soils are on long hillsides in the uplands. The Alford soil is on the upper part of the slopes and on ridges between drainageways. The Westmore soil is on the lower part of the slopes and along drainageways. Individual areas are circular or irregular in shape and range from 20 to 200 acres in size. They are about 30 to 60 percent Alford soil and 25 to 45 percent Westmore soil.

Typically, the surface layer of the Alford soil is dark brown, friable silt loam about 4 inches thick. The subsurface layer is yellowish brown, friable silt loam about 3 inches thick. The subsoil extends below a depth of 60 inches. The upper part is dark yellowish brown, friable silt loam; the next part is strong brown and brownish yellow, firm silty clay loam; and the lower part is brown, firm silt loam. In some places the slope is less than 18 percent. In other places the lower part of the subsoil is dense and brittle. In some areas the subsoil has a higher content of sand.

Typically, the surface layer of the Westmore soil is brown, friable silt loam about 4 inches thick. The subsurface layer is light yellowish brown, very friable silt loam about 3 inches thick. The subsoil is about 47 inches thick. The upper part is light brown and strong brown, friable silt loam; the next part is strong brown and yellowish brown, friable and firm silty clay loam; and the lower part is brownish yellow and light yellowish brown, very firm silty clay that has small rock fragments. The substratum to a depth of 60 inches is brownish yellow and light yellowish brown silty clay. In some places stone fragments are throughout the soil. In other places the middle part of the subsoil is clayey.

Included with these soils in mapping are small areas of the stony Brookside soils and areas of silty alluvial soils along small streams. Included soils make up 10 to 15 percent of the unit.

Water and air move through the Alford soil and the upper part of the Westmore soil at a moderate rate and through the lower part of the Westmore soil at a moderately slow or slow rate. Available water capacity is high in both soils. Surface runoff is rapid. The subsoil is dominantly medium acid to very strongly acid, but the lower part of the subsoil in the Westmore soil is mildly alkaline. Organic matter content is low in both soils. The potential for frost action is high.

Most areas are used as woodland. These soils are moderately suited to habitat for openland wildlife and are well suited to woodland and to habitat for woodland wildlife. They generally are unsuited to cultivated crops, hay, pasture, dwellings, and septic tank absorption fields because of the steep slope and a severe erosion hazard.

If these soils are used as woodland, the erosion hazard and the equipment limitation are management concerns. They are caused by the slope. Plant competition also is a management concern. It affects the seedlings of desirable species. The competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Logging roads and skid trails should be established on the contour if possible. On the steeper slopes, the logs or trees should be skidded uphill with a cable and winch. Firebreaks should be the grass type. Bare logging areas should be seeded to grass or to a grass-legume mixture. Machinery should be used only when the soils are firm enough to support the equipment. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soils, and damage to tree roots.

Most areas of these soils have contrasting relief and support native vegetation. In some areas streams cascade over stones. Species of woodland wildlife, such as bluejays and squirrels, are common. Carefully planned trails or paths can be constructed for hiking and sightseeing. The severe erosion hazard should be considered during construction. Because they are not too steep, many of the ridges between drainageways and the foot slopes can be used as sites for shelters or similar structures.

The land capability classification is VIIe.

859D3—Blair-Ursa silty clay loams, 10 to 18 percent slopes, severely eroded. These strongly sloping, somewhat poorly drained soils are on hillsides in rolling areas. The Blair soil is on the upper part of the slopes, and the Ursa soil is on the lower part. In most areas, nearly all of the original surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. Slopes generally are 80 to 350 feet long. Individual areas are long and irregular in shape and range from 10 to 200 acres in size. They are about 45 to 60 percent Blair soil and 30 to 45 percent Ursa soil.

Typically, the surface layer of the Blair soil is dark yellowish brown, firm silty clay loam about 3 inches thick. The subsoil extends below a depth of 60 inches. The upper part is yellowish brown, mottled, firm silty clay loam and silt loam, and the lower part is grayish brown, mottled, friable silt loam. Sand grains and pebbles are common throughout the profile.

Typically, the surface layer of the Ursa soil is yellowish brown, firm silty clay loam about 4 inches thick. The subsoil extends below a depth of 60 inches. The upper part is yellowish brown and strong brown, mottled, firm silty clay loam and very firm silty clay; the next part is grayish brown, mottled, very firm silty clay; and the lower part is yellowish brown and grayish brown, mottled, firm silty clay loam. Sand grains and pebbles are common throughout the profile. In some of the less eroded areas, the surface layer is silt loam. In places the slope is less than 10 percent.

Included with these soils in mapping are small areas of the moderately well drained Hosmer and somewhat poorly drained Stoy soils. These included soils have a lower content of sand and gravel in the subsoil than the Blair and Ursa soils. They are on the upper part of side slopes and on narrow spur ridges. Also included are small areas of alluvial soils along drainageways and small streams, areas of stony soils on the lower part of some slopes, and a few areas where gullies have formed. Included soils make up 15 to 20 percent of the unit.

Water and air move through the Blair soil at a moderately slow rate and through the Ursa soil at a slow rate. Surface runoff is rapid on both soils. Available water capacity is moderate. The Blair soil has a seasonal high water table at a depth of 1.5 to 3.5 feet from March through June in most years. The subsoil of the Blair soil is very strongly acid to medium acid, and that of Ursa soil is strongly acid to mildly alkaline. Organic matter content and natural fertility are low in both soils. The surface soil generally is cloddy, and tilth is poor. The shrink-swell potential is moderate in the Blair soil and high in the Ursa soil. The potential for frost action is high in the Blair soil and moderate in the Ursa soil.

Most areas are used for cultivated crops or for pasture. These soils are moderately suited to pasture, woodland, and habitat for openland and woodland wildlife. They generally are unsuited to cultivated crops because of the slope and the erosion hazard. The Blair soil is moderately suited to dwellings, and the Ursa soil is poorly suited. Both soils are poorly suited to septic tank absorption fields.

Establishing pasture plants or hay helps to keep soil loss within tolerable limits. Seedbed preparation is difficult on severely eroded side slopes where the subsoil is exposed. A no-till method of pasture renovation or seeding helps to establish forage species and control further erosion. The plants should not be grazed until they are sufficiently established. Proper stocking rates, rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to prevent surface compaction and excessive runoff.

If these soils are used as woodland, measures that prevent fires are needed. Also, excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soils, and damage to tree roots.

If these soils are used as sites for dwellings, the shrink-swell potential and the slope are limitations. The seasonal high water table in the Blair soil also is a limitation. Installing subsurface tile drains near the foundations lowers the water table. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling. Cutting, filling, and land shaping help to overcome the slope.

The seasonal wetness of the Blair soil and the restricted permeability and slope of both soils are limitations on sites for septic tank absorption fields. A septic tank system can function satisfactorily if a sealed sand filter and a disinfection tank or an evapotranspiration bed are installed and the site is leveled.

On sites for local roads and streets, frost action is a hazard and the slope and low strength are limitations. Strengthening or replacing the base material can help to prevent road damage. Grading may be needed during construction. During periods before a plant cover is established in disturbed areas, additions of mulch are needed to control erosion.

The land capability classification is VIe.

860D—Hosmer-Ursa silt loams, 10 to 18 percent slopes. These strongly sloping soils are on hillsides in rolling areas. The moderately well drained Hosmer soil is on the upper part of the slopes, and the well drained Ursa soil is on the lower part. Slopes generally are 80 to 500 feet long. Individual areas are mainly long and irregular in shape and range from 10 to 150 acres in size. They are about 50 to 65 percent Hosmer soil and 25 to 40 percent Ursa soil.

Typically, the surface layer of the Hosmer soil is dark yellowish brown, friable silt loam about 5 inches thick. The subsurface layer is yellowish brown, friable silt loam about 3 inches thick. The subsoil extends below a depth of 60 inches. The upper part is dark yellowish brown and yellowish brown, firm silty clay loam and silt loam; the next part is brown and strong brown, mottled, firm, brittle silt loam; and the lower part is strong brown and brown, mottled, friable silt loam. In some areas the subsoil does not have a brittle layer.

Typically, the surface layer of Ursa soil is dark yellowish brown, very friable silt loam about 8 inches thick. The subsurface layer is yellowish brown, friable silt loam about 4 inches thick. The subsoil extends below a depth of 60 inches. The upper part is dark yellowish brown, firm silty clay loam; the next part is brown, mottled, very firm silty clay; and the lower part is brown and strong brown, mottled, very firm and firm silty clay loam. Sand grains and pebbles are common in the subsoil. In places grayish mottles are in the upper part of the subsoil.

Included with these soils in mapping are small areas of the somewhat poorly drained Stoy soils. These included soils are in the less sloping areas upslope from the Hosmer soil. Also included are small areas of alluvial soils along small streams and areas of stony soils on the lower part of some slopes. Included soils make up 10 to 15 percent of the unit.

Water and air move through the upper part of the Hosmer soil at a moderate rate and through the lower part at a very slow rate. They move through the Ursa soil at a slow rate. Surface runoff is rapid on both soils. Available water capacity is high in the Hosmer soil and moderate in the Ursa soil. The Hosmer soil has a seasonal high water table at a depth of 2.5 to 3.0 feet during March and April in most years. The subsoil of the Hosmer soil is very strongly acid to medium acid, and that of the Ursa soil is very strongly acid to mildly alkaline. Organic matter content is moderately low in both soils. The shrink-swell potential is moderate in the Hosmer soil and high in the Ursa soil. The potential for frost action is high in the Hosmer soil and moderate in the Ursa soil.

Most areas are used as pasture or woodland. These soils are poorly suited to cultivated crops. They are moderately suited to woodland and to habitat for openland wildlife and are well suited to habitat for woodland wildlife. The Hosmer soil is moderately suited to dwellings, and the Ursa soil is poorly suited. Both soils are poorly suited to septic tank absorption fields.

Unless the surface is protected, erosion is a severe hazard in the areas used for corn, soybeans, or small grain. It can be controlled by a system of conservation tillage that leaves crop residue on the surface after planting, by contour farming, or by a cropping sequence that is dominated by forage crops. Tilling when the soils are wet causes surface cloddiness and compaction and excessive runoff and erosion. Returning crop residue to the soil and regularly adding other organic material increase the rate of water infiltration and improve tilth.

Adapted forage and hay plants grow well on these soils. Timely deferment of grazing helps to prevent overgrazing and thus also helps to prevent surface compaction, excessive runoff, and a greater susceptibility to erosion. Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion. Applications of fertilizer are needed. The plants should not be grazed or clipped until they are sufficiently established.

In the areas used as woodland, windthrow and plant competition are management concerns on the Hosmer soil. Harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Only high-value trees should be removed from a strip 50 feet wide along the west and south edges of the woodland. Plant competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soils, and damage to tree roots. Measures that protect the woodland from fire are needed.

If these soils are used as sites for dwellings, the slope and the shrink-swell potential are limitations. The seasonal high water table in the Hosmer soil also is a limitation. Installing subsurface tile drains near the foundations lowers the water table. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling. Cutting, filling, and land shaping help to overcome the slope.

The seasonal wetness of the Hosmer soil and the restricted permeability and slope of both soils are limitations on sites for septic tank absorption fields. A septic tank system can function satisfactorily if a sealed sand filter and a disinfection tank or an evapotranspiration bed are installed and the site is leveled.

On sites for local roads and streets, frost action is a hazard and the slope and low strength are limitations. Strengthening or replacing the base material can help to prevent road damage. Grading may be needed during construction. During periods before a plant cover is established in disturbed areas, additions of mulch are needed to control erosion.

The land capability classification is IVe.

860D3—Hosmer-Ursa silty clay loams, 10 to 18 percent slopes, severely eroded. These strongly sloping soils are on hillsides in rolling areas. The moderately well drained Hosmer soil is on the upper part of the slopes, and the well drained Ursa soil is on the lower part. Slopes generally are 80 to 300 feet long. In most areas, nearly all of the original surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. Individual areas are mainly long and irregular in shape and range from 10 to 200 acres in size. They are about 45 to 55 percent Hosmer soil and 30 to 45 percent Ursa soil.

Typically, the surface layer of the Hosmer soil is mixed dark yellowish brown and yellowish brown, firm silty clay loam about 6 inches thick. The subsoil is about 42 inches thick. The upper part is brown, pale brown, and yellowish brown, firm silty clay loam; the next part is pale brown and yellowish brown, mottled, firm, brittle silty clay loam; and the lower part is pale brown and yellowish brown, mottled, firm silt loam. The substratum to a depth of 60 inches is light brownish gray, mottled silt loam. In places the subsoil does not have a brittle layer.

Typically, the surface layer of Ursa soil is brown, firm silty clay loam about 6 inches thick. The subsoil extends below a depth of 60 inches. It is mottled and very firm. The upper part is strong brown silty clay, and the lower part is brown and strong brown silty clay loam. Sand grains and pebbles are common throughout the profile. In places the subsoil has more sand. In the less eroded areas, the surface layer is silt loam and is darker. In some areas the slope is less than 10 percent.

Included with these soils in mapping are small areas of the somewhat poorly drained Stoy and Blair soils. Stoy soils are on the upper part of some slopes, and Blair soils are on side slopes between the Hosmer and Ursa soils. Also included are small areas of alluvial soils along drainageways and small streams, a few areas where gullies have formed, and some areas of stony soils on the lower part of the slopes. Included soils make up 10 to 15 percent of the unit.

Water and air move through the upper part of the Hosmer soil at a moderate rate and through the lower part at a slow rate. They move through the Ursa soil at a slow rate. Surface runoff is rapid on both soils. Available water capacity is moderate. The Hosmer soil has a seasonal high water table at a depth of 2.5 to 3.0 feet during March and April in most years. The subsoil of the Hosmer soil is very strongly acid to medium acid, and that of the Ursa soil is very strongly acid to mildly alkaline. Organic matter content and natural fertility are low in both soils. The surface layer generally is cloddy, and tilth is poor. The shrink-swell potential is moderate in the Hosmer soil and high in the Ursa soil. The potential for frost action is high in the Hosmer soil and moderate in the Ursa soil.

Most areas are cultivated or pastured. Because of the erosion hazard, these soils are generally unsuited to cultivated crops. They are moderately suited to hay and pasture and to woodland. They are suited to habitat for woodland and openland wildlife. The Hosmer soil is moderately suited to dwellings and the Ursa soil is poorly suited. Both soils are poorly suited to septic tank absorption fields.

Establishing pasture plants or hay helps to keep soil loss within tolerable limits. Seedbed preparation is difficult on severely eroded side slopes where the subsoil is exposed. A no-till method of pasture renovation or seeding helps to establish forage species and control further erosion. The plants should not be grazed until they are sufficiently established. Proper stocking rates, rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to prevent surface compaction and excessive runoff.

If this unit is used as woodland, windthrow and plant competition are management concerns on the Hosmer soil. Harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Only high-value trees should be removed from a strip 50 feet wide along the west and south edges of the woodland. Plant competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soils, and damage to tree roots. Measures that protect the woodland from fire are needed.

If these soils are used as sites for dwellings, the shrink-swell potential and the slope are limitations. The seasonal high water table in the Hosmer soil also is a limitation. Installing subsurface tile drains near the foundations lowers the water table. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling. Cutting, filling, and land shaping help to overcome the slope.

The restricted permeability and slope of both soils and the seasonal wetness of the Hosmer soil are limitations on sites for septic tank absorption fields. A septic tank system can function satisfactorily if a sealed sand filter and a disinfection tank or an evapotranspiration bed are installed and the site is leveled.

On sites for local roads and streets, frost action is a hazard and the slope and low strength are limitations. Strengthening or replacing the base material can help to prevent road damage. Grading may be needed during construction. During periods before a plant cover is established in disturbed areas, additions of mulch are needed to control erosion.

The land capability classification is VIe.

864—Pits, quarries. This map unit consists of open pits, the entrances to room and pillar quarries, and the adjacent work and storage areas. Individual areas are mainly circular or long and narrow and range from 5 to 50 acres in size.

In a typical area, the basin and sidewalls are limestone bedrock. In many places a talus slope is along the basin or at the foot of the sidewalls. The work area includes stockpiles of crushed limestone, small buildings, machinery, and haulage roads.

Included in this unit in mapping is a rim of soil around the top of the sidewalls. Also included are pools of water and scattered areas of debris. Included areas make up about 10 percent of the unit.

In most areas the quarries are active, but in some they are abandoned. They are a source of agricultural lime or crushed rock for use in construction. They generally are unsuited to recreational uses because of the exposed barren bedrock, extensive dark caverns, and the risks of falling rock and landslides.

This map unit is not assigned to a land capability classification.

866—Dumps, slurry. This map unit occurs as areas of fine refuse from coal preparation plants or ash from power plants. Individual areas are mainly rectangular or long and narrow and range from 8 to 100 acres in size.

A typical area is one where slurry is pumped into a pond or, in surface-mined areas, into a box cut. Pumping of the slurry continues through the end of mining activities or until the pond or box cut is filled. Slurry pits are commonly active for 3 to more than 25 years. When additions of the slurry cease, the slurry material dries, oxidizes, and becomes extremely acid. Oxidized slurry has a high concentration of iron, aluminum, and zinc. The concentrations of these elements are toxic to most plants. Ash slurry from power plants is less acid and does not have toxic concentrations of iron, aluminum, or zinc.

Included in this unit in mapping are the earth embankments that contain the slurry.

Most areas are currently active and are the property of a mining company. They are neither available for nor suited to recreational uses. The older pits are suited to mining for the recovery of coal. Dried slurry from power plants is a probable source of sand for use in buried sand filters and as subgrade material for roads.

This map unit is not assigned to a land capability classification.

871C—Lenzburg silt loam, 4 to 12 percent slopes. This sloping, well drained soil is on graded spoil banks in areas that formerly were surface mined. Scattered stones cover as much as 2 percent of the surface. Slopes generally are 120 to 300 feet long. Individual areas are rectangular or irregular in shape and range from 45 to 350 acres in size.

Typically, the surface layer is multicolored, friable silt loam about 3 inches thick. Below this is multicolored friable silt loam about 3 inches thick. The upper part of the substratum is mixed pale brown and brown, firm silty clay loam. The lower part to a depth of 60 inches is mixed brown and gray, very firm silty clay. Pebbles, channers, and flagstones of limestone and pieces of carbolithic material are throughout the soil. In some areas the soil has layers or pockets of loam or fine sandy loam. In other areas it is less sloping.

Included with this soil in mapping are areas where compacted layers or traffic pans have formed as a result of the movement of heavy equipment across the soil. Also included are depressional areas that are occasionally ponded, small areas of clayey soils, and a few areas of soils that have pockets of extremely acid material. Included soils make up 11 to 15 percent of the unit.

Water and air move through the Lenzburg soil at a moderately slow rate. Surface runoff is medium. Available water capacity is moderate or high. The soil is dominantly calcareous, but individual layers range from slightly acid to moderately alkaline. Organic matter content is low. The shrink-swell potential and the potential for frost action are moderate.

Most areas are used for hay or pasture. This soil is well suited to hay and pasture. It is moderately suited to cultivated crops. It is well suited to habitat for openland and woodland wildlife. It is poorly suited to dwellings and septic tank absorption fields. Time for settling is needed before reclaimed soils are used as sites for agronomic or urban structures, such as terraces and dwellings.

If this soil is used for corn, soybeans, or small grain, erosion is a hazard and tilth and the surface stoniness are limitations. The larger stones in the surface soil can be removed by a stone picker. The soil can be tilled by a field cultivator or similar equipment. Soil loss can be kept within tolerable limits by a crop rotation that includes 1 or more years of forage crops, by a conservation tillage system that leaves crop residue on the surface after planting, by contour farming, by terraces, or by a combination of these. Returning crop residue to the soil and regularly adding other organic material help to maintain productivity, prevent crusting, and improve tilth.

Adapted forage and hay plants grow well on this soil. Removal of surface stones may be needed. Timely deferment of grazing helps to prevent overgrazing and thus also helps to prevent surface compaction, excessive runoff, and a greater susceptibility to erosion. Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion. Applications of fertilizer are needed. The plants should not be grazed or clipped until they are sufficiently established.

If this soil is used as a site for dwellings, the slope and the shrink-swell potential are limitations. Cutting, filling, and land shaping help to overcome the slope. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling. In areas where subsidence can be expected, a floating foundation may be needed.

The moderately slow permeability and the slope are limitations if this soil is used as a site for septic tank absorption fields. Increasing the size of the absorption field or replacing the soil with more permeable material helps to overcome the moderately slow permeability. Installing the filter lines on the contour or cutting and land shaping help to overcome the slope.

Low strength is a limitation on sites for local roads and streets. Strengthening or replacing the base material helps to prevent road damage.

The land capability classification is IIIe.

871E—Lenzburg stony silty clay loam, 12 to 30 percent slopes. This strongly sloping to steep, well drained soil is on the side slopes and crests of spoil banks in areas that formerly were surface mined. The landscape is rolling and hilly. Scattered stones cover as much as 10 percent of the surface. The side slopes are 75 to 125 feet long. Individual areas are rectangular or irregular in shape and range from 15 to 700 acres in size.

Typically, the surface layer is mixed dark brown, brownish yellow, and light brownish gray, friable silty clay loam about 3 inches thick. The substratum to a depth of 60 inches occurs as layers of mixed brown, yellowish brown, strong brown, and light brownish gray, firm silty clay loam, loam, and silt loam. Flagstones, stones, pebbles, and channers of limestone are common throughout the soil. In some areas rills and small gullies have formed.

Included with this soil in mapping are areas of the very stony Morristown soils and areas where boulders are near the base of some slopes. Also included are a few depressional areas that are occasionally ponded, a few areas that have haulage roads, and seepy spots on a few side slopes. Included areas make up 8 to 12 percent of the unit.

Water and air move through the Lenzburg soil at a moderately slow rate. Surface runoff is rapid. Available water capacity is moderate or high. Organic matter content is low. The soil is dominantly calcareous, but individual layers range from slightly acid to moderately alkaline. The potential for frost action is moderate.

Most areas are used as pasture. This soil is moderately suited to pasture and to habitat for openland wildlife. It is well suited to habitat for woodland wildlife. It generally is unsuited to cultivated crops and to dwellings and septic tank absorption fields because of the slope, the erosion hazard, and the stoniness.

Erosion control is needed when grasses and legumes are becoming established in the pastured areas. A permanent cover of pasture plants helps to control erosion and maintains tilth. Selection of suitable species for planting, proper stocking rates, pasture rotation, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition. In areas where the pasture is established, seeding legumes on the contour improves forage quality and helps to control erosion.

The land capability classification is VIIe.

871G—Lenzburg stony silty clay loam, 30 to 70 percent slopes. This very steep, well drained soil is in areas that formerly were mined for coal. It is on the crest and side slopes of spoil banks and on the sides of box cuts, final cuts, and incline slopes. Slopes are 60 to 125 feet long. Individual areas are long and narrow or rectangular in shape and range from 30 to 75 acres in size.

Typically, the surface layer is mixed dark grayish brown, friable silty clay loam about 3 inches thick. The substratum is mixed dark grayish brown, dark yellowish brown, and yellowish brown. The upper part is firm channery silty clay loam. The lower part to a depth of 60 inches is very firm channery silty clay. In some areas the soil has only a few stones or no stones. In other areas it has pockets of sandy or clayey material.

Included with this soil in mapping are areas of very stony material on the lower parts of the slopes and in pockets in nearly vertical columns. Also included are some small water areas between ridges. Included areas make up 10 to 15 percent of the unit.

Water and air move through the Lenzburg soil at a moderately slow rate. Surface runoff is very rapid. Available water capacity is moderate. In most places the soil is calcareous, but individual layers range from slightly acid to moderately alkaline. Organic matter content is low. The potential for frost action is moderate.

Most areas have a cover of grasses and shrubs or are used as woodland. This soil generally is unsuited to cultivated crops and to dwellings and septic tank absorption fields because of the slope, the stoniness, and the risk of soil slippage.

The plant cover on this soil protects the watershed from erosion and provides food and cover for wildlife. Aerial seeding may be needed if new plant species are to be introduced or a given area is to be renovated. The high, very steep slopes provide scenic overlooks.

The land capability classification is VIIe.

909A—Coulterville-Oconee silt loams, 0 to 2 percent slopes. These nearly level, somewhat poorly drained soils are on broad upland plains that formerly were prairie plains. In recently tilled fields, the Coulterville soil can be identified by a lighter colored surface layer. Also, cultivated crops, particularly soybeans, frequently show a lighter green foliage and mature earlier in areas of the Coulterville soil. Individual areas are irregular in shape and range from 10 to 100 acres in size. They are about 40 to 60 percent Coulterville soil and 20 to 40 percent Oconee soil.

Typically, the surface layer of the Coulterville soil is dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is grayish brown and light gray, friable silt loam about 6 inches thick. The subsoil is firm silty clay loam about 33 inches thick. It is mottled. The upper part is brown, and the lower part is grayish brown and has a high content of sodium. The substratum to a depth of 60 inches is light brownish gray, mottled silt loam. In places the subsoil contains less clay.

Typically, the surface layer of the Oconee soil is very dark grayish brown, friable silt loam about 10 inches thick. The subsurface layer is grayish brown, friable silt loam about 4 inches thick. The subsoil extends below a depth of 60 inches. It is mottled. The upper part is dark brown, firm silty clay loam; the next part is grayish brown, firm silty clay loam; and the lower part is grayish brown, friable silt loam. In some areas the surface layer is lighter in color.

Included with these soils in mapping are small areas of moderately well drained soils on slight rises. These included soils make up 4 to 8 percent of the unit.

Water and air move through the Coulterville and Oconee soils at a slow rate. Surface runoff also is slow. Available water capacity is moderate in the Coulterville soil and high in the Oconee soil. In most years the seasonal high water table is at a depth of 1 to 3 feet from February through June in the Coulterville soil and from March through June in the Oconee soil. The subsoil of the Coulterville soil is dominantly neutral to moderately alkaline but is acid in the upper part. The subsoil of Oconee soil is very strongly acid to medium acid. Organic matter content is moderately low in the Coulterville soil and moderate in the Oconee soil. The surface layer of both soils is friable and can be easily tilled. The one in the Coulterville soil, however, tends to puddle and crust after hard rains. The high content of sodium in the subsoil of the Coulterville soil restricts the availability and uptake of some plant nutrients and causes plant stress, especially during dry periods. The shrink-swell potential is moderate in the Coulterville soil and high in the Oconee soil. The potential for frost action is high in both soils.

Most areas are used for cultivated crops. These soils are well suited to cultivated crops, hay, pasture, and habitat for openland wildlife. They are poorly suited to dwellings and septic tank absorption fields.

A drainage system has been installed in the areas used for corn, soybeans, and small grain. Measures that maintain or improve the drainage system are needed. Surface drains and surface inlet tile function satisfactorily if suitable outlets are available. Applying a conservation tillage system that leaves crop residue on the surface after planting and returning crop residue to the soil improve tilth, help to prevent surface compaction and crusting, and increase the rate of water intake.

The seasonal wetness and the shrink-swell potential are limitations if these soils are used as sites for dwellings. Reinforcing footings and foundations helps to prevent the structural damage caused by shrinking and swelling. Installing subsurface drains around the footings helps to lower the water table. Elevating the floor of dwellings without basements above the surrounding ground level, grading, and diverting surface water also help to overcome the wetness.

The seasonal wetness and the slow permeability are limitations if these soils are used as sites for septic tank absorption fields. A septic tank system can function satisfactorily if a sealed sand filter and a disinfection tank or an evapotranspiration bed are installed. Sewage lagoons function well on these soils.

On sites for local roads and streets, low strength is a limitation and frost action is a hazard. Strengthening or replacing the base material helps to prevent road damage.

The land capability classification is IIw.

909B—Coulterville-Oconee silt loams, 2 to 5 percent slopes. These gently sloping, somewhat poorly drained soils are on broad ridges and on knolls on plains that formerly were prairie plains. In recently tilled fields, the Coulterville soil can be identified by a lighter colored surface layer. Also, cultivated crops, particularly soybeans, sometimes show a lighter green foliage and mature earlier in areas of the Coulterville soil. Individual areas are irregular in shape and range from 10 to 70 acres in size. They are about 40 to 60 percent Coulterville soil and 20 to 40 percent Oconee soil.

Typically, the surface layer of the Coulterville soil is dark grayish brown, very friable silt loam about 7 inches thick. The subsurface layer is grayish brown and light gray, firm silt loam about 3 inches thick. The subsoil is very firm and firm, mottled silty clay loam about 30 inches thick. The upper part is brown, and the lower part is grayish brown and has a high content of sodium. The substratum to a depth of 60 inches is light gray silt loam. In some places the subsoil contains less clay. In other places the surface layer is darker.

Typically, the surface layer of the Oconee soil is very dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is grayish brown, firm silt loam about 5 inches thick. The subsoil is firm silty clay loam about 36 inches thick. It is mottled. The upper part is brown and has patches of darker coatings. The lower part is grayish brown. The substratum to a depth of 60 inches is grayish brown, mottled silt loam. In places the surface layer is lighter in color.

Included with these soils in mapping are a few areas of moderately well drained soils on the higher ridges. These included soils make up about 4 to 8 percent of the unit.

Water and air move through the Coulterville and Oconee soils at a slow rate. Surface runoff is medium. Available water capacity is moderate in the Coulterville soil and high in the Oconee soil. In most years the seasonal high water table is at a depth of 1 to 3 feet from February through June in the Coulterville soil and from March through June in the Oconee soil. The subsoil of the Coulterville soil is medium acid or slightly acid in the upper part and mildly alkaline or moderately alkaline in the lower part. The subsoil of the Oconee soil is very strongly acid to medium acid. Organic matter content is moderately low in the Coulterville soil and moderate in the Oconee soil. The surface layer of both soils is friable and can be easily tilled when moist. The one in the Coulterville soil, however, tends to puddle and crust after hard rains. The high content of sodium in the subsoil of the Coulterville soil restricts the availability and uptake of some plant nutrients and results in plant stress. The shrink-swell potential is moderate in the Coulterville soil and high in the Oconee soil. The potential for frost action is high in both soils.

Most areas are used for cultivated crops. These soils are well suited to cultivated crops, hay, pasture, and habitat for openland and woodland wildlife. They are poorly suited to dwellings and septic tank absorption fields.

In the areas used for corn, soybeans, or small grain, erosion is a hazard unless the surface is protected. Also, the wetness can delay planting in some years. It can be reduced by surface ditches. Erosion can be controlled by a system of conservation tillage that leaves crop residue on the surface after planting and by contour farming. Tilling when the soils are wet causes surface compaction and reduces the rate of water infiltration. Returning crop residue to the soil and regularly adding other organic material increase the infiltration rate and improve tilth.

Adapted forage and hay plants grow well on these soils. Overgrazing or grazing when the soils are too wet reduces forage yields, causes surface compaction and excessive runoff, and increases the susceptibility to erosion. Proper stocking rates, rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to control erosion.

If these soils are used as sites for dwellings, the seasonal high water table and the shrink-swell potential are limitations. Installing either tile drains near the foundations or interceptor drains on the higher adjacent side slopes helps to lower the water table. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

The seasonal wetness and the slow permeability are limitations if these soils are used as sites for septic tank absorption fields. A septic tank system can function satisfactorily if a sealed sand filter and a disinfection tank or an evapotranspiration bed are installed. Sewage lagoons function well on these soils.

On sites for local roads and streets, frost action is a hazard and low strength and the shrink-swell potential are limitations. Strengthening or replacing the base material helps to prevent road damage.

The land capability classification is IIe.

934D3—Blair-Grantfork silt loams, 7 to 15 percent slopes, severely eroded. These somewhat poorly drained, strongly sloping soils are on side slopes and hillsides, mainly adjacent to drainageways or small streams. The Blair soil is at the upper end of drainageways and on the upper part of the slopes, and the Grantfork soil is on the lower and steeper parts of the slopes. In most areas, nearly all of the original surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. Individual areas are long and irregular in shape and range from 15 to 135 acres in size. They are about 40 to 60 percent Blair soil and 20 to 40 percent Grantfork soil.

Typically, the surface layer of the Blair soil is dark grayish brown, friable silt loam about 5 inches thick. The subsoil is firm and very firm silty clay loam about 47 inches thick. It is mottled. The upper part is yellowish brown, and the lower part is grayish brown and light brownish gray. The substratum to a depth of 60 inches is light brownish gray, mottled silty clay loam. Sand grains and pebbles are common throughout the soil. In some places the upper part of the subsoil has less sand. In other places the subsoil has more sand throughout.

Typically, the surface layer of the Grantfork soil is dark brown, friable silt loam about 4 inches thick. The subsoil is about 50 inches thick. The upper part is brown, firm silty clay loam; the next part is light brownish gray, mottled, very firm silt loam and has a high content of sodium; and the lower part is light gray, mottled, very firm loam. The substratum to a depth of 60 inches is light gray, mottled silt loam. Sand grains and pebbles are common throughout the soil. In some areas the surface layer is silty clay loam. In some places the upper part of the subsoil is grayish brown. In other places the surface layer and subsoil contain less sand.

Included with these soils in mapping are small areas of the well drained Hickory soils on the steeper parts of the slopes. Also included are scald spots and gullies where the surface layer has a high content of sodium and a few areas of hillside seeps. Included areas make up 10 to 15 percent of the unit.

Water and air move through the Blair soil and the upper part of the Grantfork soil at a moderately slow rate. They move through the lower part of the Grantfork soil at a slow rate. Surface runoff is rapid on both soils. Available water capacity is moderate. The seasonal high water table is at a depth of 1.0 to 3.5 feet from January through June in most years. Reaction is strongly acid to slightly acid throughout the subsoil of the Blair soil and in the upper part of the subsoil in the Grantfork soil. The lower part of the Grantfork soil is mildly alkaline to strongly alkaline. Organic matter content is low in both soils. The surface layer is firm when moist and hard and cloddy when dry. Tilth is poor. The soils dry out slowly in the spring. The high content of sodium in the Grantfork soil restricts the availability and uptake of some plant nutrients and causes plant stress. The potential for frost action is high in both soils. The shrink-swell potential is moderate.

Most areas are used for hay and pasture. Some are cultivated, and a few are idle. Because of the erosion hazard and the slope, these soils generally are unsuited to cultivated crops. They are moderately suited to hay, pasture, woodland, and habitat for openland wildlife. They are poorly suited to dwellings and septic tank absorption fields.

Establishing pasture plants or hay helps to keep soil loss within tolerable limits. Establishing plants is difficult because of the poor tilth in both soils and the high content of sodium in the subsoil of the Grantfork soil. Seedbed preparation is difficult on severely eroded side slopes where the subsoil is exposed. A no-till method of pasture renovation or seeding helps to establish forage species and control further erosion. The plants should not be grazed until they are sufficiently established. Proper stocking rates, rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and help to prevent surface compaction and excessive runoff.

In the areas used as woodland, plant competition is a management concern on the Blair soil. It affects the seedlings of desirable species. The competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soils, and damage to tree roots. Measures that protect the woodland from fire are needed.

If these soils are used as sites for dwellings, the seasonal high water table, the shrink-swell potential, and the slope are limitations. Installing subsurface tile drains near the foundations lowers the water table. Extending the footings below the subsoil or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling. Cutting, filling, and land shaping help to overcome the slope.

The seasonal wetness, the moderately slow or slow permeability, and the slope are limitations if these soils are used as septic tank absorption fields. A septic tank system can function satisfactorily if a sealed sand filter and a disinfection tank or an evapotranspiration bed are installed and the site is leveled.

On sites for local roads and streets, frost action is a hazard and the slope and low strength are limitations. Strengthening or replacing the base material can help to prevent road damage. Grading may be needed during construction. During periods before a plant cover is established in disturbed areas, additions of mulch are needed to control erosion.

The land capability classification is VIe.

977G—Neotoma-Wellston complex, 25 to 50 percent slopes. These very steep, well drained soils are on long hillsides in the uplands. The Neotoma soil is on the lower part of the slopes and along rock ledges. The Wellston soil is on the upper part of the slopes and in some areas above and below the rock ledges. Individual areas are circular or are long and irregular in shape. They range from 15 to 400 acres in size. They are about 40 to 60 percent Neotoma soil and 25 to 45 percent Wellston soil.

Typically, the surface layer of the Neotoma soil is very dark brown, friable stony silt loam about 3 inches thick. The subsurface layer is yellowish brown, friable flaggy silt loam about 3 inches thick. The subsoil extends to a depth of about 45 inches. It is yellowish brown, friable flaggy silt loam, very flaggy silt loam, and very flaggy loam. The underlying bedrock is interbedded sandstone and siltstone. In places the soil is deeper over bedrock.

Typically, the surface layer of the Wellston soil is dark brown, friable silt loam about 3 inches thick. The subsurface layer is yellowish brown, friable silt loam about 5 inches thick. The subsoil is about 41 inches thick. The upper part is strong brown, friable silty clay loam and firm silt loam, and the lower part is strong brown, firm channery silt loam. The substratum to a depth of 60 inches is strong brown very channery loam. In some places small rock fragments are throughout the subsoil. In other places bedrock is within a depth of 40 inches. In some areas the lower part of the subsoil contains more clay.

Included with these soils in mapping are small areas of Alford soils. These included soils are silty throughout. They are on the upper part of the slopes and on narrow ridges between drainageways. Also included are rock ledges, areas of boulders, and small areas of stony soils that formed in alluvium along small streams. Included areas make up 10 to 15 percent of the unit.

Water and air move through the Neotoma soil at a moderately rapid rate and through the Wellston soil at a moderate rate. Surface runoff is very rapid on both soils. Available water capacity is moderate in the Neotoma soil and high in the Wellston soil. The subsoil in both soils ranges from very strongly acid to slightly acid. Organic matter content is moderately low. The potential for frost action is high in the Wellston soil and low in the Neotoma soil.

Most areas are used as woodland. These soils are moderately suited to woodland and well suited to habitat for woodland wildlife. They generally are unsuited to cultivated crops, hay, pasture, dwellings, and septic tank absorption fields because of the very steep slope, the erosion hazard, and the stoniness.

If these soils are used as woodland, the erosion hazard and the equipment limitation are management concerns. They are caused by the slope. Plant competition also is a management concern. It affects the seedlings of desirable species. The competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Logging roads and skid trails should be established on the contour if possible. On the steeper slopes, the logs or trees should be skidded uphill with a cable and winch. Firebreaks should be the grass type. Bare logging areas should be seeded to grass or to a grass-legume mixture. Machinery should be used only when the soils are firm enough to support the equipment. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soils, and damage to tree roots.

These soils have contrasting relief and commonly support native trees. Many areas are rocky, and streams cascade over rock ledges. Species of woodland wildlife, such as bluejays and squirrels, are common. Carefully planned trails or paths can be constructed for hiking and sightseeing. The erosion hazard should be considered during construction. Because they are not too steep, many of the ridges between drainageways and the foot slopes can be used as sites for shelters or similar structures.

The land capability classification is VIIe.

1334—Birds silt loam, wet. This nearly level, very poorly drained soil is in low or depressional areas on flood plains. It is frequently flooded for long periods in the spring of most years and is subject to ponding by backwater. Individual areas are mainly long and irregular in shape or are circular. They range from 10 to 80 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 4 inches thick. The substratum to a depth of 60 inches is light brownish gray and gray, mottled, friable silt loam. In places it has layers of silty clay loam.

Included with this soil in mapping are areas of the somewhat poorly drained Wakeland soils on the slightly higher parts of the flood plain. Also included are clayey soils in small swampy areas on the lower parts of the flood plain. Included soils make up 3 to 8 percent of the unit.

Water and air move through the Birds soil at a moderately slow rate. Available water capacity is high. Surface runoff is ponded. The seasonal high water table is 0.5 foot above the surface to 1.0 foot below from March through June in most years. The soil is dominantly medium acid to mildly alkaline, but some layers are strongly acid. Organic matter content is moderately low. The potential for frost action is high.

Most areas are used as woodland. Some are occasionally used for cultivated crops. This soil is moderately suited to hay and pasture. It is well suited to woodland and to habitat for woodland and wetland wildlife. It generally is unsuited to cultivated crops and to dwellings and septic tank absorption fields because of the flooding and the ponding.

If this soil is used as woodland, the equipment limitation, seedling mortality, and windthrow are management concerns. They are caused by the wetness. Plant competition also is a concern. It affects the seedlings of desirable species. Machinery should be used only when the soil is firm enough to support the equipment. The seedling mortality rate can be reduced by planting on ridges, by selecting planting stock that is older and larger than is typical, or by mulching. Some replanting may be needed. Harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Only high-value trees should be removed from a strip 50 feet wide along the west and south edges of the woodland. Plant competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

Many areas provide good habitat for wetland wildlife. Some shallow water areas are available, and others could be easily developed. Wild herbaceous plants and shrubs grow naturally in a number of areas and could be planted in other areas.

The land capability classification is Vw.

1457—Booker silty clay, wet. This nearly level, very poorly drained soil is in depressional areas, mainly in sloughs on bottom land along the major rivers. It is protected by a levee and is subject to only rare flooding. It is ponded for long periods in most years. Individual areas are mainly long and narrow or are oblong. They range from 8 to 150 acres in size.

Typically, the surface layer is very dark gray, firm silty clay about 7 inches thick. The subsoil is about 42 inches thick. It is dark gray, mottled, and very firm. The upper part is clay, and the lower part is silty clay. The substratum to a depth of 60 inches is dark gray, mottled silty clay. In some places the lower part of subsoil and the substratum contain more sand and less clay. In other places concretions of lime are in the lower part of the soil. In some areas the surface layer is silty overwash and is lighter in color.

Included with this soil in mapping are small areas of the poorly drained Fults soils. These soils are higher on the flood plains than the Booker soil and are near the edge of the mapped areas. They make up 5 to 8 percent of the unit.

Water and air move through the Booker soil at a very slow rate. Available water capacity is moderate. Surface runoff is ponded. The seasonal high water table is 0.5 foot above the surface to 1.0 foot below from November through May in most years. The subsoil is medium acid to neutral. Organic matter content is moderate. The surface layer is very sticky when wet and very hard when dry. The potential for frost action is moderate.

Most areas are wooded or used intermittently for cultivated crops. This soil is moderately suited to habitat for wetland wildlife and poorly suited to woodland. It generally is unsuited to cultivated crops, hay, pasture, dwellings, and septic tank absorption fields because of the ponding and the flooding.

If this soil is used as woodland, the equipment limitation, seedling mortality, and windthrow are management concerns. They are caused by the wetness. Plant competition also is a concern. It affects the seedlings of desirable species. Machinery should be used only when the soil is firm enough to support the equipment. The seedling mortality rate can be reduced by planting on ridges, by selecting planting stock that is older and larger than is typical, or by mulching. Some replanting may be needed. Harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Only high-value trees should be removed from a strip 50 feet wide along the west and south edges of the woodland. Plant competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

In many areas the naturally occurring plant species provide food and cover for wetland wildlife. Shallow water areas can be easily developed. Ponded areas furnish temporary feeding and resting sites for waterfowl. Protection from fire and grazing is essential.

The land capability classification is Vw.

3038B—Rocher loam, frequently flooded, 1 to 5 percent slopes. This gently sloping, somewhat excessively drained soil is on ridges and natural levees on flood plains adjacent to overflow channels or the major rivers. It is frequently flooded for brief periods from

February through July in most years. Individual areas are long and narrow and range from 5 to 70 acres in size.

Typically, the surface layer is dark brown, very friable loam about 5 inches thick. The substratum to a depth of 60 inches is stratified brown, very friable very fine sandy loam, light yellowish brown, loose loamy fine sand, and yellowish brown, loose loamy very fine sand.

Included with this soil in mapping are small areas of the moderately well drained Haynie and somewhat poorly drained Blake soils. These soils are not droughty and have a lower content of sand throughout than the Rocher soil. Also, they are lower on the flood plains. They make up 3 to 8 percent of the unit.

Water and air move through the Rocher soil at a moderately rapid rate. Surface runoff is slow. Available water capacity is low. The soil is mildly alkaline or moderately alkaline and is calcareous throughout. Organic matter content is low. The surface layer is loose or very friable and can be easily tilled. The soil dries out quickly after rains and warms up early in spring. During periods of flooding, many areas are subject to scouring and deposition. The potential for frost action is moderate.

Most areas are cultivated. Some support recently established stands of trees and shrubs. This soil is poorly suited to cultivated crops. It is moderately suited to woodland and to habitat for woodland wildlife. It is well suited to habitat for openland wildlife. It generally is unsuited to dwellings and septic tank absorption fields because of the flooding.

If this soil is used for corn, soybeans, or small grain, the low available water capacity is a limitation and water erosion, soil blowing, and flooding are hazards. In some years the flooding causes crop damage. Levees and drainage channels reduce the flooding hazard. Drought-tolerant crops or crop varieties that have a short growing season should be selected for planting. Irrigation is beneficial, and a source of irrigation water generally is available. Fertilizer should be applied in several small applications rather than one large application. Erosion can be controlled and moisture conserved by a conservation tillage system that leaves crop residue on the surface after planting, by contour farming, or by terraces. Field windbreaks and a tillage system that leaves the surface rough are effective in controlling soil blowing.

If this soil is used as woodland, plant competition is a management concern. It affects the seedlings of desirable species. The competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

The land capability classification is IVw.

3071—Darwin silty clay, frequently flooded. This nearly level, poorly drained soil is on broad flats and in depressions in old stream channels and in sloughs along the major streams. It is frequently flooded or ponded for brief periods from January through June in most years (fig. 14). Individual areas are long and generally broad and range from 15 to 800 acres in size.

Typically, the surface layer is very dark gray, firm silty clay about 6 inches thick. The upper part of the substratum is very dark grayish brown and dark grayish brown, mottled, very firm silty clay that has thin strata of silt loam. The lower part to a depth of 60 inches is very dark grayish brown, firm silty clay loam and dark grayish brown silt loam that has thin strata of loam. In some areas layers of fine sandy loam and loamy fine sand are in the lower part of the substratum. In other areas the surface layer is silt loam overwash.

Included with this soil in mapping are areas that are intermittently covered by water and small areas of the somewhat poorly drained Parkville soils. Parkville soils have more sand in the lower part than the Darwin soil. They are on slight rises and low natural levees. Included areas make up 11 to 15 percent of the unit.

Water and air move through the Darwin soil at a very slow rate. Available water capacity is moderate or high. Surface runoff is ponded. The seasonal high water table is 1 foot above the surface to 2 feet below from January through June in most years. The substratum is mildly alkaline or moderately alkaline and is calcareous. Organic matter content is high. The surface layer is clayey and cannot be easily tilled. Large cracks form during dry periods. The potential for frost action is high.

Most areas are cultivated or wooded. This soil is poorly suited to row crops. It is moderately suited to woodland. It is well suited to habitat for wetland wildlife and poorly suited to habitat for openland and woodland wildlife. It generally is unsuited to dwellings and septic tank absorption fields because of the flooding.

In the areas used for cultivated crops, a drainage system has been installed. Measures that maintain or improve the drainage system are needed. Shallow ditches that are closely spaced and land shaping reduce the wetness. Early maturing varieties of soybeans and grain sorghum are less likely to be damaged by floodwater than other varieties. Tilth can be improved by plowing in the fall and by incorporating crop residue or other organic material into the surface layer. Keeping spring tillage to a minimum helps to prevent soil compaction.

If this soil is used as woodland, the equipment limitation, seedling mortality, and windthrow are management concerns. They are caused by the wetness. Plant competition also is a concern. It affects the seedlings of desirable species. Machinery should be used only when the soil is firm enough to support the equipment. The seedling mortality rate can be reduced by planting on ridges, by selecting planting stock that is

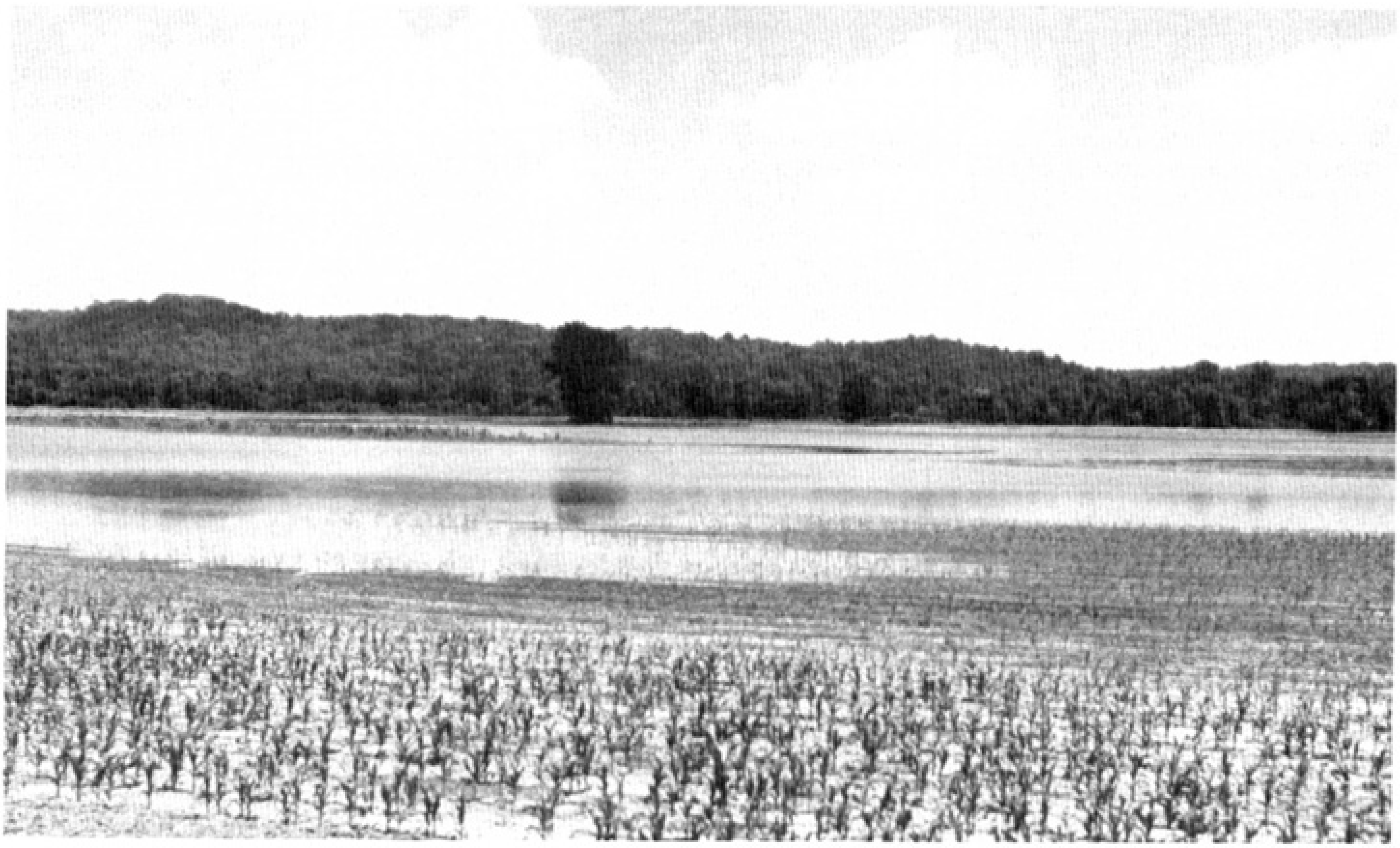


Figure 14.—Floodwater in an area of Darwin silty clay, frequently flooded.

older and larger than is typical, or by mulching. Some replanting may be needed. Harvest methods that do not isolate the remaining trees or leave them widely spaced reduce the windthrow hazard. Only high-value trees should be removed from a strip 50 feet wide along the west and south edges of the woodland. Plant competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

The land capability classification is IVw.

3394B—Haynie silt loam, frequently flooded, 1 to 5 percent slopes. This gently sloping, moderately well drained soil is on ridges and flood plains along the major streams. It is frequently flooded for very brief periods from February through June in most years. Individual areas are long and narrow or crescent shaped and are parallel to the rivers. They are 5 to 90 acres in size.

Typically, the surface layer is very dark grayish brown, very friable silt loam about 7 inches thick. The substratum to a depth of 60 inches is very friable. The upper part is stratified dark grayish brown, very dark grayish brown, and dark brown silt loam; the next part is dark brown, dark grayish brown, and brown, mottled loam; and the lower part is stratified grayish brown and pale brown very fine sandy loam and loamy very fine sand.

Included with this soil in mapping are small areas of the somewhat poorly drained Blake and somewhat excessively drained Rocher soils. Blake soils have more clay throughout than the Haynie soil. Also, they are lower on the flood plains. Rocher soils have more sand throughout than the Haynie soil and are droughty. They are on the slightly higher natural levees near the streams. Included soils make up 5 to 8 percent of the unit.

Water and air move through the Haynie soil at a moderate rate. Surface runoff is slow. Available water capacity is high. Most of the profile is mildly alkaline or moderately alkaline and is calcareous. Organic matter content is moderate to low. The potential for frost action is high.

Most areas are used for cultivated crops. This soil is moderately suited to row crops. It is well suited to woodland and to habitat for openland and woodland wildlife. It generally is unsuited to dwellings and septic tank absorption fields because of the flooding.

If this soil is used for corn or soybeans, erosion, flooding, and soil blowing are hazards. Also, the low available water capacity and the level of fertility are limitations. Irrigation is beneficial, and a source of irrigation water generally is available. Fertilizer should be applied in several small applications rather than one large application. During periods of flash flooding, scouring, deposition, and streambank cutting are hazards. In some years the overflow damages crops. Levees and drainage channels reduce the flooding hazard. Diversions can intercept surface runoff from the higher adjacent areas. Erosion can be controlled and moisture conserved by a conservation tillage system that leaves crop residue on the surface after planting, by contour farming, or by terraces. Field windbreaks and a tillage system that leaves the surface rough are effective in controlling soil blowing.

If this soil is used as woodland, plant competition is a management concern. It affects the seedlings of desirable species. The competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

The land capability classification is IIIw.

3619A—Parkville silty clay, frequently flooded, 0 to 3 percent slopes. This very gently sloping, somewhat poorly drained soil is adjacent to sloughs and overflow channels along the major streams. It is frequently flooded for brief periods from February through June in most years. Individual areas are long and narrow and range from 15 to 200 acres in size.

Typically, the surface soil is about 14 inches of very dark grayish brown and dark grayish brown, firm and very firm silty clay and silty clay loam. The substratum to a depth of 60 inches is dark brown, brown, and grayish brown, mottled, very friable, stratified silt loam, very fine sandy loam, and loamy very fine sand.

Included with this soil in mapping are small areas of the moderately well drained Haynie and poorly drained Darwin soils. Haynie soils have less clay in the upper part than the Parkville soil. They are in slightly higher positions on the flood plains. Darwin soils are clayey to a greater depth than the Parkville soil. They are in swales or low areas on the flood plains. Also included are soils on short, steep slopes on breaks to the sloughs or overflow channels. Included soils make up 5 to 10 percent of the unit.

Water and air move through the upper part of the Parkville soil at a very slow rate and through the lower part at a moderately rapid rate. Surface runoff is slow. Available water capacity is moderate. The seasonal high water table is at a depth of 1 to 2 feet from November through April in most years. The soil is mildly alkaline or moderately alkaline and is calcareous throughout. Organic matter content is moderate. The surface soil is firm and cannot be easily tilled. Clods form if the soil is tilled when it is too wet. Deep, wide cracks form during dry periods. The potential for frost action is moderate.

Most areas are used for cultivated crops. This soil is moderately suited to cultivated crops, woodland, and habitat for openland and woodland wildlife. It generally is unsuited to dwellings and septic tank absorption fields because of the flooding.

If this soil is used for corn, soybeans, or small grain, the flooding is a hazard. Also, the seasonal high water table can delay planting in some years. The flooding occurs less often than once every 2 years during the growing season. Dikes or diversions reduce the extent of the crop damage caused by floodwater. Selecting crop varieties adapted to a short growing season and to wet conditions also reduces the extent of this damage. A combination of subsurface drains and surface inlets helps to drain wet spots. Keeping tillage to a minimum and returning crop residue to the soil help to maintain tilth and productivity.

The land capability classification is IVw.

5308C—Alford silt loam, karst, 4 to 12 percent slopes. This sloping, well drained, slightly eroded to severely eroded soil is on ridges and side slopes that have a karst topography characterized by sinkholes. Most of the sinkholes have concave bottoms, where sediment accumulates. In a few areas, the bottom of the sinkholes is open and surface runoff flows through creviced bedrock into the ground water. Individual areas are circular or irregular in shape and range from 5 to 100 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 10 inches thick. The subsoil extends below a depth of 60 inches. It is yellowish brown and dark yellowish brown, firm silty clay loam and silt loam. In some areas the subsoil has grayish mottles and coatings. In other areas it has a dense and brittle layer. In severely eroded areas the surface layer is mostly silty clay loam from the upper part of the subsoil.

Included with this soil in mapping are small areas of silty alluvial soils at the base of the sinkholes. Also included are a few sinkholes that are ponded for long periods. Included areas make up 4 to 8 percent of the unit.

Water and air move through the Alford soil at a moderate rate. Surface runoff is slow or medium and generally flows into the sinkholes. Available water capacity is high. The subsoil is medium acid to very strongly acid. Organic matter content is moderately low or low. The potential for frost action is high.

Most areas are used for cultivated crops, hay, or pasture. This soil is moderately suited to row crops, small grain, and vegetables. It is well suited to hay, pasture, orchards, woodland, and habitat for openland and woodland wildlife. It generally is unsuited to dwellings and septic tank absorption fields because of the hazard of further sinkhole development.

If this soil is used for corn, soybeans, or small grain, erosion is a hazard and tilth is a limitation. Soil loss can be kept within tolerable limits by a crop rotation that includes 1 or more years of forage crops, by a conservation tillage system that leaves crop residue on the surface after planting, by contour farming, by terraces, or by a combination of these. Returning crop residue to the soil and regularly adding other organic material help to maintain productivity, prevent crusting, and improve tilth.

Adapted forage and hay plants grow well on this soil. Timely deferment of grazing helps to prevent overgrazing and thus also helps to prevent surface compaction, excessive runoff, and a greater susceptibility to erosion. Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to control erosion. Applications of fertilizer are needed. The plants should not be grazed or clipped until they are sufficiently established.

If this soil is used as woodland, plant competition is a management concern. It affects the seedlings of desirable species. The competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots. Measures that protect the woodland from fire are needed.

Most areas are on ridges or knolls, and a number are adjacent to steep hillsides that commonly are wooded. This setting favors such activities as picnicking, camping, and hiking. Cutting and filling are needed in some areas to overcome the slope. Measures that keep concentrated runoff from forming gullies on the adjacent side slopes are needed.

Trees and shrubs can be easily established on this soil. The existing stands of trees provide good habitat for woodland wildlife. The soil can be used for the grain and seed crops and grasses and legumes grown as food and cover for openland wildlife habitat. Protection from fire and grazing helps to prevent the depletion of the shrubs and sprouts that provide food for wildlife.

The land capability classification is IIIe.

5308E—Alford silt loam, karst, 12 to 25 percent slopes. This sloping, well drained, slightly eroded to severely eroded soil is on the sides of sinkholes and on ridges between the sinkholes in areas of karst topography. The sinkholes generally have concave bottoms, where surface runoff and sediment accumulate. In some areas, the bottom of the sinkholes is open and surface runoff flows through creviced bedrock and into the ground water. Individual areas are circular or irregular in shape and range from 5 to 30 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 3 inches thick. The subsoil is about 40 inches thick. The upper part is strong brown, firm silty clay loam, and the lower part is yellowish brown, firm silt loam. The substratum to a depth of 60 inches is brownish yellow silt loam. In places a dense and brittle layer is in the lower part of the subsoil. In some severely eroded areas, the surface layer is mostly silty clay loam from the upper part of the subsoil. In other areas the subsoil has a higher content of sand.

Included with this soil in mapping are small areas of Westmore soils on the lower part of some of the steeper side slopes, particularly where the sinkholes are open. These soils are clayey in the lower part of the subsoil. Also included are silty alluvial soils at the bottom of closed sinkholes. Included soils make up 9 to 14 percent of the unit.

Water and air move through the Alford soil at a moderate rate. Surface runoff is medium or rapid and generally flows into the sinkholes. Available water capacity is high. The subsoil is medium acid to very strongly acid. Organic matter content is moderately low or low. The potential for frost action is high.

Most areas are used as pasture or woodland. This soil is well suited to pasture and woodland and to habitat for openland and woodland wildlife. It generally is unsuited to cultivated crops, dwellings, and septic tank absorption fields because of the gradient and shape of the slopes and the hazard of further sinkhole development.

Establishing pasture plants or hay helps to control erosion on this soil. Overgrazing causes surface compaction, excessive runoff, and a greater susceptibility to erosion. Proper stocking rates and timely deferment of grazing help to prevent overgrazing. Applications of fertilizer are needed. The plants should not be grazed or clipped until they are sufficiently established. Tilling on the contour when a seedbed is prepared or the pasture is renovated helps to keep the pasture in good condition and helps to control erosion.

If this soil is used as woodland, the erosion hazard and the equipment limitation are management concerns. They are caused by the slope. Plant competition also is a management concern. It affects the seedlings of desirable species. The competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Logging roads and skid trails should be established on the contour if possible. On the steeper slopes, the logs or trees should be skidded uphill with a cable and winch. Firebreaks should be the grass type. Bare logging areas should be seeded to grass or to a grass-legume mixture. Machinery should be used only when the soil is firm enough to support the equipment. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, compaction of the soil, and damage to tree roots.

The undulating and rolling areas of native woodland are suited to carefully planned trails and paths for hiking and sightseeing. Measures that control erosion are essential.

The land capability classification is VIe.

Prime Farmland

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

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

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

About 169,440 acres in Randolph County, or nearly 44 percent of the total acreage, meets the requirements for prime farmland. Associations 1, 4, 5, 6, 7, and 8, which are described under the heading "General Soil Map Units," have the highest percentage of prime farmland. Most of this land is used for cultivated crops, mainly corn, soybeans, and wheat, which account for much of the local agricultural income each year.

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

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

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

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

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

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

About 215,700 acres in Randolph County is used as cropland and 16,700 acres as permanent pasture. The soils have good potential for increased production of crops, particularly corn, soybeans, and hay. This soil survey is a valuable guide to the latest management techniques that can increase food production.

The main management needs in the county are measures that control erosion, drain the wetter soils, and improve fertility and tilth. Soil erosion is a major problem on more than two-thirds of the cropland and half of the pasture in the county. It is a hazard if the slope is more than 2 percent and the surface is not protected.

Sheet erosion, or loss of the surface layer, is damaging for three major reasons. First, the productivity of most soils is reduced if the surface layer is eroded away and the subsoil is incorporated into the plow layer. Second, severe erosion on sloping soils reduces the rate of water infiltration. It is especially damaging on clayey soils that are cloddy when wet and that puddle and crust after hard rains. As a result of the cloddiness, preparing a good seedbed is difficult. The crusting increases the runoff rate. Third, uncontrolled erosion allows sediment to enter drainage ditches, streams, lakes, rivers, and road ditches. Removing this sediment is expensive. Management that controls erosion minimizes pollution by sediment and improves water quality for municipal and recreational uses and for fish and wildlife.

Conservation practices provide a protective surface cover, increase the rate of water infiltration, and reduce the risks of runoff and erosion. In some areas a combination of practices is required for adequate erosion control.

A conservation cropping system is one that keeps a plant cover on the soil, minimizes erosion, and helps to maintain the productivity of the soil. The cropping sequence commonly includes grasses and legumes for hay and pasture. The grasses and legumes help to control erosion, provide nitrogen, and improve tilth.

Contour stripcropping helps to control erosion through a combination of a crop rotation and contour farming. Strips of close-growing crops are alternated with row crops on the slopes. For ease of farming, the strips generally parallel one another.

Terraces, contour farming, and conservation tillage help to control erosion by decreasing the rate of runoff. Terraces are effective on slopes that are uniform and are not broken by drainageways (fig. 15). Some sloping soils, such as Coulterville soils, which have a high content of sodium in the subsoil, and Colp soils, which have a high content of clay in the subsoil, generally are not suited to terracing. Alford, Hosmer, and Stoy soils generally can be terraced. Contour farming, which includes both tilling and planting on the contour, is most effective on slopes of 7 percent or less. It is commonly used in combination with terraces. Land smoothing helps to align the terraces and facilitates contour cultivation.

A conservation tillage system is one in which crop residue is left on the surface through the planting season. The crop residue protects the soil from erosion, helps to maintain good soil structure, minimizes surface compaction, and improves tilth. A no-till or minimum tillage system helps to control erosion, reduces the runoff rate, and increases the rate of water intake. Conservation tillage is suitable on most of the soils in the county but is less successful on severely eroded

Figure 15.—A grassed ridge terrace and an inlet in an area of Alford and Stoy soils.

soils, on soils that have a clayey surface layer, and in nearly level areas where wetness is a problem.

Sandy soils are susceptible to soil blowing. Bloomfield soils are an example. Maintaining a cover of plants or mulch and keeping the surface rough through proper tillage help to control soil blowing. Windbreaks also are effective in controlling soil blowing.

Further information about measures that control soil blowing and water erosion is available at the local office of the Soil Conservation Service.

A drainage system is needed on much of the farmland in the county. About one-third of the cropland occurs as somewhat poorly drained or poorly drained soils. Darwin and Fults soils on bottom land and Rushville and Okaw soils on uplands are examples of poorly drained soils in the county. Unless these soils are drained, planting is delayed and yields are reduced during most years.

The design of drainage systems varies from soil to soil. Subsurface drains function well where the soil is permeable and outlets are available. Surface ditches are needed where permeability is restricted. A combination of subsurface drains and surface outlets can drain wet spots. Areas that are subject to overflow during the growing season should be protected by diversion terraces or by levees. Land shaping improves surface drainage on poorly drained and somewhat poorly drained soils. Information about the drainage system suitable for each kind of soil is available in the local office of the Soil Conservation Service.

Soil fertility is naturally low in most of the soils on uplands in the county. Most of the soils in the county, except for the major ones in the Darwin-Fults, Haynie-Blake-Landes, and Wakeland-Haymond soil associations, are naturally acid. Applications of limestone can raise the pH level in acid soils.

Most of the soils in the county have a naturally low supply of nitrogen. Exceptions are soils having a dark surface layer, such as Darwin and Raddle soils. Crops, such as corn and wheat, respond well to applications of nitrogen fertilizer. Planting legumes, which take nitrogen from the air, and adding livestock waste to the soil help to replenish the nitrogen supply. Additions of lime, nitrogen, phosphorus, potassium, and other elements should be based on the results of soil tests. The Cooperative Extension Service can help in determining the kinds and amounts of nutrients needed.

Soil tilth is an important factor influencing the germination of seeds, the rate of runoff, and the rate of water intake. A surface soil that is in good tilth is granular and porous. Poor tilth is a problem in light colored soils that are low in content of organic matter. The structure of these soils is weak. During periods of intense rainfall, a crust forms on the surface. Because it is nearly impervious to water, this crust increases the risks of runoff and erosion. Including grasses or deep-rooted legumes in the crop rotation, adding manure, and chisel plowing improve tilth.

Field crops that are suited to the soils and climate of the county include corn, soybeans, and grain sorghum. Many areas of wheat are double cropped with soybeans. Wheat is the principal close-growing crop. Rye, barley, and oats are occasionally grown. Other crops grown commercially in the county include apples, peaches, strawberries, and vegetables. The soils and the pattern of air drainage in the Alford association are particularly well suited to fruit production. The less sloping areas in this association and in the Hosmer-Stoy-Hickory association generally are suited to vegetable crops.

Alfalfa hay is grown on about 10,000 acres of cropland throughout the county (fig. 16). Much of it is grown as a source of feed for dairy and beef cattle. The county has over 100 dairy farms.

Proper management of permanent or rotation pasture helps to obtain optimum production. Periodic renovation increases the productivity and quality of the forage. The renovation program should include applications of fertilizer based on the results of soil tests. Other management needs are erosion control, selection of suitable species for planting, disease and insect control, rotation grazing, and measures that maintain fertility.

A grass-legume mixture is desirable in newly seeded areas. Including orchardgrass, tall fescue, or timothy in a mixture with alfalfa improves productivity, helps to control erosion, minimizes the damage caused by winter heaving, and results in a more efficient use of the soil nutrients. Fertilizer should be applied to maintain a proper grass-legume ratio and to replace the nutrients removed during a harvest.

In areas of native or introduced grasses, such as Kentucky bluegrass and tall fescue, proper management is needed to maintain production and control erosion. Delayed grazing in the spring, proper stocking rates, and a fertility program increase forage production. Intertilling legumes into these grasses improves the quality of the forage.

In the descriptions under the headings "Detailed Soil Map Units" and "General Soil Map Units," the suitability of the soils for cultivated crops and for hay and pasture is specified. The land capability class indicates the suitability for cultivated crops. Class I or II soils are well suited to cultivated crops; Class III, moderately suited; Class IV, poorly suited; and Class V, VI, and VII, generally unsuited. Expected average yields indicate the suitability for hay. Soils that can produce over 3 tons per acre generally are well suited; those with yields of 2 to 3 tons per acre generally are moderately suited; and those with yields of less than 2 tons per acre generally are poorly suited. Soils that have a slope of more than 18 percent also are poorly suited. The expected animal-unit-months indicate the suitability for pasture. Soils that can yield an average of over 5 animal-unit-months are generally well suited; those than can yield 3 to 5 animal-unit-months generally are moderately suited; and those that can yield less than 3 animal-unit-months generally

Figure 16.—Hay in an area of Coulterville-Oconee silt loams, 2 to 5 percent slopes.

are poorly suited. Soils that have a slope of more than 30 percent also are poorly suited.

Yields Per Acre

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

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents (*4*). Available yield data from nearby counties and results of field trials and demonstrations are also considered.

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

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

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

Land Capability Classification

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

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

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

Class I soils have few limitations that restrict their use.

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

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

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

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

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

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

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

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

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

Woodland Management and Productivity

Hardwood forests originally covered most areas of Randolph County. Only 52,607 acres in the county was woodland in 1976 (*8*). This acreage includes state forests and parks. In 1982, about 41,800 acres was woodland (*11*).

Most of the trees have been cleared from the soils suitable for cultivated crops. As a result, much of the remaining woodland occurs as soils that are unsuitable for cultivation (fig. 17). Many areas are too steep, too wet, too stony, or too remote for cultivated crops. The soils in the wooded areas have fair or good potential for trees of high quality if the best suited species are selected for planting and the woodland is properly managed.

The largest areas of woodland are in soil associations 4, 5, 8, and 9, which are described under the heading "General Soil Map Units." The most common desirable trees on uplands are white oak, red oak, black oak, hickory, black walnut, and yellow-poplar. The main species on bottom land are cottonwood, sycamore, sweetgum, pin oak, and pecan.

Harvesting mature trees and removing unmerchantable trees can improve much of the commercial woodland. Measures that protect the woodland from fire and from grazing by livestock are needed. Tree planting is needed unless stocking is adequate. Control of competing vegetation is needed if seedlings are planted. A cover of grasses between the rows of seedlings helps to control erosion in sloping areas. If excessive erosion occurs or the slope is more than about 15 percent, runoff should be diverted away from haul roads and skid trails. A surface drainage system improves the woodland in wet

Figure 17.—Upland oaks on Alford-Ursa silt loams, 18 to 30 percent slopes. These soils are generally unsuited to cultivated crops and are moderately suited to woodland.

areas. Machinery should be used only when the soil is firm enough to support the equipment.

Table 7 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

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

In table 7, *slight, moderate,* and *severe* indicate the degree of the major soil limitations to be considered in management.

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

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

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

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

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

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

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

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

Windbreaks and Environmental Plantings

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

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

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

Table 8 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 8 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a commercial nursery.

Recreation

Randolph County has many areas of scenic, geologic, and historic interest. These areas are used for camping, hiking, hunting, fishing, sightseeing, picnicking, and boating. The public lands available for recreation include the Randolph County Conservation Area, the Baldwin Lake Conservation Area, Ft. Kaskaskia Historic Site, Ft. De Chartres Historic Site, and Piney Creek Nature Preserve.

The use of recreational areas in the county has increased greatly in recent years. The potential for additional development of recreational facilities is good throughout the county. The areas having the best potential are in soil associations 4, 8, and 9, which are described in the section "General Soil Map Units." These associations are characterized by hilly terrain, wooded slopes, rock formations, and many streams, all of which provide a variety of recreational possibilities.

The soils of the survey area are rated in table 9 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 9, 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 9 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 12 and interpretations for dwellings without basements and for local roads and streets in table 11.

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 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

Randolph County has a large and varied population of fish and wildlife. White-tailed deer, squirrels, thrushes, and bluejays inhabit the wooded areas. Bobwhite quail, cottontail rabbits, red fox, and many types of songbirds live in farmed areas where enough food and cover are available. Catfish, crappie, largemouth bass, smallmouth bass, and sunfish are common species in the streams and lakes. Some of the lakes and wetlands also provide resting and feeding sites for migrating ducks and geese in the spring and fall.

In many areas the wildlife habitat can be improved by providing food, cover, and water. The areas that have the best potential for improvement are in soil associations 2, 3, 4, 7, 8, and 9, which are described in the section "General Soil Map Units."

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

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

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

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

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, lovegrass, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, and grama.

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

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

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

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

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

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

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

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas (fig. 18). Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Engineering

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

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

Figure 18.—An area of Birds silt loam, wet, which furnishes temporary feeding and resting sites for waterfowl.

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 11 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 (fig. 19). The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic

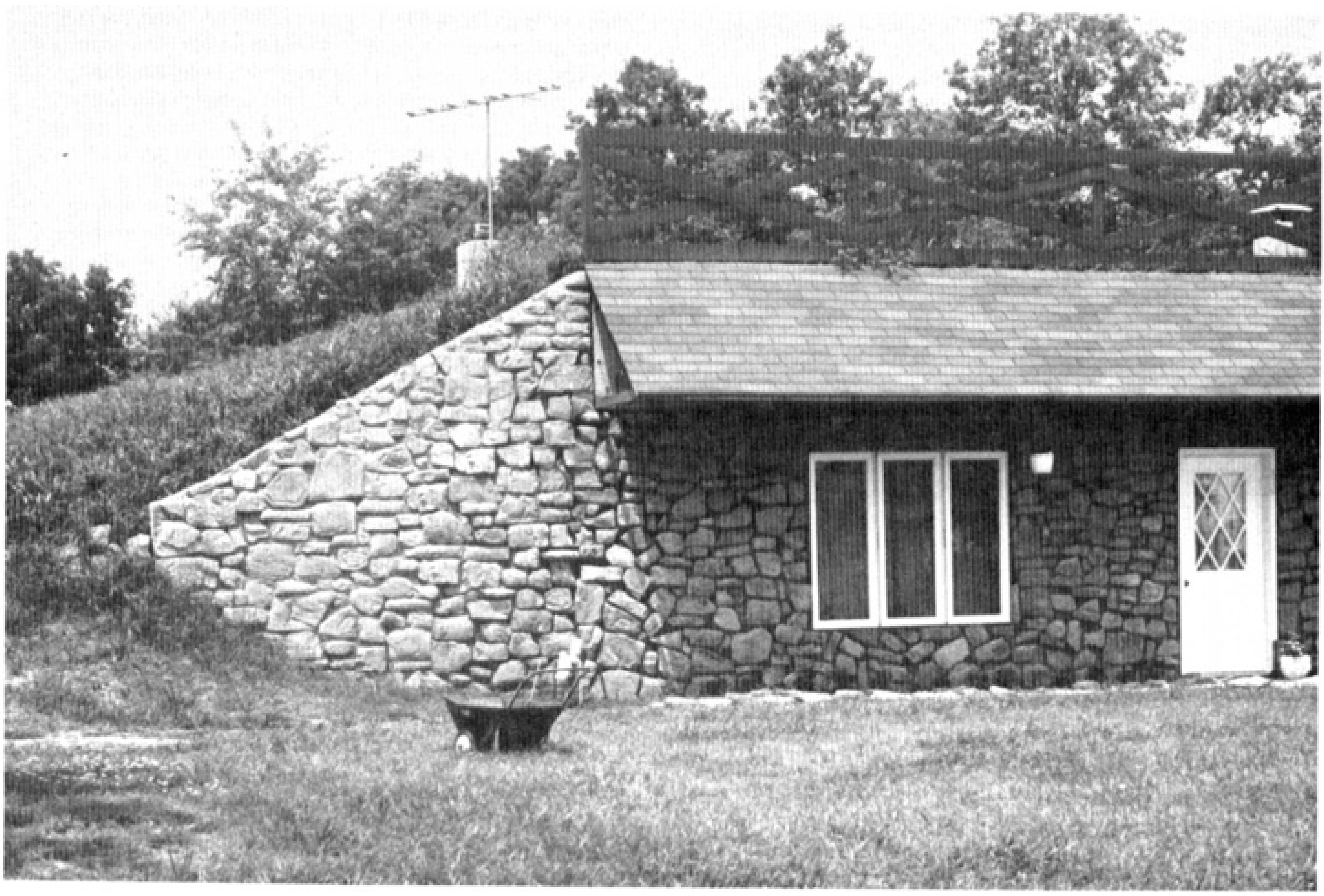


Figure 19.—A dwelling in an area of Hosmer silt loam, 1 to 5 percent slopes.

matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 12 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 12 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, and flooding affect absorption of the effluent. Large stones 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 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 12 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 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 12 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 the 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 13 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 13, 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 14 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and for embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

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

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

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

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment.

Generally, deeper onsite investigation is needed to determine these properties.

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

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

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

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

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

Soil Properties

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

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 18.

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 15 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. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

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

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

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

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in table 18.

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

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

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

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

Physical and Chemical Properties

Table 16 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

5. Loamy soils that are less than 20 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control soil blowing are used.

6. Loamy soils that are 20 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.

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

8. Stony or gravelly soils and other soils not subject to soil blowing.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 16, 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 17 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

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

The four hydrologic soil groups are:

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

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

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

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

If a soil is assigned to two hydrologic groups in table 17, the first letter is for drained areas and the second is for undrained areas.

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

Table 17 gives the frequency and duration of flooding and the time of year when flooding is most likely.

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

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

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

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 17 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 17.

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

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

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

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

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

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

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

Engineering Index Test Data

Table 18 shows laboratory test data for several pedons sampled at carefully selected sites in the survey area. The pedons are representative of the series described in the section "Soil Series and Their Morphology." The soil samples were tested by the Illinois Department of Transportation.

The testing methods generally are those of the American Association of State Highway and Transportation Officials (AASHTO) or the American Society for Testing and Materials (ASTM).

The tests and methods are AASHTO classification—M 145 (AASHTO), D 3282 (ASTM); Unified classification—D 2487 (ASTM); Mechanical analysis—T 88 (AASHTO), D 2217 (ASTM); Liquid limit—T 89 (AASHTO), D 423 (ASTM); Plasticity index—T 90 (AASHTO), D 424 (ASTM); and Moisture density, Method A—T 99 (AASHTO), D 698 (ASTM).

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*10*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 19 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

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

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

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

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

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-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* (*9*). Many of the technical terms used in the descriptions are defined in *Soil Taxonomy* (*10*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

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

Alford Series

The Alford series consists of well drained, moderately permeable soils on ridgetops, knolls, and side slopes in the uplands (fig. 20). These soils formed in loess. Slopes range from 1 to 50 percent.

Alford soils are similar to Hosmer, St. Charles, and Westmore soils and commonly are adjacent to Hickory, Ursa, Wellston, and Westmore soils. Hosmer soils have mottles with chroma of 2 or less in the lower part of the subsoil and have a dense and brittle layer in the lower part. They commonly are on the slightly lower or less sloping parts of the landscape. St. Charles soils have

Figure 20.—An area of Alford soils on narrow, gently sloping ridgetops and moderately sloping to steep side slopes.

more sand in the lower part than the Alford soils. Hickory, Ursa, Wellston, and Westmore soils are on slopes below the Alford soils. Hickory soils formed dominantly in glacial till. Ursa soils contain more clay, sand, and pebbles throughout than the Alford soils. Wellston and Westmore soils contain rock fragments in the lower part and have bedrock within a depth of 6 feet.

Typical pedon of Alford silt loam, 1 to 5 percent slopes, in a cultivated field about 4 miles southwest of Steeleville; approximately 2,200 feet south and 2,000 feet east of the northwest corner of sec. 25, T. 6 S., R. 6 W.

Ap—0 to 9 inches; dark yellowish brown (10YR 4/4) silt loam, yellowish brown (10YR 5/4) dry; weak medium granular structure; friable; common fine and very fine roots; slightly acid; abrupt smooth boundary.

Bt1—9 to 14 inches; yellowish brown (10YR 5/6) silty clay loam; weak and moderate medium subangular blocky structure; friable; common fine roots; few thin brown (7.5YR 4/4) clay films on faces of peds; slightly acid; clear smooth boundary.

Bt2—14 to 24 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium subangular blocky structure; firm; common fine roots; common distinct brown (7.5YR 4/4) clay films on faces of peds; medium acid; clear smooth boundary.

Bt3—24 to 42 inches; strong brown (7.5YR 5/6) silty clay loam; strong medium prismatic structure parting to strong fine and medium subangular blocky; firm; few fine and very fine roots; common distinct brown (7.5YR 4/4) clay films and few thin very pale brown (10YR 7/3) silt coatings on faces of peds; few dark stains (iron and manganese oxides); very strongly acid; clear smooth boundary.

Bt4—42 to 58 inches; strong brown (7.5YR 5/6) silt loam; moderate medium prismatic structure parting to weak medium and coarse subangular blocky; friable; few fine and very fine roots; few distinct brown (7.5YR 4/4) clay films and few faint very pale brown (10YR 7/3) silt coatings on faces of peds; common dark stains (iron and manganese oxides); strongly acid; gradual smooth boundary.

C—58 to 60 inches; strong brown (7.5YR 5/6) silt loam; massive; friable; few thin pinkish gray (7.5YR 6/2) clay coatings in vertical cracks and channels; few dark stains (iron and manganese oxides); strongly acid.

The thickness of the solum ranges from 45 to more than 60 inches. The control section ranges from 22 to 30 percent clay and averages less than 10 percent sand.

The A horizon is very dark grayish brown (10YR 3/2) in wooded areas. The Ap or A horizon is dominantly silt loam, but the range includes silty clay loam in severely eroded areas. The most acid part of the Bt horizon commonly ranges from medium acid to very strongly acid.

Banlic Series

The Banlic series consists of somewhat poorly drained, slowly permeable soils on low stream terraces. These soils formed in silty alluvium. Slopes range from 0 to 3 percent.

Banlic soils commonly are adjacent to Birds, Haymond, and Wakeland soils. The adjacent soils are on the flood plains. They do not have a Bx horizon. Also, Haymond soils do not have chroma of 2 or less within a depth of 30 inches.

Typical pedon of Banlic silt loam, 0 to 3 percent slopes, in a cultivated field about 3 miles south of Welge; approximately 440 feet west and 4,880 feet north of the southeast corner of partial sec. 23, T. 7 S., R. 6 W.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak medium granular and subangular blocky structure; friable; few fine dark concretions (iron and manganese oxides); neutral; abrupt smooth boundary.

E1—7 to 12 inches; dark brown (10YR 4/3) silt loam; weak thick platy structure; friable; few dark stains and concretions (iron and manganese oxides); slightly acid; clear smooth boundary.

E2—12 to 17 inches; brown (10YR 5/3) silt loam; few medium prominent strong brown (7.5YR 5/8) and few medium faint yellowish brown (10YR 5/8) mottles; weak coarse prismatic structure parting to weak thick platy; friable; many dark stains and concretions (iron and manganese oxides); strongly acid; clear smooth boundary.

Bg—17 to 22 inches; light brownish gray (10YR 6/2) silt loam; few medium prominent brown (7.5YR 5/4) mottles; weak coarse prismatic structure; firm; common faint white (10YR 8/2) silt coatings on faces of peds; many fine dark stains and concretions (iron and manganese oxides); very strongly acid; clear smooth boundary.

Bx1—22 to 38 inches; light brownish gray (10YR 6/2) silt loam; common medium prominent brown (7.5YR 5/4) mottles; weak and moderate medium prismatic structure; firm; brittle; many distinct white (10YR 8/2) silt coatings on faces of peds; common coarse dark stains (iron and manganese oxides); very strongly acid; clear smooth boundary.

Bx2—38 to 54 inches; grayish brown (10YR 5/2) silt loam; common coarse prominent strong brown (7.5YR 5/8) and reddish brown (5YR 4/4) mottles; weak coarse prismatic structure; firm; brittle; common distinct light gray (10YR 7/2) silt coatings on faces of peds; strongly acid; gradual smooth boundary.

Cg—54 to 60 inches; dark grayish brown (10YR 4/2) silt loam; common medium prominent brown (7.5YR 4/4) mottles; massive; friable; few faint light gray (10YR 7/2) silt coatings in crevices; strongly acid.

The thickness of the solum ranges from 45 to 60 inches. The depth to the Bx horizon ranges from 20 to 36 inches. The control section ranges from 10 to 18 percent clay and averages less than 15 percent fine sand or coarser sand. The B horizon ranges from medium acid to very strongly acid throughout.

The Ap or A horizon has value of 4 or 5 and chroma of 2 or 3. The Bx horizon is silt loam or silt. It is firm or very firm.

Birds Series

The Birds series consists of poorly drained, moderately slowly permeable soils in low areas on flood plains. These soils formed in silty alluvium derived primarily from loess-covered uplands. Slopes commonly are less than 1 percent but range from 0 to 2 percent.

Birds soils commonly are adjacent to Haymond and Wakeland soils. The well drained Haymond and somewhat poorly drained Wakeland soils are mainly on the slightly higher parts of the flood plains, but they also are along degrading streams or overflow channels in the lower areas of more recent sediments.

Typical pedon of Birds silt loam, in a wooded area about 1 mile southeast of Eden; approximately 1,260 feet north and 400 feet east of the southwest corner of sec. 10, T. 5 S., R. 5 W.

A—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; common fine, medium, and coarse roots; medium acid; clear smooth boundary.

ACg—9 to 16 inches; gray (10YR 5/1) silt loam; few fine distinct dark yellowish brown (10YR 4/4) and strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure parting to moderate medium granular; friable; common fine, medium, and coarse roots; common dark stains and concretions (iron and manganese oxides); medium acid; clear smooth boundary.

Cg1—16 to 28 inches; light brownish gray (10YR 6/2) silt loam; few fine distinct dark yellowish brown (10YR 4/4) and few fine prominent strong brown (7.5YR 5/6) mottles; massive; friable; few fine, medium, and coarse roots; common dark stains and concretions (iron and manganese oxides); medium acid; clear smooth boundary.

Cg2—28 to 41 inches; gray (10YR 5/1) silt loam; common medium distinct yellowish brown (10YR 5/6) and dark yellowish brown (10YR 4/4) mottles; massive; friable; few thin strata of darker material; light brownish gray (10YR 6/2) silt coatings in channels and crevices; few fine, medium, and coarse roots; few dark stains and concretions (iron and manganese oxides); slightly acid; gradual smooth boundary.

Cg3—41 to 60 inches; dark gray (10YR 4/1) silt loam; common medium prominent strong brown (7.5YR 5/6) and distinct yellowish brown (10YR 5/6) mottles; massive; friable; light brownish gray (10YR 6/2) silt coatings in channels and crevices; few dark stains and concretions (iron and manganese oxides); slightly acid.

The thickness of the solum ranges from 5 to 20 inches. The control section ranges from 18 to 27 percent clay and averages less than 15 percent fine sand or coarser sand. Reaction ranges from medium acid to mildly alkaline throughout the profile.

The A horizon has hue of 10YR, value of 4 to 6, and chroma of 1 or 2. In some pedons the AC horizon has hue of 2.5Y or 5Y and value of 3 to 6 and is mottled. The Cg horizon has hue of 10YR, 2.5Y, or 5Y, value of 4 to 7, and chroma of 1 or 2 and is mottled. It is dominantly silt loam, but some pedons have strata of silty clay loam or loam.

Blair Series

The Blair series consists of somewhat poorly drained, moderately slowly permeable soils on hillsides and side slopes on dissected till plains. These soils formed in erosional sediments and glacial till. They have a thin loess mantle in places. Slopes range from 5 to 18 percent.

Blair soils are similar to Grantfork soils and commonly are adjacent to Grantfork, Hickory, Hosmer, Stoy, and Ursa soils. Grantfork soils have more exchangeable sodium in the subsoil than the Blair soils. They are on the lower parts of the slopes. Hickory soils are well drained and generally are on the steeper slopes farther downstream from the Blair soils. Hosmer and Stoy soils are on slopes above the Blair soils. They formed entirely in loess and have a Btx horizon. Also, Hosmer soils are moderately well drained. Ursa soils have more clay in the control section than the Blair soils. They are on side slopes below the Blair soils.

Typical pedon of Blair silt loam, 10 to 18 percent slopes, eroded, in a pasture about 3 miles east of Sparta; approximately 50 feet east and 195 feet north of the southwest corner of sec. 35, T. 4 S., R. 5 W.

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

Bt1—8 to 14 inches; yellowish brown (10YR 5/4) silty clay loam; weak medium subangular blocky structure; firm; few faint yellowish brown (10YR 5/4) clay films on faces of peds; about 8 percent sand and 3 percent small pebbles; common fine and very fine roots; very strongly acid; abrupt smooth boundary.

Bt2—14 to 16 inches; pale brown (10YR 6/3) silty clay loam; moderate medium subangular blocky structure; firm; many distinct brown (10YR 5/3) clay films on faces of peds; about 8 percent sand and 3 percent pebbles; common fine and very fine roots; very strongly acid; abrupt smooth boundary.

Bt3—16 to 21 inches; grayish brown (10YR 5/2) silty clay loam; few fine distinct yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure; hard; many distinct grayish brown (10YR 5/2) clay films on faces of peds; common distinct light gray (10YR 7/2) silt coatings on faces of peds; about 10 percent sand and 5 percent pebbles; common fine and very fine roots; very strongly acid; clear smooth boundary.

Btg1—21 to 28 inches; light brownish gray (10YR 6/2) silty clay loam; few fine distinct yellowish brown (10YR 5/4) mottles; moderate coarse subangular blocky structure; hard; many distinct grayish brown (10YR 5/2) clay films on faces of peds; about 9 percent sand and 4 percent pebbles; few fine and very fine roots; very strongly acid; clear smooth boundary.

Btg2—28 to 33 inches; light brownish gray (10YR 6/2) silty clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky and moderate thick platy structure; hard; many distinct grayish brown (10YR 5/2) clay films on faces of peds; about 14 percent sand and 4 percent pebbles; few fine and very fine roots; strongly acid; clear smooth boundary.

Btg3—33 to 45 inches; gray (10YR 6/1) silty clay loam; common coarse prominent strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky and moderate thick platy structure; firm; few distinct light brownish gray (10YR 6/2) clay films on faces of peds; about 14 percent sand and 5 percent pebbles; few fine and very fine roots; strongly acid; gradual smooth boundary.

BCg—45 to 60 inches; gray (10YR 6/1) silty clay loam; common coarse to fine prominent strong brown (7.5YR 4/6) mottles; weak thick platy structure; firm; few faint light brownish gray (10YR 6/2) clay films on faces of peds; about 11 percent sand and 3 percent pebbles; very few fine and very fine roots; medium acid; gradual smooth boundary.

Cg—60 to 65 inches; gray (10YR 6/1) silty clay loam; few fine prominent strong brown (7.5YR 5/6) mottles; massive; firm; about 17 percent sand and 5 percent pebbles; slightly acid.

The thickness of the solum ranges from 50 to more than 60 inches. The control section ranges from 25 percent to 35 percent clay and from 10 to 25 percent sand and till pebbles.

The A horizon typically is silt loam or loam, but the range includes clay loam and silty clay loam. This horizon ranges from 3 to 10 inches in thickness. The Bt horizon ranges from very strongly acid in the upper part to mildly alkaline in the lower part. The upper part of this horizon is silty clay loam or silt loam. The lower part is silty clay loam, clay loam, or loam. It has mottles or matrix colors with chroma of 1 or 2.

Blake Series

The Blake series consists of somewhat poorly drained soils mainly on low, broad ridges and in high swales on flood plains along the major streams. These soils formed in stratified, calcareous, silty recent alluvium. Permeability is moderate in the upper part of the profile and moderately rapid in the lower part. Slopes range from 0 to 3 percent.

Blake soils commonly are adjacent to Darwin, Haynie, and Parkville soils. The poorly drained Darwin soils are in low areas below the Blake soils. They average more than 40 percent clay in the control section. The moderately well drained Haynie soils are on ridges above the Blake soils. They average less than 18 percent clay in the control section. Parkville soils have more clay in the upper part than the Blake soils and more sand in the lower part. They are in landscape positions similar to those of the Blake soils.

Typical pedon of Blake silty clay loam, 0 to 3 percent slopes, in a cultivated field about 1 mile south of Rockwood; 3,295 feet south and 897 feet west of the northeast corner of partial sec. 18, T. 8 S., R. 5 W.

Ap—0 to 6 inches; very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; moderate fine granular structure in the upper part; massive and moderate fine subangular blocky structure in the lower part; firm; mildly alkaline; clear smooth boundary.

C1—6 to 15 inches; stratified very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; few fine faint grayish brown (10YR 5/2) mottles; thin bedding planes; firm; slight effervescence; mildly alkaline; clear smooth boundary.

C2—15 to 20 inches; stratified dark grayish brown (10YR 4/2) silty clay loam and brown (10YR 5/3) silt loam; common medium distinct yellowish brown (10YR 5/4) mottles; moderately thick bedding planes; firm; very dark gray (10YR 3/1) faces of peds and worm casts; slight effervescence; mildly alkaline; abrupt smooth boundary.

C3—20 to 33 inches; stratified dark brown (10YR 4/3) silt loam and very dark grayish brown (10YR 3/2) silty clay loam; common medium faint yellowish brown (10YR 5/4) mottles; massive; friable; many fine pores; common worm casts; slight effervescence; mildly alkaline; abrupt smooth boundary.

C4—33 to 60 inches; stratified brown (10YR 5/3) and dark grayish brown (10YR 4/2) silt loam, loam, and very fine sandy loam; many medium and coarse faint pale brown (10YR 6/3) mottles; massive; very friable; strong effervescence; mildly alkaline.

The thickness of the solum is less than 10 inches and corresponds to the thickness of the A or Ap horizon. Free carbonates are throughout the 10- to 40-inch control section. The content of fine sand or coarser sand is less than 15 percent in the control section.

The A horizon is silty clay loam or silt loam. The C horizon ranges from 25 to 35 percent clay, although individual strata may exceed 35 percent. The depth to the moderately rapidly permeable material is 22 to 35 inches. This material occurs as layers of silt loam, loam, or very fine sandy loam and ranges from 10 to 28 percent clay. It has mottles or matrix colors with chroma of 2 or less. In some pedons as much as 12 inches of loamy very fine sand is below a depth of 40 inches.

Bloomfield Series

The Bloomfield series consists of somewhat excessively drained, rapidly permeable soils on the summits of ridges and the sides of terraces. These soils formed in wind- and water-deposited, sandy sediments. Slopes range from 1 to 20 percent.

Bloomfield soils commonly are adjacent to Martinsville, Roby, and St. Charles soils. The adjacent soils are either on the slightly lower ridges or on the side slopes farther from the stream. The well drained Martinsville and moderately well drained St. Charles soils have more clay and less sand in the Bt horizon than the Bloomfield soils. The somewhat poorly drained Roby soils have mottles with chroma of 2 or less in the upper part of the Bt horizon.

Typical pedon of Bloomfield loamy fine sand, 1 to 7 percent slopes, in a cultivated field about 3 miles southwest of Evansville; Illinois State Plane Coordinates

505,400 feet north and 558,400 feet east (Illinois West Zone), T. 5 S., R. 8 W.

Ap—0 to 12 inches; dark brown (10YR 4/3) loamy fine sand, brown (10YR 5/3) dry; weak fine and medium subangular blocky structure; very friable; many fine and very fine roots; neutral; abrupt smooth boundary.

E—12 to 23 inches; dark yellowish brown (10YR 4/4) loamy fine sand; weak medium subangular blocky structure; very friable; few thin dark brown (10YR 4/3) clay bridges between sand grains; common fine dark stains and accumulations (iron and manganese oxides); common fine and very fine roots; neutral; clear smooth boundary.

Bw—23 to 33 inches; yellowish brown (10YR 5/4) loamy fine sand; weak medium and coarse subangular blocky structure; very friable; few distinct dark yellowish brown (10YR 4/4) clay films bridging sand grains; common fine dark stains and accumulations (iron and manganese oxides); few fine and very fine roots; neutral; clear smooth boundary.

E'—33 to 41 inches; yellowish brown (10YR 5/6) loamy fine sand; single grained; loose; common fine dark stains and accumulations (iron and manganese oxides); few fine and very fine roots; neutral; clear smooth boundary.

E&Bt—41 to 60 inches; brownish yellow (10YR 6/6) loamy fine sand (E part); single grained; loose; brown (7.5YR 4/4) fine sandy loam lamellae (Bt part) 0.25 inch to 1.25 inches thick with a total thickness of about 7 inches; massive; very friable; very few very fine roots; neutral.

The solum ranges from 50 to more than 60 inches in thickness. It ranges from strongly acid to mildly alkaline.

The A and E horizons are loamy fine sand or fine sandy loam. The individual Bt lamellae, which typically are below a depth of 35 inches, are 1/4 inch to 5 inches thick. The total thickness of the lamellae ranges from 6 to 12 inches in the 60-inch profile. The lamellae are fine sandy loam or loamy fine sand. In some pedons they have weak subangular blocky structure.

Booker Series

The Booker series consists of very poorly drained, very slowly permeable soils in depressional areas on broad flood plains along the major rivers. These soils formed in clayey slack-water sediments. Slopes range from 0 to 2 percent.

Booker soils are similar to Darwin, Fults, and Jacob soils and commonly are adjacent to those soils. The adjacent soils are in the slightly higher landscape positions. Darwin and Fults soils have less clay in the control section than the Booker soils. Also, Fults soils have loamy material within a depth of 45 inches. Jacob soils do not have a mollic epipedon and are more acid in the Bg horizon than the Booker soils.

Typical pedon of Booker silty clay, in a cultivated field about 1 mile south of Modoc; Illinois State Plane Coordinates 496,200 feet north and 540,100 feet east (Illinois West Zone), T. 5 S., R. 8 W.

Ap—0 to 7 inches; very dark gray (10YR 3/1) silty clay, gray (10YR 5/1) dry; moderate fine granular structure; firm; common fine and very fine roots; neutral; abrupt smooth boundary.

Ag—7 to 17 inches; very dark gray (10YR 3/1) clay, gray (10YR 5/1) dry; moderate medium angular blocky structure; very firm; dark reddish brown (2.5YR 3/4) and strong brown (7.5YR 4/6) stains; common fine and very fine roots; common stress surfaces; medium acid; clear smooth boundary.

Bg1—17 to 26 inches; very dark gray (5Y 3/1) clay; moderate medium prismatic structure; very firm; dark reddish brown (2.5YR 3/4) stains; common stress surfaces; common fine and very fine roots; medium acid; clear smooth boundary.

Bg2—26 to 39 inches; very dark gray (5Y 3/1) clay; common medium prismatic structure; very firm; reddish brown (5YR 4/4) stains; common stress surfaces; common fine and very fine roots; medium acid; clear smooth boundary.

Bg3—39 to 49 inches; dark gray (5Y 4/1) clay; few fine faint pale olive (5Y 6/3) mottles; moderate coarse prismatic structure; very firm; reddish brown (5YR 4/4) stains; common stress surfaces; few fine and very fine roots; slightly acid; gradual smooth boundary.

BCg—49 to 58 inches; gray (5Y 5/1) clay; common medium distinct pale olive (5Y 6/3) and prominent strong brown (7.5YR 4/6) mottles; weak medium prismatic structure parting to weak medium subangular blocky; very firm; common stress surfaces; very few very fine roots; slightly acid; gradual smooth boundary.

Cg—58 to 60 inches; dark gray (5Y 4/1) clay; few fine prominent yellowish brown (10YR 5/6) mottles; massive; very firm; neutral.

The solum ranges from 40 to more than 60 inches in thickness. It is medium acid to neutral. The mollic epipedon commonly extends to a depth of 36 inches or more. Deep, wide cracks form during dry periods in most years. The content of clay ranges from 60 to 75 percent in the control section.

The A horizon has value of 3 or less. The Bg horizon has hue of 2.5Y or 5Y, value of 5 or less, and chroma of 2 or less. It is commonly mottled below a depth of 18 inches.

Brookside Series

The Brookside series consists of deep, moderately well drained, moderately slowly permeable soils on foot slopes and benches and on the lower parts of side slopes in the uplands. These soils formed in clayey colluvium derived mainly from calcareous shale, siltstone, and limestone. Slopes range from 20 to 50 percent.

Brookside soils are similar to Ursa soils and commonly are adjacent to Alford, Neotoma, Wellston, and Westmore soils. Ursa soils formed in glacial till. Alford soils formed entirely in loess and have less clay throughout than the Brookside soils. They are on side slopes above the Brookside soils. Neotoma and Wellston soils are more acid in the subsoil than the Brookside soils, have less clay throughout, and are underlain by sandstone and siltstone bedrock. They are on the steeper slopes above the Brookside soils. Westmore soils have less clay in the control section than the Brookside soils. They formed in 20 to 36 inches of loess and in the underlying residuum. They are on side slopes above the Brookside soils.

Typical pedon of Brookside bouldery silty clay loam, 30 to 50 percent slopes, in a wooded area about 4 miles south of Ellis Grove; approximately 1,405 feet south and 950 feet west of the northeast corner of partial sec. 31, T. 6 S., R. 7 W.

Oa—1 inch to 0; decaying leaf litter and twigs; abrupt smooth boundary.

A—0 to 4 inches; very dark gray (10YR 3/1) bouldery silty clay loam, dark grayish brown (10YR 4/2) dry; moderate fine granular and moderate medium angular blocky structure; about 20 percent fragments of limestone and siltstone; firm; many fine, medium, and coarse roots; neutral; abrupt smooth boundary.

Bt1—4 to 6 inches; very dark grayish brown (10YR 3/2) flaggy silty clay, grayish brown (10YR 5/2) dry; common fine faint dark brown (10YR 4/3) mottles; moderate medium angular blocky structure; common faint dark grayish brown (10YR 4/2) clay films on faces of peds; very firm; about 20 percent fragments of limestone and siltstone; common fine, medium, and coarse roots; neutral; clear smooth boundary.

Bt2—6 to 18 inches; dark yellowish brown (10YR 4/4) silty clay; moderate medium and coarse angular blocky structure; many distinct dark grayish brown (10YR 4/2) clay films on faces of peds and lining pores; very firm; about 15 percent fragments of limestone and siltstone; common fine and medium roots; neutral; clear smooth boundary.

Bt3—18 to 26 inches; dark brown (10YR 4/3) silty clay; common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium angular blocky structure; many distinct dark grayish brown (2.5Y 4/2) clay films on faces of peds and lining pores; very firm; about 10 percent fragments of limestone and siltstone; few stress surfaces; common fine and medium roots; mildly alkaline; gradual wavy boundary.

Bt4—26 to 41 inches; grayish brown (2.5Y 5/2) and light olive brown (2.5Y 5/4) silty clay; many medium distinct gray (N 6/0) and common medium faint light olive brown (2.5Y 5/6) mottles; moderate medium prismatic structure parting to weak medium angular blocky; very firm; about 15 percent fragments of limestone and siltstone; few stress surfaces; slight effervescence; few fine roots; mildly alkaline; gradual wavy boundary.

BC—41 to 50 inches; light olive brown (2.5Y 5/4 and 5/6) channery silty clay; common medium distinct grayish brown (2.5Y 5/2) mottles; weak medium subangular blocky structure; very firm; about 20 percent fragments of limestone and siltstone; very few very fine roots; strong effervescence; moderately alkaline; gradual wavy boundary.

C—50 to 60 inches; light olive brown (2.5Y 5/6) channery silty clay; common medium distinct grayish brown (2.5Y 5/2) mottles; few cleavage planes; very firm; about 25 percent fragments of limestone and siltstone; strong effervescence; moderately alkaline.

The thickness of the solum ranges from 40 to 60 inches. The depth to bedrock is more than 60 inches. The control section ranges from 35 to 55 percent clay. The rock fragments are mainly flagstones of limestone, siltstone, and sandstone. The content of these fragments ranges from 8 to 30 percent in the solum and from 10 to 40 percent in the C horizon. Reaction ranges from medium acid to moderately alkaline in the solum and from slightly acid to moderately alkaline in the C horizon.

Stones and boulders cover as much as 15 percent of the surface. The A horizon has value of 3 to 5 and chroma of 1 to 4. It is silt loam or silty clay loam. The Bt horizon is silty clay loam, silty clay, or the channery, gravelly, or flaggy analogs of these textures. The C horizon is silty clay loam, silty clay, clay, or the channery, gravelly, or flaggy analogs of these textures.

Coffeen Series

The Coffeen series consists of somewhat poorly drained, moderately permeable soils on large flood plains adjacent to streams that flow out of bluff areas and on flood plains along small streams in the uplands. They formed in silty alluvium. Slopes range from 0 to 2 percent.

Coffeen soils are similar to Tice soils and commonly are adjacent to Haymond, Raddle, and Wakeland soils. Tice soils have more clay throughout than the Coffeen soils. The moderately well drained Haymond and Raddle soils are in the slightly higher landscape positions.

Haymond soils do not have a mollic epipedon. Raddle soils contain more clay throughout than the Coffeen soils and commonly contain more very fine sand in the control section. Wakeland soils do not have a mollic epipedon. They are in landscape positions similar to those of the Coffeen soils.

Typical pedon of Coffeen silt loam, in a cultivated field about 0.5 mile southeast of Modoc; Illinois State Plane Coordinates 503,200 feet north and 538,150 feet east (Illinois West Zone), T. 5 S., R. 8 W.

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

Bw—10 to 21 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; slightly acid; clear smooth boundary.

Bg1—21 to 26 inches; dark grayish brown (10YR 4/2) silt loam; few medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; medium acid; clear smooth boundary.

Bg2—26 to 33 inches; grayish brown (10YR 5/2) silt loam; common fine prominent strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; friable and firm; dark grayish brown (10YR 4/2) faces of peds; medium acid; clear smooth boundary.

Bg3—33 to 39 inches; grayish brown (10YR 5/2) silt loam; common fine prominent strong brown (7.5YR 5/6) mottles; weak medium subangular blocky structure; friable; medium acid; clear smooth boundary.

BCg—39 to 47 inches; light brownish gray (10YR 6/2) silt loam; common fine distinct yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure and massive; friable; slightly acid; gradual smooth boundary.

Cg—47 to 60 inches; gray (10YR 6/1) silt loam; many fine distinct yellowish brown (10YR 5/4) mottles; massive; friable; slightly acid.

The solum ranges from 30 to 50 inches in thickness. The control section is medium acid to neutral.

The A horizon is 10 to 24 inches thick. It has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The Bg horizon has chroma of 2 or less and is mottled. The Cg horizon is dominantly silt loam but has strata of loam or fine sandy loam in some pedons. A dark buried A horizon is below a depth of 50 inches in some pedons.

Colp Series

The Colp series consists of moderately well drained, slowly permeable soils on ridges and side slopes on terraces near the major streams. These soils formed in a thin layer of loess or silty sediments and in the underlying lacustrine sediments. Slopes range from 1 to 12 percent.

Colp soils are similar to Hurst and Marine soils and commonly are adjacent to Hurst, Markland, and St. Charles soils. The somewhat poorly drained Hurst soils are generally less sloping than the Colp soils and are farther from the streams. The somewhat poorly drained Marine soils are characterized by an abrupt textural change between the E and Bt horizons. Markland soils are calcareous within a depth of 40 inches. They are on side slopes below the Colp soils. St. Charles soils have less clay in the subsoil than the Colp soils. Also, they generally are slightly higher on the landscape or are nearer to the streams.

Typical pedon of Colp silt loam, 1 to 5 percent slopes, in a cultivated field about 1.5 miles north of Evansville; approximately 210 feet north and 1,045 feet west of the center of sec. 12, T. 5 S., R. 8 W.

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

E—10 to 17 inches; pale brown (10YR 6/3) silt loam; common fine distinct yellowish brown (10YR 5/6) mottles; weak medium platy structure parting to moderate fine subangular blocky; friable; common very fine and fine roots; few fine dark accumulations (iron and manganese oxides); medium acid; abrupt smooth boundary.

2Bt1—17 to 26 inches; brown (10YR 5/3) silty clay loam; common medium distinct dark yellowish brown (10YR 4/6) and yellowish brown (10YR 5/6) mottles; strong medium subangular blocky structure; very firm; common very fine and fine roots; many distinct brown (10YR 4/3) clay films on faces of peds; common prominent pale brown (10YR 6/3) silt coatings on faces of peds; few fine dark accumulations (iron and manganese oxides); very strongly acid; clear smooth boundary.

2Bt2—26 to 35 inches; brown (10YR 5/3) silty clay loam; common medium distinct dark yellowish brown (10YR 4/6) and yellowish brown (10YR 5/6) and common medium faint grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; very firm; common very fine and fine roots; common distinct brown (10YR 4/3) clay films on faces of peds; few distinct pale brown (10YR 6/3) silt coatings on faces of peds; few fine dark accumulations (iron and manganese oxides); very strongly acid; clear smooth boundary.

2Bt3—35 to 45 inches; pale brown (10YR 6/3) silty clay loam; common medium distinct yellowish brown (10YR 5/8), grayish brown (10YR 5/2), and strong brown (7.5YR 5/6) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; very firm; few fine roots; common distinct brown (10YR 5/3) clay films on faces of peds; few fine dark accumulations (iron and manganese oxides); very strongly acid; gradual smooth boundary.

2BC—45 to 56 inches; pale brown (10YR 6/3) silty clay loam; common medium distinct strong brown (7.5YR 5/8), few medium prominent yellowish red (5YR 5/6), and many medium faint light brownish gray (10YR 6/2) mottles; weak coarse prismatic structure; firm; few fine roots; few distinct grayish brown (2.5Y 5/2) clay films on faces of peds; few fine dark accumulations and stains (iron and manganese oxides); strongly acid; gradual smooth boundary.

2C—56 to 60 inches; pale brown (10YR 6/3) silty clay loam; common medium distinct strong brown (7.5YR 5/6 and 5/8) and many medium faint light brownish gray (10YR 6/2) mottles; massive; firm; very few very fine roots; common fine and medium dark accumulations and stains (iron and manganese oxides); strongly acid.

The solum ranges from 45 to more than 60 inches in thickness. The loess or silty mantle ranges from 8 to 20 inches in thickness. The control section ranges from 35 to 50 percent clay and averages less than 15 percent fine sand or coarser sand.

The Ap horizon typically is silt loam, but it is silty clay loam in severely eroded areas. The Bt horizon is mainly silty clay or silty clay loam, but it commonly has strata of clay loam, silt loam, or loam in the lower part. It ranges from very strongly acid in the upper part to medium acid in the lower part. The C horizon is stratified in some pedons. It ranges from strongly acid to moderately alkaline.

Coulterville Series

The Coulterville series consists of somewhat poorly drained, slowly permeable soils on broad drainage divides, ridges, and side slopes. These soils have a high content of exchangeable sodium in the lower part of the Bt horizon. They formed in loess and, in some areas, the underlying loamy sediments, which are low in content of sand. Slopes range from 0 to 10 percent.

Coulterville soils are similar to Kendall soils and commonly are adjacent to Huey, Grantfork, Marine, and Oconee soils. Kendall soils have a lower content of exchangeable sodium throughout than the Coulterville soils. The poorly drained Huey soils are in depressions below the Coulterville soils. They have lower chroma in the upper part of the Bt horizon than the Coulterville soils. Grantfork soils are on the lower side slopes. They have more sand throughout than the Coulterville soils. Marine and Oconee soils are in landscape positions similar to those of the Coulterville soils. Marine soils, however, generally are nearer to streams. They are more acid in the Bt horizon than the Coulterville soils and do not have concentrations of exchangeable sodium. Oconee soils have a surface layer that is darker than that of the Coulterville soils. Also, they have a lower content of exchangeable sodium within a depth of 40 inches.

Typical pedon of Coulterville silt loam, 2 to 5 percent slopes, eroded, in a cultivated field about 1 mile east of Tilden; approximately 865 feet south and 1,740 feet west of the center of sec. 4, T. 4 S., R. 5 W.

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak medium subangular blocky and weak thick platy structure; friable; neutral; abrupt smooth boundary.

Bt1—8 to 13 inches; brown (10YR 5/3) silty clay; common fine faint grayish brown (10YR 5/2) and common fine prominent strong brown (7.5YR 5/8) and yellowish red (5YR 5/6) mottles; weak medium prismatic structure parting to moderate medium angular blocky; firm; many distinct dark brown (10YR 4/3) and grayish brown (10YR 5/2) clay films on faces of peds; few fine dark accumulations (iron and manganese oxides); medium acid; abrupt smooth boundary.

Bt2—13 to 17 inches; pale brown (10YR 6/3) silty clay loam; common fine and medium faint grayish brown (10YR 5/2) and prominent strong brown (7.5YR 5/8) and yellowish red (5YR 5/6) mottles; moderate coarse prismatic structure parting to moderate medium angular blocky; firm; many prominent dark brown (10YR 4/3) clay films on vertical faces of some peds, common and distinct on faces of other peds; few fine dark accumulations (iron and manganese oxides); slightly acid; clear smooth boundary.

Btg—17 to 24 inches; grayish brown (10YR 5/2) silty clay loam; common fine and medium distinct brownish yellow (10YR 6/6) and prominent yellowish red (5YR 5/6) mottles; moderate coarse prismatic structure parting to weak coarse angular blocky; firm, very hard; common distinct grayish brown (10YR 5/2) and faint dark brown (10YR 4/3) clay films and few light gray (10YR 7/2) silt coatings on faces of peds; common fine and medium dark accumulations (iron and manganese oxides); neutral; clear smooth boundary.

BCg—24 to 33 inches; grayish brown (10YR 5/2) silt loam; common fine and medium distinct brownish yellow (10YR 6/6) and prominent yellowish red (5YR 5/6) mottles; weak coarse subangular blocky structure; friable, very hard; common faint and distinct dark grayish brown (10YR 4/2) clay films and common light gray (10YR 7/2) silt coatings on faces of peds and in crevices; few fine dark accumulations (iron and manganese oxides); moderately alkaline; gradual smooth boundary.

Cg1—33 to 42 inches; gray (10YR 6/1) silt loam; few fine prominent strong brown (7.5YR 5/6) and yellowish red (5YR 5/6) mottles; massive; friable, very hard; common light gray (10YR 7/2) silt coatings in crevices; moderately alkaline; gradual smooth boundary.

Cg2—42 to 60 inches; gray (10YR 5/1) silt loam; common fine and coarse prominent yellowish red (5YR 4/6) mottles; massive; friable; common fine and medium dark accumulations (iron and manganese oxides); common light gray (10YR 7/2) silt coatings in crevices; moderately alkaline.

The solum ranges from 30 to 60 inches in thickness. The control section ranges from 27 to 42 percent clay and averages less than 10 percent sand to a depth of about 45 inches. The content of exchangeable sodium is 5 to 15 percent in one or more subhorizons of the part of the subsoil within a depth of 30 inches.

The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. It is commonly silt loam but is silty clay loam in severely eroded areas. The Bt horizon is silty clay loam, silt loam, or silty clay. The BC horizon is silt loam or silty clay loam.

Darwin Series

The Darwin series consists of poorly drained, very slowly permeable soils on flood plains along the major streams. These soils formed in clayey slack-water sediments. Slopes commonly are less than 1 percent but range from 0 to 2 percent.

Darwin soils are similar to Booker, Fults, and Montgomery soils and commonly are adjacent to Booker, Fults, and Jacob soils. Booker soils are in the lower areas. They have more clay in the Bg horizon than the Darwin soils. Fults soils are on the slightly higher parts of the flood plains. They have loamy sediments within a depth of 45 inches. Montgomery soils have a high shrink-swell potential and do not have vertic properties. Jacob soils have more clay in Bg horizon than the Darwin soils, are more acid, and do not have a mollic epipedon.

Typical pedon of Darwin silty clay, in a cultivated field about 4 miles southwest of Ellis Grove; Illinois State Plane Coordinates 479,700 feet north and 560,700 feet east (Illinois West Zone), T. 6 S., R. 8 W.

Ap—0 to 10 inches; very dark gray (10YR 3/1) silty clay, dark gray (10YR 4/1) dry; moderate fine and medium subangular blocky structure; firm; mildly alkaline; abrupt smooth boundary.

Bg1—10 to 25 inches; dark gray (5Y 4/1) silty clay; common fine distinct grayish brown (10YR 5/2) mottles; moderate medium prismatic structure parting to moderate medium and coarse angular blocky; very firm; very dark gray (10YR 3/1) faces of peds; mildly alkaline; gradual smooth boundary.

Bg2—25 to 35 inches; dark gray (5Y 4/1) silty clay; common fine distinct grayish brown (10YR 5/2) mottles; moderate medium prismatic structure parting to moderate medium and coarse angular blocky; very firm; common faint very dark gray (10YR 3/1) coatings on faces of peds; mildly alkaline; gradual smooth boundary.

Bg3—35 to 59 inches; gray (10YR 5/1) silty clay; common fine distinct yellowish brown (10YR 5/4) mottles; weak medium prismatic structure parting to weak medium and coarse angular blocky; very firm; mildly alkaline; gradual smooth boundary.

Cg—59 to 65 inches; gray (10YR 5/1) silty clay; common fine distinct brown (10YR 5/3) mottles; massive; very firm; mildly alkaline.

The solum ranges from 45 to 60 inches in thickness. It is slightly acid to mildly alkaline. The control section ranges from 45 to 60 percent clay.

The A horizon is 10 to 24 inches thick. It is silty clay loam or silty clay. It has hue of 10YR or 2.5Y, value of 2 or 3, and chroma of 1 or 2. The Bg horizon is silty clay or clay. It has hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 or 2. The Cg horizon is dominantly silty clay or silty clay loam. In some pedons, however, it has strata of silt loam or loam.

Drury Series

The Drury series consists of well drained, moderately permeable soils on foot slopes and alluvial fans along bluffs in river valleys. These soils formed in local sediments derived from the loess-covered adjacent uplands. Slopes range from 4 to 12 percent.

Drury soils commonly are adjacent to Alford and Brookside soils. Alford soils are on the steeper side slopes. They have a B horizon that contains more clay than that of the Drury soils. Also, they commonly are more acid. Brookside soils are clayey and have rock fragments in the solum. They are upslope from the Drury soils.

Typical pedon of Drury silt loam, 4 to 12 percent slopes, in a cultivated field about 2.5 miles southwest of Ellis Grove; Illinois State Plane Coordinates 479,655 feet north and 571,755 feet east (Illinois West Zone), T. 6 S., R. 7 W.

Ap—0 to 10 inches; dark brown (10YR 4/3) silt loam, brown (10YR 5/3) dry; weak fine granular structure; very friable, slightly acid; abrupt smooth boundary.

E—10 to 14 inches; dark yellowish brown (10YR 4/4) silt loam, pale brown (10YR 6/3) dry; moderate medium platy structure; friable; slightly acid; clear smooth boundary.

Bw1—14 to 22 inches; dark yellowish brown (10YR 4/4) silt loam; moderate fine and medium subangular blocky structure; friable; slightly acid; clear smooth boundary.

Bw2—22 to 42 inches; dark yellowish brown (10YR 4/4) silt loam; weak coarse subangular blocky structure parting to moderate fine and medium subangular blocky; friable; few faint dark brown (10YR 3/3) coatings on faces of peds; neutral; clear smooth boundary.

C—42 to 60 inches; dark yellowish brown (10YR 4/4) silt loam; massive; friable; few fine dark accumulations (iron and manganese oxides); neutral.

The solum ranges from 33 to 45 inches in thickness. The control section is medium acid to mildly alkaline. It ranges from 18 to 22 percent clay and averages less than 15 percent fine sand or coarser sand.

The A horizon has hue of 10YR and value and chroma of 3 or 4. The Bw horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. In some pedons it has mottles with chroma of 2 or less in the lower part. The C horizon commonly is silt loam but in some pedons has strata of coarser textured material below a depth of 40 inches.

Dupo Series

The Dupo series consists of somewhat poorly drained soils on flood plains. The flood plains mainly are along the major rivers, but a few are along tributary streams in the uplands, where clayey sediments have been deposited. These soils formed in recent silty sediments overlying dark, clayey soils. They are moderately permeable in the upper part and slowly permeable in the lower part. Slopes range from 0 to 2 percent.

Dupo soils are similar to Wakeland soils and commonly are adjacent to Darwin, Haymond, and Wakeland soils. The similar and adjacent soils are not characterized by contrasting textures. The dark, clayey Darwin soils are in the lower areas on the flood plains, farther from the bluffs. The moderately well drained Haymond and somewhat poorly drained Wakeland soils generally are on bottom land or on the higher parts of the larger flood plains, near the bluffs.

Typical pedon of Dupo silt loam, in a cultivated field about 2.5 miles west of Modoc; Illinois State Plane Coordinates 506,150 feet north and 526,600 feet east (Illinois West Zone), T. 5 S., R. 9 W.

Ap—0 to 9 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; very friable; many fine roots; mildly alkaline; abrupt smooth boundary.

C1—9 to 17 inches; brown (10YR 5/3) silt loam; common fine distinct grayish brown (10YR 5/2) and common fine faint yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure; very friable; common fine roots; mildly alkaline; clear smooth boundary.

C2—17 to 25 inches; brown (10YR 5/3) silt loam; many medium faint grayish brown (10YR 5/2) and many medium distinct dark yellowish brown (10YR 4/4) mottles; massive; very friable; common very dark grayish brown (10YR 3/2) worm casts; common fine roots; neutral; abrupt smooth boundary.

2Ab1—25 to 39 inches; very dark gray (10YR 3/1) silty clay; common fine distinct dark yellowish brown (10YR 4/4) and common medium prominent yellowish red (5YR 4/6) mottles; moderate medium prismatic structure parting to strong fine angular blocky; very firm; dark yellowish brown (10YR 4/4) silt coatings on vertical faces of prisms; few fine and very fine roots; neutral; clear smooth boundary.

2Ab2—39 to 59 inches; very dark gray (10YR 3/1) silty clay; common fine distinct dark yellowish brown (10YR 4/4) and few medium prominent strong brown (7.5YR 4/6) mottles; moderate coarse prismatic structure parting to moderate medium angular blocky; very firm; common stress surfaces; common faint dark yellowish brown (10YR 4/4) silt coatings on vertical faces of prisms; few fine and very fine roots; neutral; gradual smooth boundary.

2Bgb—59 to 65 inches; dark gray (10YR 4/1) silty clay; common fine distinct dark yellowish brown (10YR 4/4) mottles; weak coarse prismatic structure; very firm; common stress surfaces; very few fine and very fine roots; mildly alkaline.

The depth to the 2Ab horizon ranges from 20 to 40 inches. The 10- to 40-inch control section ranges from medium acid to moderately alkaline.

The A and C horizons range from 10 to 18 percent clay and average less than 15 percent fine sand or coarser sand. They have hue of 10YR, value of 3 to 5, and chroma of 1 to 3. The 2Ab horizon has value of 2 or 3 and chroma of 2 or less and commonly is mottled. It is mainly silty clay, but the range includes clay and silty clay loam that has a high content of clay. The content of clay in this horizon is at least 25 percent higher than that in the overlying horizons. The 2Bgb horizon has the same textures as the 2Ab horizon, but it typically has higher value.

Fults Series

The Fults series consists of poorly drained soils on broad flats and low ridges, mainly at intermediate levels on flood plains along the major rivers. These soils formed in clayey slack-water sediments and in the underlying loamy or sandy alluvium. Permeability is very slow in the upper part of the profile and moderate or moderately rapid in the lower part. Slopes range from 0 to 2 percent.

Fults soils are similar to Darwin soils and commonly are adjacent to Darwin, Parkville, and Raddle soils. Darwin soils do not have loamy textures within a depth of 45 inches. They are in the slightly lower areas. Parkville and Raddle soils are on ridges above the Fults soils. The somewhat poorly drained Parkville soils have loamy textures within a depth of 20 inches. The moderately well drained Raddle soils contain less clay and commonly more very fine sand in the upper part of the solum than the Fults soils.

Typical pedon of Fults silty clay, in a cultivated field about 2.5 miles southwest of Modoc; Illinois State Plane Coordinates 491,500 feet north and 534,650 feet east (Illinois West Zone), T. 6 S., R. 8 W.

Ap—0 to 5 inches; very dark gray (10YR 3/1) silty clay, dark gray (10YR 4/1) dry; moderate fine angular blocky structure parting to moderate medium granular; firm; many fine roots; neutral; abrupt smooth boundary.

A—5 to 10 inches; very dark gray (10YR 3/1) silty clay, dark gray (10YR 4/1) dry; moderate medium angular blocky structure; firm; common fine roots; neutral; clear smooth boundary.

Bg1—10 to 16 inches; dark gray (10YR 4/1) clay; few fine distinct dark yellowish brown (10YR 4/4) mottles; moderate medium angular blocky structure; very firm; common fine roots; common pressure faces on peds; neutral; clear smooth boundary.

Bg2—16 to 25 inches; dark gray (10YR 4/1) silty clay; common fine distinct dark yellowish brown (10YR 4/4) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; very firm; few fine roots; many pressure faces on peds; slightly acid; clear smooth boundary.

Bg3—25 to 30 inches; dark grayish brown (10YR 4/2) silty clay; common fine distinct yellowish brown (10YR 5/4) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; very firm; few fine roots; many dark gray (10YR 4/1) pressure faces on peds; very firm; about 8 percent sand; slightly acid; clear smooth boundary.

2Btg1—30 to 33 inches; grayish brown (10YR 5/2) silty clay loam; many medium distinct yellowish brown (10YR 5/4) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; firm; few fine roots; few dark gray (10YR 4/1) clay films on faces of peds; about 16 percent sand; slightly acid; clear smooth boundary.

2Btg2—33 to 37 inches; grayish brown (10YR 5/2) silt loam; many medium distinct yellowish brown (10YR 5/4) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; friable; few fine roots; few dark gray (10YR 4/1) clay films on faces of peds; about 27 percent sand; neutral; clear smooth boundary.

2Bg—37 to 42 inches; grayish brown (10YR 5/2) silt loam; many medium distinct yellowish brown (10YR 5/4) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; very friable; few fine roots; about 22 percent sand; neutral; clear smooth boundary.

2Cg—42 to 60 inches; dark grayish brown (10YR 4/2) fine sand; single grained; loose; about 96 percent sand; neutral.

The thickness of the solum ranges from 30 to 50 inches. Reaction is medium acid to mildly alkaline throughout the profile. The depth to the loamy 2Bg or 2Btg horizon ranges from 25 to 40 inches.

The A horizon ranges from 10 to 20 inches in thickness. The Bg horizon has chroma of 0 to 3. It is mottled. The faces of peds in the Bg horizon typically are shiny and have low chroma. This horizon is dominantly clay or silty clay, but in some pedons it has subhorizons of silty clay loam. The 2Btg and 2Bg horizons have a dominant chroma of 1 to 3 and have mottles with redder hue or higher chroma. They range from fine sandy loam to silty clay loam and from 10 to 35 percent clay. The 2Cg horizon is loam, fine sandy loam, loamy fine sand, or fine sand.

Grantfork Series

The Grantfork series consists of somewhat poorly drained soils on side slopes and hillsides on till plains. These soils formed in erosional sediments and glacial till that in places have a thin loess cap. They have concentrations of exchangeable sodium in the subsoil. Permeability is moderately slow in the upper part of the profile and slow in the lower part. Slopes range from 7 to 15 percent.

The Grantfork soils in this survey area have a lower content of fine sand or coarser sand in the control section than is definitive for the series. This difference, however, does not significantly alter the usefulness or behavior of the soils.

Grantfork soils are similar to Blair soils and commonly are adjacent to Blair, Hickory, Hosmer, and Ursa soils. The similar and adjacent soils do not have concentrations of sodium. Blair soils are more acid than the Grantfork soils. Also, they are higher on the landscape. The well drained Hickory and moderately well drained Hosmer soils are more acid throughout than the Grantfork soils. Also, Hosmer soils are upslope from the Grantfork soils and formed entirely in loess. Hickory and Ursa soils are on side slopes, mainly downstream from the Grantfork soils. The well drained Ursa soils are more clayey than the Grantfork soils.

Typical pedon of Grantfork silt loam, in an area of Blair-Grantfork silt loams, 7 to 15 percent slopes, severely eroded, in a pasture about 2 miles northwest of

Coulterville; approximately 500 feet south and 90 feet west of the center of sec. 3, T. 4 S., R. 5 W.

Ap—0 to 4 inches; dark brown (10YR 4/3) silt loam, brown (10YR 5/3) dry; about 14 percent sand; moderate medium granular and weak medium platy structure; friable; slightly acid; abrupt smooth boundary.

Bt—4 to 7 inches; brown (10YR 5/3) silty clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; many distinct brown (10YR 5/3) clay films on faces of peds; about 10 percent sand; strongly acid; abrupt smooth boundary.

Btg1—7 to 13 inches; light brownish gray (10YR 6/2) silt loam; few fine distinct yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; common distinct grayish brown (10YR 5/2) clay films on faces of peds; about 17 percent sand; neutral; clear smooth boundary.

Btg2—13 to 24 inches; light brownish gray (10YR 6/2) silt loam; few fine distinct yellowish brown (10YR 5/8) mottles; moderate medium prismatic structure; very firm; few faint light brownish gray (10YR 6/2) clay films on faces of peds and in crevices; about 12 percent sand; mildly alkaline; gradual smooth boundary.

Btg3—24 to 34 inches; light brownish gray (10YR 6/2) silt loam; common medium prominent strong brown (7.5YR 5/8) mottles; moderate medium prismatic structure; very firm; few faint light brownish gray (10YR 6/2) clay films on faces of peds and in crevices; about 21 percent sand; moderately alkaline; clear smooth boundary.

Btg4—34 to 40 inches; light gray (10YR 7/1) loam; few fine prominent dark brown (7.5YR 3/4) mottles; weak coarse subangular blocky structure; very firm; common faint light brownish gray (10YR 6/2) clay films on faces of peds; about 35 percent sand; slightly stratified; moderately alkaline; clear smooth boundary.

Btg5—40 to 43 inches; light gray (10YR 7/1) loam; common fine prominent dark brown (7.5YR 3/4) mottles; moderate medium prismatic structure; very firm; common faint light brownish gray (10YR 6/2) clay films on faces of peds; about 31 percent sand; common dark stains and concretions (iron and manganese oxides); mildly alkaline; gradual smooth boundary.

Btg6—43 to 54 inches; light gray (10YR 7/1) loam; common fine prominent dark brown (7.5YR 3/4) mottles; moderate coarse prismatic structure; very firm; many distinct grayish brown (10YR 5/2) clay films on faces of peds; dark brown (7.5YR 3/4) coatings along former root channels; common dark stains and concretions (iron and manganese oxides); about 28 percent sand and 8 percent pebbles; mildly alkaline; gradual smooth boundary.

Cg—54 to 60 inches; light gray (10YR 7/1) silt loam; common medium prominent dark brown (7.5YR 3/4) mottles; moderate coarse prismatic structure; firm; many distinct grayish brown (10YR 5/2) clay films on faces of peds; common dark stains and concretions (iron and manganese oxides); about 16 percent sand and 6 percent pebbles; mildly alkaline.

The solum ranges from 45 to more than 60 inches in thickness. It ranges from 20 to 30 percent clay. The content of exchangeable sodium is 10 to 15 percent in one or more of the subhorizons between depths of 10 and 40 inches.

The Ap or A horizon is 3 to 11 inches thick. It is silt loam or silty clay loam. A few pedons have an E, EB, or BE horizon 2 to 8 inches thick. These horizons are silt loam or silty clay loam and commonly are 1 or 2 units higher in value and chroma than the Ap or A horizon. The Bt or 2Bt horizon has hue of 10YR, 2.5Y, or 7.5YR and value of 4 to 7. It has chroma of 2 to 4 in the upper part and chroma of 1 to 4 in the lower part. The Bt horizon commonly is loam, silt loam, or clay loam, but the range includes silty clay loam. This horizon ranges from strongly acid to strongly alkaline in the upper part and from mildly alkaline to strongly alkaline in the lower part. The content of sand and pebbles commonly increases with increasing depth.

Hamburg Series

The Hamburg series consists of somewhat excessively drained, moderately permeable soils on bluffs along the major river valleys. These soils formed in a thick layer of coarse loess. Slopes are dominantly 40 to 55 percent but range from 25 to 60 percent.

Hamburg soils commonly are adjacent to Alford and Brookside soils. The well drained Alford soils are in landscape positions similar to those of the Hamburg soils or are in higher positions. They have more clay in the Bt horizon than the Hamburg soils and are more acid in the solum. The moderately well drained Brookside soils are on the lower slopes. They have more clay throughout than the Hamburg soils. They have rock fragments in the solum and are underlain by shale, siltstone, and limestone bedrock.

Typical pedon of Hamburg silt loam, 25 to 60 percent slopes, on a prairie about 2 miles southeast of Prairie Du Rocher; Illinois State Plane Coordinates 509,400 feet north and 528,600 feet east (Illinois West Zone), T. 5 S., R. 9 W.

A—0 to 3 inches; dark brown (10YR 4/3) silt loam, grayish brown (10YR 5/2) dry; weak medium granular structure; very friable; few medium and coarse lime concretions (calcium carbonates); slight effervescence; mildly alkaline; clear smooth boundary.

AC—3 to 7 inches; dark yellowish brown (10YR 4/4) silt loam; weak medium granular structure; very friable; few medium and coarse lime concretions (calcium carbonates); slight effervescence; mildly alkaline; gradual smooth boundary.

C1—7 to 15 inches; yellowish brown (10YR 5/4) silt loam; massive; friable; common medium and coarse lime accumulations and concretions (calcium carbonates); strong effervescence; mildly alkaline; gradual wavy boundary.

C2—15 to 60 inches; dark yellowish brown (10YR 4/4) silt loam; massive; friable, hard; few coarse lime accumulations and common concretions (calcium carbonates); violent effervescence; mildly alkaline.

The solum is less than 20 inches thick. The content of clay is less than 12 percent throughout the profile. The soils have free carbonates throughout and range from neutral to moderately alkaline.

The A and AC horizons are silt loam or very fine sandy loam. They have value of 3 or 4 and chroma of 2 to 4. The C horizon is silt loam, very fine sandy loam, or silt.

Haymond Series

The Haymond series consists of moderately well drained, moderately permeable soils on flood plains along streams and overflow channels. These soils formed in silty alluvium. Slopes range from 0 to 2 percent.

Haymond soils are similar to Haynie soils and commonly are adjacent to the somewhat poorly drained Banlic and Wakeland soils. Haynie soils are stratified directly below the A or Ap horizon and are calcareous in the control section. Banlic soils are on low stream terraces. They commonly are more acid in the B horizon than the Haymond soils. They have a Bx horizon. Wakeland soils have mottles with chroma of 2 or less within a depth of 30 inches. They are on the lower parts of the flood plains.

Typical pedon of Haymond silt loam, in a cultivated field about 3 miles south of Welge; approximately 4,400 feet north and 120 feet west of the southeast corner of partial sec. 23, T. 7 S., R. 6 W.

Ap—0 to 9 inches; mixed dark brown (10YR 4/3) and yellowish brown (10YR 5/4) silt loam, pale brown (10YR 6/3) dry; weak medium granular and moderate medium platy structure; very friable; neutral; abrupt smooth boundary.

Bw1—9 to 23 inches; dark brown (10YR 4/3) and brown (10YR 5/3) silt loam; weak medium subangular blocky structure; very friable; neutral; gradual smooth boundary.

Bw2—23 to 43 inches; yellowish brown (10YR 5/4) silt loam; weak medium subangular blocky structure; very friable; pale brown (10YR 6/3) fillings in channels; neutral; clear wavy boundary.

C1—43 to 51 inches; stratified pale brown (10YR 6/3) fine sandy loam and brown (10YR 4/3) loam; massive; very friable; neutral; clear wavy boundary.

C2—51 to 60 inches; brown (10YR 5/3) silt loam; common medium distinct grayish brown (10YR 5/2) and dark yellowish brown (10YR 4/4) mottles; massive; very friable; neutral.

The solum ranges from 40 to 55 inches in thickness. It is neutral to medium acid. The control section ranges from 8 to 18 percent clay and averages less than 15 percent fine sand or coarser sand.

In some pedons the Bw horizon has mottles with chroma of 2 or less below a depth of 30 inches. The C horizon is silt loam, loam, or fine sandy loam. It has mottles with chroma of 2 or less in one or more subhorizons.

Haynie Series

The Haynie series consists of moderately well drained, moderately permeable soils on ridges and natural levees on flood plains along the major streams. These soils formed in recently deposited, calcareous, stratified, silty and loamy sediments. Slopes range from 1 to 5 percent.

Haynie soils are similar to Haymond soils and commonly are adjacent to Blake and Rocher soils. Haymond soils are not calcareous in the control section and are not stratified directly below the Ap or A1 horizon. They are on bottom land near streams or bluffs. The somewhat poorly drained Blake soils are in the lower areas. They have more clay in the upper part of the solum than the Haynie soils. Rocher soils have more sand in the control section than the Haynie soils.

Typical pedon of Haynie silt loam, 1 to 5 percent slopes, in a cultivated field about 0.75 mile southeast of Kaskaskia; Illinois State Plane Coordinates 453,665 feet north and 571,165 feet east (Illinois West Zone), T. 7 S., R. 8 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; mildly alkaline; abrupt smooth boundary.

C1—8 to 18 inches; brown (10YR 4/3) very fine sandy loam; massive; very friable; slight effervescence; mildly alkaline; clear smooth boundary.

C2—18 to 42 inches; grayish brown (10YR 5/2) very fine sandy loam; massive; very friable; strong effervescence; mildly alkaline; clear smooth boundary.

C3—42 to 53 inches; dark grayish brown (10YR 4/2) and grayish brown (10YR 5/2) very fine sandy loam; common fine distinct dark yellowish brown (10YR 4/6) mottles; massive; very friable; few lenses of silty clay loam; strong effervescence; mildly alkaline; abrupt smooth boundary.

C4—53 to 60 inches; dark grayish brown (10YR 4/2) silt loam; common fine distinct dark yellowish brown (10YR 4/6) mottles; massive; friable; strong effervescence; mildly alkaline.

The solum is less than 10 inches thick. The control section averages less than 18 percent clay and less than 15 percent sand or coarser sand, but the content of clay combined with the content of silt is more than 35 percent and the total sand content is typically more than 15 percent. Free carbonates are throughout the control section and commonly throughout all horizons.

The A horizon is silt loam or very fine sandy loam. It has hue of 10YR or 2.5Y, value of 3, and chroma of 2 or 3. The C horizon is dominantly very fine sandy loam or silt loam, but in some pedons it has strata of loam and, in the lower part, strata of loamy very fine sand.

Hickory Series

The Hickory series consists of well drained, moderately permeable soils on hillsides and side slopes in the uplands. These soils formed either in a thin mantle of loess and the underlying glacial till or entirely in glacial till. Slopes range from 18 to 60 percent.

Hickory soils commonly are adjacent to Alford, Hosmer, Ursa, and Wellston soils. Alford and Hosmer soils contain less sand than the Hickory soils. They formed in loess on the upper side slopes. Ursa and Wellston soils are in landscape positions similar to those of the Hickory soils. Ursa soils contain more clay in the control section than the Hickory soils. Wellston soils contain less sand in the control section than the Hickory soils, have a higher content of coarse fragments in the lower part of the solum, and are underlain by sandstone and siltstone bedrock.

Typical pedon of Hickory silt loam, 25 to 60 percent slopes, in a wooded area about 1 mile south of Wine Hill; approximately 2,080 feet north and 1,540 feet west of the southeast corner of sec. 8, T. 7 S., R. 5 W.

Oa—1 inch to 0; dark grayish brown (10YR 4/2), partially decomposed organic material; many roots; abrupt smooth boundary.

A—0 to 4 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; about 18 percent sand; very strongly acid; abrupt smooth boundary.

E—4 to 8 inches; brown (10YR 5/3) silt loam; moderate medium platy structure; friable; about 18 percent sand; very strongly acid; abrupt smooth boundary.

BE—8 to 15 inches; strong brown (7.5YR 5/6) silt loam; moderate medium subangular blocky structure; firm; about 22 percent sand; very strongly acid; clear smooth boundary.

Bt1—15 to 23 inches; strong brown (7.5YR 5/6) clay loam; moderate medium subangular blocky structure; firm; common distinct dark brown (7.5YR 4/4) clay films and few white (10YR 8/2) silt coatings on faces of peds; about 22 percent sand; very strongly acid; clear smooth boundary.

Bt2—23 to 35 inches; yellowish brown (10YR 5/4) clay loam; few fine distinct yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; many distinct dark brown (7.5YR 4/4) clay films and common white (10YR 8/2) silt coatings on faces of peds; about 22 percent sand; very strongly acid; clear smooth boundary.

Bt3—35 to 43 inches; yellowish brown (10YR 5/6) clay loam; few fine distinct yellowish brown (10YR 5/8) mottles; moderate medium subangular structure; firm; many distinct dark yellowish brown (10YR 4/4) clay films and common white (10YR 8/2) silt coatings on faces of peds; about 26 percent sand; very strongly acid; clear smooth boundary.

Bt4—43 to 51 inches; brownish yellow (10YR 6/6) clay loam; few fine distinct yellowish brown (10YR 5/8) and light yellowish brown (10YR 6/4) mottles; moderate medium subangular blocky structure; firm; common faint dark yellowish brown (10YR 4/4) clay films on faces of peds; about 25 percent sand; medium acid; clear smooth boundary.

C—51 to 60 inches; brownish yellow (10YR 6/6) loam; few fine distinct light yellowish brown (10YR 6/4) and very pale brown (10YR 7/4) mottles; massive; firm; about 26 percent sand; neutral.

The solum ranges from 40 to 60 inches in thickness. The control section ranges from 27 to 35 percent clay and averages 15 percent or more fine sand or coarser sand.

In eroded areas the A horizon is 4 to 12 inches thick. It is commonly silt loam or loam. In eroded areas, however, it is silt loam, silty clay loam, or clay loam. The Bt horizon commonly is loam or clay loam. In areas where the loess mantle is thicker, however, the upper part of this horizon is silty clay loam. The Bt horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 4 to 8. In some pedons it has mottles with chroma of 2 or less in the lower part. It ranges from very strongly acid to medium acid. The C horizon is clay loam, loam, or sandy loam. It is strongly acid to moderately alkaline.

Hickory silt loam, 18 to 30 percent slopes, and Hickory silt loam, 18 to 30 percent slopes, severly eroded, have more silt and less sand in the solum than is definitive for the Hickory series. This difference, however, does not significantly alter the usefulness or behavior of the soils.

Hosmer Series

The Hosmer series consists of moderately well drained soils on ridges, side slopes, and hillsides in the uplands.

These soils formed in loess. Permeability is moderate in the upper part of the profile and very slow in the lower part. Slopes range from 1 to 18 percent.

The Hosmer soils in this survey area do not have the coarse structure and degree of brittleness that are definitive for the series. Also, Hosmer silt loam, 10 to 18 percent slopes, severely eroded, and the Hosmer soil in the map unit Hosmer-Ursa silty clay loams, 10 to 18 percent slopes, severely eroded, have more total sand in the lower part of the solum than is definitive for the series. These differences, however, do not significantly alter the usefulness or behavior of the soils.

Hosmer soils are similar to Alford, Muren, and St. Charles soils and commonly are adjacent to Alford, Hickory, Stoy, and Ursa soils. The similar soils do not have a Bx horizon. Alford soils are on the narrower ridges and the steeper side slopes. St. Charles soils are on terraces. They have loamy outwash within a depth of 55 inches. The well drained Hickory soils are on the steeper slopes. They have more sand and pebbles in the control section than the Hosmer soils. The somewhat poorly drained Stoy soils are on the lower or less sloping parts of the landscape. Ursa soils are lower on the landscape than the Hosmer soils. Also, they have more clay and more sand and pebbles in the control section.

Typical pedon of Hosmer silt loam, 1 to 5 percent slopes, in a cultivated field about 4 miles south of Coulterville; approximately 714 feet south and 45 feet east of the center of sec. 1, T. 5 S., R. 5 W.

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

E—6 to 12 inches; yellowish brown (10YR 5/4) silt loam; moderate medium subangular blocky structure; friable; common very fine and fine roots; very strongly acid; clear smooth boundary.

Bt—12 to 19 inches; yellowish brown (10YR 5/6) silt loam; moderate medium angular blocky structure; firm; common very fine and fine roots; common distinct yellowish brown (10YR 5/4) clay films on faces of peds; common prominent very pale brown (10YR 7/3) silt coatings on faces of peds; very strongly acid; abrupt smooth boundary.

B/E—19 to 24 inches; yellowish brown (10YR 5/6) silty clay loam (B part); few medium faint yellowish brown (10YR 5/8) mottles; moderate medium subangular blocky structure; firm; few fine and very fine roots; many distinct yellowish brown (10YR 5/4) clay films on faces of peds; many prominent very pale brown (10YR 7/3) silt coatings on faces of peds and filling vertical interstices between peds (E part); very strongly acid; clear smooth boundary.

B't—24 to 33 inches; yellowish brown (10YR 5/6) silty clay loam; few fine faint yellowish brown (10YR 5/4) and common medium distinct strong brown (7.5YR 5/8) and light brownish gray (10YR 6/2) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; slightly brittle; many distinct very pale brown (10YR 7/3) silt coatings on faces of peds and in accumulations between some peds; few fine and very fine roots; very strongly acid; gradual smooth boundary.

Btx—33 to 50 inches; yellowish brown (10YR 5/6) silty clay loam; few fine distinct light brownish gray (10YR 6/2) and common medium distinct strong brown (7.5YR 5/8) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; very firm; slightly brittle; common distinct brown (10YR 5/3) clay films on faces of peds; common prominent very pale brown (10YR 7/3) silt coatings on faces of peds and in accumulations between some peds; few fine and very fine roots on vertical faces of peds, very few within the peds; very strongly acid; gradual smooth boundary.

C—50 to 60 inches; yellowish brown (10YR 5/6) silt loam; few fine faint yellowish brown (10YR 5/8) and few fine distinct brown (10YR 5/3) and light brownish gray (10YR 6/2) mottles; moderate medium and thick platy structure; firm; few prominent very pale brown (10YR 7/3) silt accumulations; very few fine and very fine roots; strongly acid.

The thickness of the solum ranges from 50 to more than 60 inches. The depth to the Bx horizon is generally about 30 inches but ranges from 25 to 40 inches. The control section ranges from 24 to 30 percent clay, and the solum averages less than 10 percent sand to a depth of 45 inches or more. Typically, the subhorizon directly below the B/E horizon has the highest content of clay in the solum.

The A horizon generally ranges from 6 to 11 inches in thickness. In eroded areas, however, it is as thin as 3 inches and is silt loam or silty clay loam. Eroded pedons commonly do not have an E horizon. Some pedons do not have a B/E horizon. The Bt and Bx horizons have hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6. They generally range from very strongly acid to medium acid. Because of local liming practices, however, the upper part of the Bt horizon is less acid in some pedons.

Huey Series

The Huey series consists of poorly drained, very slowly permeable, saline-alkali soils on broad flats and in slight depressions on the Illinoian till plains. These soils formed in loess. Slopes range from 0 to 2 percent.

Huey soils are similar to Piasa soils and commonly are adjacent to Coulterville, Oconee, and Piasa soils. The somewhat poorly drained Coulterville soils generally are in the slightly more sloping areas. They are more acid in the upper part of the solum than the Huey soils. The somewhat poorly drained Oconee soils are on slight rises. They have a surface layer that is darker and thicker than that of the Huey soils. Also, their subsoil contains more clay and has no concentrations of sodium. Piasa soils have a surface layer that is darker than that of the Huey soils and contain more clay in the subsoil. They are in landscape positions similar to those of the Huey soils.

Typical pedon of Huey silt loam, in a cultivated field about 3.5 miles southwest of Willisville; approximately 300 feet north and 150 feet east of the southwest corner of sec. 2, T. 7 S., R. 5 W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; neutral; clear smooth boundary.

E—9 to 13 inches; light brownish gray (10YR 6/2) silt loam; moderate medium platy structure; friable, neutral; abrupt smooth boundary.

Btg1—13 to 24 inches; grayish brown (10YR 5/2) silty clay loam; few medium prominent strong brown (7.5YR 5/8) mottles; moderate medium prismatic structure; firm; common faint grayish brown (10YR 5/2) clay films on faces of peds; mildly alkaline; clear smooth boundary.

Btg2—24 to 32 inches; light brownish gray (10YR 6/2) silty clay loam; few medium prominent strong brown (7.5YR 5/8) mottles; moderate medium prismatic structure; firm; common faint light brownish gray (10YR 6/2) clay films on faces of peds; common light colored accumulations of calcium carbonates; moderately alkaline; clear smooth boundary.

Btg3—32 to 51 inches; light brownish gray (10YR 6/2) silty clay loam; common medium prominent strong brown (7.5YR 5/8) mottles; weak medium subangular blocky structure; firm; few faint light brownish gray (10YR 6/2) clay films on faces of peds; common light colored accumulations of calcium carbonates; moderately alkaline; clear smooth boundary.

Cg—51 to 60 inches; light brownish gray (10YR 6/2) silt loam; few medium prominent strong brown (7.5YR 5/8) mottles; massive; firm; few light colored accumulations of calcium carbonates; neutral.

The solum ranges from 42 to more than 60 inches in thickness. The control section ranges from 25 to 35 percent clay. The content of exchangeable sodium is more than 15 percent within 16 inches of the surface.

The surface soil is 10 to 14 inches thick. The Btg horizon has hue of 10YR, 2.5Y, or 5Y; value of 4 to 6, and chroma of 1 or 2. It is mildly alkaline to strongly alkaline. The C horizon is silt loam or silty clay loam.

Hurst Series

The Hurst series consists of somewhat poorly drained, very slowly permeable soils on plains, ridges, and side slopes on terraces along the major rivers. These soils formed in a thin mantle of loess or silty sediments and in the underlying clayey lacustrine sediments. Slopes are mainly 0 to 3 percent but range from 0 to 5 percent.

Hurst soils are similar to Colp soils and commonly are adjacent to Colp, Kendall, Okaw, and St. Charles soils. Colp and St. Charles soils are either on the higher parts of the landscape or on the steeper slopes below the Hurst soils. Colp soils are moderately well drained. St. Charles and Kendall soils average less than 35 percent clay in the control section. Kendall soils are on the slightly higher parts on the landscape. Their loess mantle is thicker than that of the Hurst soils. Okaw soils are poorly drained and are on slightly lower terraces.

Typical pedon of Hurst silt loam, 0 to 2 percent slopes, in a cultivated field about 2.5 miles east of Ruma; approximately 1,020 feet east and 555 feet south of the center of partial sec. 35, T. 4 S., R. 8 W.

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam, grayish brown (10YR 5/2) dry; common fine distinct dark yellowish brown (10YR 4/4) mottles; moderate medium granular structure parting to weak medium platy; friable; medium acid; clear smooth boundary.

E—8 to 11 inches; light gray (10YR 7/2) silt loam; moderate medium subangular blocky structure; friable; medium acid; abrupt smooth boundary.

Bt1—11 to 19 inches; brown (10YR 5/3) silty clay loam; few fine faint yellowish brown (10YR 5/8) and common medium faint grayish brown (10YR 5/2) mottles; moderate medium prismatic structure; firm; common faint grayish brown (10YR 5/2) clay films and light gray (10YR 7/2) silt coatings on faces of peds; very strongly acid; clear smooth boundary.

2Bt2—19 to 26 inches; brown (10YR 5/3) silty clay; few fine faint yellowish brown (10YR 5/8) mottles; moderate medium prismatic structure parting to weak medium subangular blocky; very firm; many distinct grayish brown (10YR 5/2) clay films on faces of peds; very strongly acid; clear smooth boundary.

2Bt3—26 to 40 inches; brown (10YR 5/3) silty clay; common medium faint grayish brown (10YR 5/2) mottles; moderate medium prismatic structure parting to weak medium subangular blocky; very firm; common distinct grayish brown (10YR 5/2) clay films on faces of peds; very strongly acid; clear smooth boundary.

2Btg—40 to 48 inches; light brownish gray (10YR 6/2) silty clay loam; common medium distinct yellowish brown (10YR 5/8) mottles; weak medium prismatic structure parting to weak medium subangular blocky; firm; many distinct grayish brown (2.5Y 5/2) clay films on faces of peds; slightly acid; clear smooth boundary.

2Cg—48 to 60 inches; dark grayish brown (2.5Y 4/2) silty clay loam; common medium prominent yellowish red (5YR 4/6) mottles; massive; neutral.

The loess or silty mantle is 10 to 20 inches thick. The solum ranges from 42 to more than 60 inches in thickness. It generally is extremely acid to medium acid, but it ranges to neutral in the lower part. The content of clay in the control section ranges from 35 to 48 percent.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The surface soil is 8 to 18 inches thick. The Bt horizon is mainly silty clay but is silty clay loam in areas where the mantle of loess is thicker. The C horizon has strata of silty clay and silt loam.

Jacob Series

The Jacob series consists of poorly drained, very slowly permeable soils on broad flats and slight ridges on flood plains along the major rivers. These soils formed in clayey slack-water sediments. Slopes commonly are less than 1 percent but range from 0 to 2 percent.

Jacob soils are similar to Booker soils and commonly are adjacent to Booker, Darwin, and Fults soils. The adjacent soils have a mollic epipedon. Booker soils commonly are on the lower flood plains. Darwin and Fults soils are in landscape positions similar to those of the Jacob soils or are in the slightly higher positions. Fults soils have loamy horizons within a depth of 45 inches.

Typical pedon of Jacob silty clay, in a cultivated field about 3 miles west of Ellis Grove; Illinois State Plane Coordinates 490,150 feet north and 557,700 feet east (Illinois West Zone), T. 6 S., R. 8 W.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silty clay, light brownish gray (10YR 6/2) dry; moderate medium angular blocky structure; firm; few dark stains (iron and manganese oxides); mildly alkaline; abrupt smooth boundary.

Bg1—6 to 14 inches; grayish brown (10YR 5/2) silty clay; common medium prominent strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to moderate medium angular blocky; very firm; few dark stains (iron and manganese oxides); medium acid; clear smooth boundary.

Bg2—14 to 34 inches; dark gray (10YR 4/1) clay; weak medium prismatic structure parting to moderate medium angular blocky; very firm; few dark stains (iron and manganese oxides); many stress surfaces; strongly acid; clear smooth boundary.

Bg3—34 to 46 inches; grayish brown (2.5Y 5/2) clay; common medium distinct yellowish brown (10YR 5/4) and strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to weak coarse angular blocky; very firm; few dark stains and concretions (iron and manganese oxides); strongly acid; clear smooth boundary.

BCg—46 to 55 inches; grayish brown (2.5Y 5/2) silty clay; common medium distinct yellowish brown (10YR 5/4) and strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to weak coarse angular blocky; very firm; few dark stains and concretions (iron and manganese oxides); neutral; clear smooth boundary.

Cg—55 to 60 inches; light brownish gray (2.5Y 6/2) silty clay that has thin strata of silty clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; massive; very firm and firm; few dark stains and concretions (iron and manganese oxides); neutral.

The solum ranges from 40 to 60 inches in thickness. In the control section the content of clay ranges from 60 to 65 percent, but in individual subhorizons it ranges from 45 to 70 percent.

The Bg horizon is dominantly strongly acid or very strongly acid but ranges from extremely acid to neutral. The C horizon is dominantly silty clay or clay.

Kendall Series

The Kendall series consists of somewhat poorly drained, moderately permeable soils on outwash plains and broad ridges on terraces near the major streams. These soils formed in loess or silty material and in the underlying stratified, loamy outwash. Slopes range from 0 to 3 percent.

Kendall soils are similar to Coulterville and Whitaker soils and commonly are adjacent to Martinsville and St. Charles soils. Coulterville soils have a high content of exchangeable sodium in the subsoil. They are on ridges and side slopes on till plains. The well drained Martinsville and moderately well drained St. Charles soils are on the higher or steeper parts of the landscape. Martinsville soils have a mantle of loess that is thinner than that of the Kendall soils. St. Charles soils do not have mottles with chroma of 2 or less in the upper part of the Bt horizon. Whitaker soils have a mantle of loess that is thinner than that of the Kendall soils. The content of fine sand or coarser sand in their control section is more than 15 percent.

Typical pedon of Kendall silt loam, 0 to 3 percent slopes, in a cultivated field about 3.5 miles northeast of Evansville; approximately 1,500 feet north and 600 feet west of the center of partial sec. 5, T. 5 S., R. 7 W.

Ap—0 to 10 inches; dark brown (10YR 4/3) silt loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; slightly acid; abrupt smooth boundary.

E—10 to 13 inches; brown (10YR 5/3) silt loam; common fine faint dark yellowish brown (10YR 4/4) mottles; weak fine subangular blocky and weak medium platy structure; friable; few faint light yellowish brown (10YR 6/4) silt coatings on faces of peds; strongly acid; clear smooth boundary.

BE—13 to 18 inches; brown (10YR 5/3) silty clay loam; common medium faint yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; friable; common faint light brownish gray (10YR 6/2) silt coatings on faces of peds; common fine dark stains and accumulations (iron and manganese oxides); very strongly acid; clear smooth boundary.

Bt1—18 to 31 inches; grayish brown (10YR 5/2) silty clay loam; common fine distinct dark yellowish brown (10YR 4/4) mottles; strong medium prismatic structure parting to weak medium and coarse subangular blocky; friable; common faint grayish brown (10YR 5/2) and dark yellowish brown (10YR 4/4) clay films and light brownish gray (10YR 6/2) silt coatings on faces of peds; strongly acid; clear smooth boundary.

Bt2—31 to 40 inches; grayish brown (10YR 5/2) silty clay loam; many coarse distinct strong brown (7.5YR 5/6) mottles; weak coarse prismatic structure parting to moderate medium subangular blocky; firm; common faint grayish brown (10YR 5/2) and dark yellowish brown (10YR 4/4) clay films and pale brown (10YR 6/3) silt coatings on faces of peds; about 15 percent sand; many fine dark stains and accumulations (iron and manganese oxides); strongly acid; clear smooth boundary.

2Bt3—40 to 45 inches; grayish brown (10YR 5/2) clay loam; many coarse distinct brown (7.5YR 4/4) mottles; weak thick platy and weak medium subangular blocky structure; firm; few faint dark yellowish brown (10YR 4/4) clay films and pale brown (10YR 6/3) silt coatings on faces of peds; about 25 percent sand; many fine dark stains and accumulations (iron and manganese oxides); strongly acid; clear smooth boundary.

2C—45 to 60 inches; brown (10YR 5/3) stratified silty clay loam and loam; common medium and coarse distinct dark yellowish brown (10YR 4/4) mottles; weak thick platy structure; firm; about 25 percent sand; many fine dark stains and accumulations (iron and manganese oxides); medium acid.

The thickness of the solum and the thickness of the overlying silty material range from 40 to 60 inches. The control section ranges from 27 to 35 percent clay and averages less than 15 percent fine sand or coarser sand.

The surface soil is 10 to 16 inches thick. The Bt and 2Bt horizons have hue of 10YR or 2.5Y, value of 4 to 6, and chroma generally of 2. At least one subhorizon within a depth of 30 inches has chroma of 3 or higher. The Bt horizon ranges from very strongly acid to neutral. Some pedons have a 2BC horizon. The 2BC and 2C horizons are stratified loam, silt loam, silty clay loam, or fine sandy loam.

Landes Series

The Landes series consists of well drained soils on ridges and natural levees on flood plains along the major rivers. These soils formed in loamy sediments. Permeability is moderately rapid in the solum and rapid in the substratum. Slopes range from 1 to 5 percent.

Landes soils are similar to Raddle soils and commonly are adjacent to Darwin, Parkville, and Raddle soils. Raddle soils are on the less sloping rises on the flood plains. The content of fine sand or coarser sand in their control section is less than 15 percent. The poorly drained Darwin and somewhat poorly drained Parkville soils are lower on the flood plains than the Landes soils. Also, Darwin soils contain more clay in the solum. Parkville soils formed in clayey material over loamy material.

Typical pedon of Landes very fine sandy loam, 1 to 5 percent slopes, in a cultivated field about 1 mile southwest of Modoc; Illinois State Plane Coordinates 498,650 feet north and 530,050 feet east (Illinois West Zone), T. 5 S., R. 9 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) very fine sandy loam, grayish brown (10YR 5/2) dry; weak medium and coarse granular structure; very friable; many fine roots; neutral; abrupt smooth boundary.

A—8 to 12 inches; very dark grayish brown (10YR 3/2) very fine sandy loam, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure; very friable; common fine roots; neutral; clear smooth boundary.

BA—12 to 26 inches; dark grayish brown (10YR 4/2) very fine sandy loam; weak coarse subangular blocky structure; very friable; common fine roots; neutral; clear smooth boundary.

Bw—26 to 37 inches; brown (10YR 5/3) loam; weak medium subangular blocky structure; very friable; few yellowish brown (10YR 5/4) very fine sand coatings on faces of peds; few very dark grayish brown (10YR 3/2) lenses; few fine roots; neutral; clear smooth boundary.

C1—37 to 50 inches; brown (10YR 5/3) loamy fine sand; single grained; loose; few fine roots; neutral; gradual smooth boundary.

C2—50 to 60 inches; brown (10YR 5/3) very fine sandy loam; massive; very friable; neutral.

The thickness of the solum ranges from 25 to 40 inches. Reaction ranges from slightly acid to moderately alkaline throughout the profile. The control section averages less than 18 percent clay, but the content of silt combined with the content of clay is more more than 25 percent. The total sand content is more than 45 percent (15 percent or more fine sand or coarser sand and about 30 percent very fine sand).

The A horizon has hue of 10YR and value of 2 or 3. The A and Bw horizons are dominantly very fine sandy loam, loam, or silt loam, but the range includes loamy very fine sand. Strata in the C horizon are mainly very fine sandy loam or loamy very fine sand, but the range includes loam and silt loam.

Lenzburg Series

The Lenzburg series consists of well drained and moderately well drained, moderately slowly permeable soils on the sides and crests of spoil banks and on graded slopes in surface-mined areas in the uplands. These soils formed in fine-earth material that is mainly a mixture of calcareous loamy till and weathered siltstone. Rock fragments of siltstone and limestone are common. Slopes range from 2 to 70 percent.

Lenzburg soils are similar to Schuline and Swanwick soils and commonly are adjacent to Morristown, Schuline, and Swanwick soils. Morristown soils are in landscape positions similar to those of the Lenzburg soils. They are loamy-skeletal. Schuline and Swanwick soils are in surface-mined areas that have been reclaimed. Their content of coal and other carbonaceous coarse fragments is less than 15 percent.

Typical pedon of Lenzburg silt loam, 4 to 12 percent slopes, in a field of fescue and alfalfa about 3 miles southeast of Schuline; approximately 12 feet south and 580 feet east of the center of sec. 22, T. 5 S., R. 6 W.

A—0 to 3 inches; mixed dark brown (10YR 4/3), light brownish gray (10YR 6/2), yellowish brown (10YR 5/6), and yellowish red (5YR 5/6) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable, slightly hard; about 15 percent till pebbles and flagstones and channers of limestone and siltstone; slight effervescence; mildly alkaline; abrupt wavy boundary.

AC—3 to 6 inches; mixed yellowish brown (10YR 5/4), light brownish gray (10YR 6/2), and strong brown (7.5YR 5/6) silt loam; moderate medium platy structure; friable, hard and slightly hard; about 15 percent till pebbles and flagstones and channers of limestone and siltstone; strong effervescence; moderately alkaline; abrupt wavy boundary.

C1—6 to 10 inches; brown (10YR 4/3) silty clay loam; strong thick horizontal layers; firm, hard; about 15 percent till pebbles and flagstones and channers of limestone and siltstone; few light brownish gray (10YR 6/2) soil fragments; strong effervescence; mildly alkaline; abrupt wavy boundary.

C2—10 to 33 inches; mixed brown (7.5YR 4/4) and pale brown (10YR 6/3) silty clay loam; massive; firm, hard; few vertical cleavage planes; few gray (10YR 5/1) soil fragments throughout and few yellowish red (5YR 5/6) soil fragments in the lower part; about 18 percent till pebbles and flagstones and channers of limestone and siltstone; strong effervescence; mildly alkaline; clear smooth boundary.

C3—33 to 45 inches; mixed brown (7.5YR 4/4) and pale brown (10YR 6/3) silty clay loam; massive; firm, hard; few gray (10YR 6/1) and grayish brown (10YR 5/2) soil fragments; about 18 percent till pebbles and flagstones and channers of limestone and siltstone; strong effervescence; moderately alkaline; clear smooth boundary.

C4—45 to 60 inches; mixed brown (7.5YR 4/4) and gray (10YR 5/1) silty clay; very firm, very hard; few yellowish red (5YR 5/8) soil fragments; about 10 percent coarse fragments of limestone; strong effervescence; mildly alkaline.

The content of rock fragments in the control section ranges from 15 to 35 percent. The rock fragments commonly range from 2 millimeters to 25 millimeters in size, but some are stones or small boulders. The control section is mildly alkaline or moderately alkaline and contains free carbonates. The acid substratum phase is neutral to extremely acid below a depth of about 48 inches. The content of organic carbon decreases irregularly with increasing depth because of mixing and the presence of flakes and fragments of coal and other carbonaceous material.

The A horizon is silt loam, silty clay loam, clay loam, loam, or the channery or flaggy analogs of these textures. The C horizon is silty clay loam, silt loam, loam, clay loam, or the channery, flaggy, or stony analogs of these textures. Included peds or fragments of previous genetic horizons have structure, clay films, organic coatings, or other properties characteristic of a previous formation.

Marine Series

The Marine series consists of somewhat poorly drained, slowly permeable soils on low, broad ridges on the Illinoian till plains. These soils formed in loess. Slopes range from 0 to 3 percent.

Marine soils are similar to Colp and Stoy soils and commonly are adjacent to Coulterville, Oconee, Rushville, and Stoy soils. Colp, Coulterville, Oconee, and Stoy soils are not characterized by an abrupt textural change from the E horizon to the Bt horizon. Colp soils formed in loess and lacustrine sediments on terraces. Coulterville and Oconee soils are on broad ridges and are farther from drainageways than the Marine soils. Coulterville soils have a high content of sodium in the lower part of the B horizon and in the C horizon. Oconee soils have a surface layer that is darker than that of the Marine soils. The poorly drained Rushville soils are on the more nearly level ridges and in depressional areas. They have a B horizon that is grayer than that of the Marine soils.

Typical pedon of Marine silt loam, 0 to 3 percent slopes, in a cultivated field about 1.5 miles southwest of Coulterville; approximately 2,493 feet south and 832 feet east of the northwest corner of sec. 23, T. 4 S., R. 5 W.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak medium granular structure; friable; few dark accumulations and concretions (iron and manganese oxides); slightly acid; abrupt smooth boundary.

E—8 to 11 inches; light brownish gray (10YR 6/2) silt loam; common medium distinct yellowish brown (10YR 5/4) mottles; weak medium platy and weak medium subangular blocky structure; friable, hard; few dark accumulations (iron and manganese oxides); grayish brown (10YR 5/2) and brown (10YR 5/3) krotovinas; slightly acid; abrupt smooth boundary.

B/E—11 to 13 inches; yellowish brown (10YR 5/4) silty clay loam (B part); common medium faint yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to strong medium subangular blocky; firm; few faint brown (10YR 5/3) clay films on faces of peds; continuous thick light brownish gray (10YR 6/2) silt coatings on faces of peds (E part); strongly acid; abrupt smooth boundary.

Bt1—13 to 15 inches; yellowish brown (10YR 5/4) silty clay; common medium distinct grayish brown (10YR 5/2) and few medium faint yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to strong medium angular blocky; very firm; many distinct grayish brown (10YR 5/2) clay films and few prominent light brownish gray (10YR 6/2) silt coatings on faces of peds; strongly acid; abrupt smooth boundary.

Bt2—15 to 26 inches; brown (10YR 5/3) silty clay; common medium faint grayish brown (10YR 5/2) and common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; very firm; many distinct brown (10YR 5/3) and grayish brown (10YR 5/2) clay films on faces of peds; common fine dark concretions (iron and manganese oxides); very strongly acid; clear smooth boundary.

Btg1—26 to 34 inches; grayish brown (10YR 5/2) silty clay loam; common medium prominent strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; common distinct grayish brown (10YR 5/2) clay films and few distinct dark grayish brown (10YR 4/2) organic stains on faces of peds; dark gray (10YR 4/1) krotovinas; few prominent yellowish red (5YR 5/8) stains (iron and manganese oxides); medium acid; gradual smooth boundary.

Btg2—34 to 46 inches; light brownish gray (10YR 6/2) silty clay loam; common medium faint grayish brown (10YR 5/2) and common medium prominent strong brown (7.5YR 5/6) mottles; weak medium prismatic structure; firm; few grayish brown (10YR 5/2) clay films on faces of peds; many yellowish red (5YR 4/6) accumulations (iron oxide); medium acid; gradual smooth boundary.

Cg—46 to 60 inches; grayish brown (10YR 5/2), gray (10YR 5/1), and light brownish gray (10YR 6/2) silt loam; common medium distinct yellowish brown (10YR 5/4) and common medium prominent strong brown (7.5YR 5/6) mottles; massive; friable; few prominent yellowish red (5YR 4/6) stains (iron oxide); neutral.

The thickness of the solum ranges from 45 to 60 inches. The control section ranges from 35 to 48 percent clay and averages less than 5 percent sand to a depth of 45 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is silt loam or silt. Some pedons, mainly those in wooded areas, have an A1 horizon, which is less than 7 inches thick and has value of 2 or 3. The E horizon typically is one or more units higher in value than the Ap horizon and is mottled. It is silt or silt loam in which the content of clay is less than 18 percent. The B/E horizon is less than 3 inches thick. Some pedons do not have a B/E horizon. The Bt horizon has hue of 10YR or 2.5Y, value of 4 to 7, and chroma of 1 to 4 and is mottled. It is silty clay loam or silty clay. It is dominantly very strongly acid to medium acid, but it ranges to slightly acid in the lower part. The C horizon is silt loam or silty clay loam. It is strongly acid to neutral.

Markland Series

The Markland series consists of moderately well drained, slowly permeable soils on the sides of terraces. These soils formed in calcareous lacustrine sediments. They have a thin silty mantle of material in some areas. Slopes range from 7 to 20 percent.

The Markland soils in this survey area are taxadjuncts to the series because they average more than 60 percent clay in the control section and have reddish strata in the BC or C horizon. These differences, however, do not significantly alter the usefulness or behavior of the soils.

Markland soils commonly are adjacent to Hurst, Martinsville, and St. Charles soils. The somewhat poorly drained Hurst soils are in the less sloping areas. Martinsville and St. Charles soils are in landscape positions similar to those of the Markland soils. They have less clay and more silt or sand in the Bt horizon than the Markland soils.

Typical pedon of Markland silty clay loam, 7 to 20 percent slopes, eroded, in a cultivated field about 3 miles northwest of Ellis Grove; Illinois State Plane Coordinates 498,300 feet north and 562,100 feet east (Illinois West Zone), T. 6 S., R. 8 W.

Ap—0 to 5 inches; dark brown (10YR 4/3) silty clay loam, pale brown (10YR 6/3) dry; moderate fine and medium subangular blocky structure; firm; neutral; abrupt smooth boundary.

Bt1—5 to 15 inches; brown (10YR 5/3) clay; few fine distinct strong brown (7.5YR 5/6) and few fine prominent red (2.5YR 4/8) mottles; strong coarse subangular blocky structure; very firm; common faint brown (10YR 5/3) clay films on faces of peds; few dark stains (iron and manganese oxides); strongly acid; clear smooth boundary.

Bt2—15 to 30 inches; light olive brown (2.5Y 5/4) clay; many medium faint grayish brown (2.5Y 5/2) and few medium prominent strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to moderate coarse angular blocky; very firm; many distinct grayish brown (2.5Y 5/2) clay films on faces of peds; few dark stains (iron and manganese oxides); strongly acid; clear smooth boundary.

BC—30 to 37 inches; grayish brown (2.5Y 5/2) silty clay; few medium distinct yellowish brown (10YR 5/4) and prominent brown (7.5YR 4/4) mottles; weak coarse angular blocky structure; very firm; common dark stains (iron and manganese oxides); few lime nodules; slight effervescence; neutral; gradual smooth boundary.

C1—37 to 51 inches; weak red (10R 5/2) silty clay loam that has lenses of dark yellowish brown (10YR 4/4) loamy fine sand; few medium prominent strong brown (7.5YR 5/6) mottles; massive; firm; common dark stains (iron and manganese oxides); many lime nodules; strong effervescence; mildly alkaline; gradual smooth boundary.

C2—51 to 60 inches; dark grayish brown (2.5Y 4/2) silty clay loam that has thin lenses of dark yellowish brown (10YR 4/4) loamy fine sand; few medium prominent strong brown (7.5YR 5/6) and yellowish brown (10YR 5/4) mottles; massive; firm; few bands of red (10R 4/6) iron stains; many lime nodules; strong effervescence; mildly alkaline.

The solum ranges from 30 to 40 inches in thickness. The control section ranges from 55 to 65 percent clay and averages less than 15 percent fine sand or coarser sand. Some pedons have a loess mantle, which is less than 6 inches thick.

The Bt horizon is silty clay or clay. It ranges from strongly acid to neutral. The C horizon is dominantly silty clay and silty clay loam but has thin layers of silt loam, loam, fine sandy loam, or loamy fine sand. It is mildly alkaline or moderately alkaline.

Martinsville Series

The Martinsville series consists of well drained, moderately permeable soils on ridges and side slopes on terraces near the major streams. These soils formed in loamy outwash. Slopes range from 1 to 18 percent.

Martinsville soils are similar to Hickory soils and commonly are adjacent to Colp and St. Charles. Hickory soils formed in glacial till. Colp soils have more clay and less sand throughout than the Martinsville soils. They are mainly at the lower terrace levels and are farther from the streams than the Martinsville soils. St. Charles soils are in landscape positions similar to those of the Martinsville soils. They have a lower content of sand in the control section than the Martinsville soils and are deeper to loamy outwash sediments.

Typical pedon of Martinsville silt loam, 1 to 7 percent slopes, in a wooded area about 2.0 miles north and 2.5 miles west of Baldwin; approximately 2,410 feet south and 100 feet west of the northeast corner of sec. 5, T. 4 S., R. 7 W.

A1—0 to 4 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; very friable; medium acid; abrupt smooth boundary.

A2—4 to 8 inches; dark brown (10YR 4/3) silt loam; weak fine and medium subangular blocky structure; friable; about 25 percent sand; medium acid; abrupt smooth boundary.

E—8 to 10 inches; light yellowish brown (10YR 6/4) silt loam; weak medium platy structure; friable; about 26 percent sand; medium acid; abrupt smooth boundary.

BE—10 to 12 inches; yellowish brown (10YR 5/4) silt loam; weak fine and medium subangular blocky structure; friable; few faint brown (10YR 5/3) clay films on faces of peds; few fine dark concretions (iron and manganese oxides); about 25 percent sand; strongly acid; abrupt smooth boundary.

Bt1—12 to 18 inches; strong brown (7.5YR 5/6) silty clay loam; moderate medium prismatic structure parting to moderate and strong medium subangular blocky; firm; many distinct brown (7.5YR 4/4) clay films on faces of peds; few dark stains and concretions (iron and manganese oxides); about 20 percent sand; strongly acid; clear smooth boundary.

Bt2—18 to 27 inches; yellowish brown (10YR 5/6) and brown (10YR 5/3) silty clay loam; strong medium prismatic structure parting to moderate and strong medium and coarse subangular blocky; firm; many distinct brown (7.5YR 4/4) clay films on faces of peds; common dark stains and concretions (iron and manganese oxides); about 20 percent sand; strongly acid; clear smooth boundary.

Bt3—27 to 38 inches; brown (10YR 5/3) clay loam; common medium distinct strong brown (7.5YR 5/8) mottles; moderate medium and coarse prismatic structure parting to moderate medium and coarse subangular blocky; firm; many faint brown (7.5YR 4/4) clay films on faces of peds; common dark stains and concretions (iron and manganese oxides); about 26 percent sand; strongly acid; gradual smooth boundary.

BC—38 to 49 inches; brown (10YR 5/3) loam; many medium distinct strong brown (7.5YR 5/8) mottles; weak medium and coarse subangular blocky structure; friable; slightly hard; discontinuous faint brown (7.5YR 4/4) clay films on faces of peds; about 41 percent sand; strongly acid; gradual smooth boundary.

C—49 to 60 inches; brown (10YR 5/3) fine sandy loam; many coarse prominent strong brown (7.5YR 5/8) mottles; massive; very friable; hard; about 62 percent sand; medium acid.

The thickness of the solum ranges from 36 to 60 inches. The control section ranges from 18 to 33 percent clay. It ranges from 15 percent or more fine sand or coarser sand and less than 5 percent coarse fragments.

The A horizon has hue of 10YR, value of 3 to 5, and chroma of 3 or 4. It is fine sandy loam, loam, or silt loam. The Bt horizon has hue of 10YR or 7.5YR, value of 4 to 6, and chroma of 3 to 6. It is fine sandy loam, loam, clay loam, or silty clay loam. It is mainly medium acid or strongly acid, but in some pedons the lower subhorizons are slightly acid. The C horizon has strata that range from loamy fine sand to silt loam.

Montgomery Series

The Montgomery series consists of very poorly drained, slowly permeable soils in slight depressions and on low benches on terraces near the major streams. These soils formed in clayey lacustrine deposits. Slopes range from 0 to 2 percent.

Montgomery soils are similar to Darwin soils and commonly are adjacent to Hurst, Okaw, and Whitaker soils. The poorly drained Darwin soils are montmorillonitic and have a very high shrink-swell potential. Hurst and Okaw soils do not have a mollic epipedon. The somewhat poorly drained Hurst soils are on the higher parts of the landscape, and the poorly drained Okaw soils are mainly on broad flats. Whitaker soils contain less clay and more sand in the solum than the Montgomery soils. Also, they are higher on the landscape or are nearer to the streams.

Typical pedon of Montgomery silty clay loam, in a cultivated field about 3 miles southeast of Red Bud; approximately 68 feet north and 1,152 feet west of the southeast corner of sec. 15, T. 4 S., R. 8 W.

Ap—0 to 9 inches; black (10YR 2/1) silty clay loam, dark gray (10YR 4/1) dry; moderate medium subangular blocky structure; firm; neutral; clear smooth boundary.

A—9 to 13 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; common medium prominent grayish brown (2.5Y 5/2) and light olive brown (2.5Y 5/4) mottles; strong medium subangular blocky structure; firm; neutral; clear smooth boundary.

Bg1—13 to 22 inches; very dark gray (10YR 3/1) silty clay, dark gray (10YR 4/1) dry; moderate coarse prismatic structure parting to moderate medium angular blocky; very firm; common dark stains and concretions (iron and manganese oxides); neutral; gradual smooth boundary.

Bg2—22 to 33 inches; dark grayish brown (2.5Y 4/2) silty clay; thin strata of sandy clay loam; common fine distinct light olive brown (2.5Y 5/4) mottles; moderate coarse prismatic structure parting to weak medium angular blocky; very firm; dark gray (10YR 4/1) pressure faces; common lime nodules (calcium carbonates); strong effervescence; mildly alkaline; gradual smooth boundary.

Bg3—33 to 43 inches; dark grayish brown (2.5Y 4/2) silty clay; thin strata of sandy clay loam; few fine distinct yellowish brown (10YR 5/4) and prominent strong brown (7.5YR 5/6) mottles; moderate coarse prismatic structure; very firm; dark grayish brown (10YR 4/2) stress surfaces; many lime nodules (calcium carbonates); violent effervescence; mildly alkaline; gradual smooth boundary.

BCg—43 to 48 inches; grayish brown (2.5Y 5/2) silty clay that has thin layers of sandy clay loam; common fine prominent strong brown (7.5YR 5/8) and common medium distinct light olive brown (2.5Y 5/4) mottles; weak medium prismatic structure; firm; grayish brown (2.5Y 5/2) pressure faces; many lime nodules (calcium carbonates); strong effervescence; mildly alkaline; gradual smooth boundary.

Cg—48 to 60 inches; grayish brown (10YR 5/2) silty clay loam; common medium prominent strong brown (7.5YR 5/8) mottles; massive; firm; few lime nodules (calcium carbonates); slight effervescence; neutral.

The solum ranges from 30 to 55 inches in thickness. It is slightly acid to mildly alkaline and is calcareous in the lower part. The control section ranges from 40 to 55 percent clay.

The A horizon has hue of 2.5Y or 10YR, value of 2 or 3, and chroma of 1 or 2. It is silty clay or silty clay loam. The Bg horizon has hue of 10YR to 5Y, value of 4 or 5, and chroma of 1 or 2. It is dominantly silty clay but ranges from silty clay loam to clay. The Cg horizon has strata of clay, silty clay, loam, or clay in some pedons.

Morristown Series

The Morristown series consists of well drained, moderately slowly permeable soils on the sides and crests of spoil banks and on graded slopes in surface-mined areas. These soils formed in a mixture of partially weathered fine-earth material and many rock fragments, mainly of siltstone and limestone. Slopes range from 4 to 35 percent.

Morristown soils commonly are adjacent to Lenzburg and Schuline soils. Lenzburg soils are in landscape positions similar to those of the Morristown soils. They have a lower content of coarse fragments throughout than the Morristown soils. Schuline soils are in reclaimed surface-mined areas. Their content of coarse fragments is less than 15 percent.

Typical pedon of Morristown very stony silty clay loam, 18 to 35 percent slopes, in a pasture about 3.5 miles northeast of Percy; approximately 2,400 feet south and 400 feet west of the northeast corner of sec. 25, T. 5 S., R. 5 W.

A—0 to 3 inches; very dark grayish brown (10YR 3/2) very stony silty clay loam, grayish brown (10YR 5/2) dry; moderate medium granular and moderate fine subangular blocky structure; friable; about 55 percent channers and stones; slight effervescence; moderately alkaline; abrupt smooth boundary.

C1—3 to 27 inches; mixed pale brown (10YR 6/3), very pale brown (10YR 7/3), and strong brown (7.5YR 5/8) very channery silt loam; remnants of weak medium subangular blocky peds but otherwise massive; friable and firm; few seams of gray (10YR 6/1) silty clay that has many coarse yellowish red (5YR 5/6) stains; common pockets of dark carbon-rich material; about 55 percent channers and stones; strong effervescence; moderately alkaline; clear smooth boundary.

C2—27 to 44 inches; mixed brown (10YR 5/3), pale brown (10YR 6/3), and strong brown (7.5YR 5/8) very channery silty clay loam; massive; friable and firm; few seams of gray (10YR 6/1) silty clay that has many medium and coarse yellowish red (5YR 5/6) stains; common pockets of dark carbon-rich material; about 45 percent channers and stones; strong effervescence; mildly alkaline; clear wavy boundary.

C3—44 to 60 inches; mixed dark gray (N 4/0), light yellowish brown (2.5Y 6/4), very dark gray (10YR 3/1), and strong brown (7.5YR 5/8) very channery silty clay; massive; firm; few seams of gray (10YR 6/1) silty clay that has many coarse yellowish red (5YR 5/6) stains; common pockets of dark carbon-rich material; about 40 percent channers and stones; mildly alkaline.

The depth to bedrock is more than 60 inches. The content of coarse fragments in the control section ranges from 35 to 65 percent and averages about 50 percent. Stones cover as much as 25 percent of the surface.

The A horizon is silt loam, silty clay loam, or loam. It has mainly weak or moderate, fine or medium, granular or subangular blocky structure. Some pedons have an AC horizon. This horizon has platy structure. The C horizon is dominantly the very channery, flaggy, or stony analogs of silty clay loam, silt loam, or loam. In some pedons, however, it has lenses or pockets of silty clay, clay loam, or loamy fine sand. It is mildly alkaline or moderately alkaline.

Muren Series

The Muren series consists of moderately well drained, moderately permeable soils on convex ridgetops and side slopes in the uplands. These soils formed in loess. Slopes range from 1 to 10 percent.

Muren soils are similar to Hosmer and Stoy soils and commonly are adjacent to Alford and Hosmer soils. Hosmer soils are in landscape positions similar to those of the Muren soils. They do not have chroma of 2 or less in the upper 10 inches of the Bt horizon and have a Bx horizon. The well drained Alford soils are on the slightly higher or steeper parts of the landscape. The somewhat poorly drained Stoy soils are in landscape positions similar to those of the Muren soils. They have a Bx horizon. In one or more of their Bt subhorizons, they are higher in clay content than the Muren soils.

Typical pedon of Muren silt loam, 1 to 5 percent slopes, in a cultivated field about 2.5 miles northeast of Prairie du Rocher, Illinois State Plane Coordinates 523,800 feet north and 530,050 feet east (Illinois West Zone), T. 5 S., R. 9 W.

Ap—0 to 10 inches; dark yellowish brown (10YR 4/4) silt loam, light yellowish brown (10YR 6/4) dry; moderate very fine and fine granular structure; friable; common dark brown (10YR 4/3) organic coatings on faces of peds; few dark brown (10YR 4/3) worm casts; common very fine and fine roots; slightly acid; abrupt smooth boundary.

E—10 to 15 inches; yellowish brown (10YR 5/4) silt loam; few fine faint yellowish brown (10YR 5/6) mottles; weak fine subangular blocky structure; friable; few dark brown (10YR 4/3) worm casts; slightly acid; abrupt smooth boundary.

Bt1—15 to 21 inches; yellowish brown (10YR 5/4) silty clay loam; few medium distinct dark yellowish brown (10YR 4/6) and common medium distinct yellowish brown (10YR 5/8) mottles; moderate fine and medium subangular blocky structure; firm; common distinct brown (10YR 5/3) clay films and many distinct light yellowish brown (10YR 6/4) silt coatings on faces of peds; few very fine and fine roots; few fine and medium dark accumulations (iron and manganese oxides); medium acid; clear smooth boundary.

Bt2—21 to 28 inches; yellowish brown (10YR 5/4) silty clay loam; common fine distinct light brownish gray (10YR 6/2) and common medium distinct dark yellowish brown (10YR 4/6) and strong brown (7.5YR 5/8) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; many distinct dark yellowish brown (10YR 4/4) clay films and common distinct light yellowish brown (10YR 6/4) silt coatings on faces of peds; few very fine roots; common fine and medium dark accumulations (iron and manganese oxides); very strongly acid; clear smooth boundary.

Bt3—28 to 41 inches; yellowish brown (10YR 5/4) silty clay loam; common fine distinct grayish brown (10YR 5/2) and light brownish gray (10YR 6/2) mottles; weak medium prismatic structure; firm; common medium distinct dark yellowish brown (10YR 4/6), strong brown (7.5YR 5/4), and dark brown (7.5YR 4/4) clay films and common distinct light yellowish brown (10YR 6/4) silt coatings on faces of peds; few very fine roots; common fine and medium dark accumulations (iron and manganese oxides); very strongly acid; gradual smooth boundary.

BC—41 to 53 inches; yellowish brown (10YR 5/4) silty clay loam; many medium distinct light brownish gray (10YR 6/2) and common fine and medium distinct strong brown (7.5YR 5/8) and dark yellowish brown (10YR 4/6) mottles; weak coarse prismatic structure and weak thin platy cleavage planes; firm; few faint dark yellowish brown (10YR 4/4) clay films on vertical faces of peds and few pale brown (10YR 6/3) and light yellowish brown (10YR 6/4) silt coatings on horizontal faces of the cleavage planes; very few very fine roots; common fine and medium dark accumulations (iron and manganese oxides); very strongly acid; gradual smooth boundary.

C—53 to 60 inches; yellowish brown (10YR 5/4 and 5/6) silt loam; many medium distinct light brownish gray (10YR 6/2) and common medium distinct dark yellowish brown (10YR 4/6) mottles; massive; few weak thick cleavage planes; friable; common fine and medium dark accumulations (iron and manganese oxides); strongly acid.

The thickness of the solum ranges from 42 to 60 inches. The control section ranges from 22 to 30 percent clay.

The surface soil is 12 to 18 inches thick in uneroded areas but is as thin as 5 inches in eroded areas. The A horizon has value of 4 or 5 and chroma of 3 or 4. It is dominantly silt loam, but in some eroded areas it is silty clay loam. Some pedons do not have an E horizon. The Bt horizon is silty clay loam or silt loam. It ranges from medium acid to very strongly acid. It has hue of 10YR or 7.5YR, value of 4 or 5, chroma of 3 to 6. Mottles with chroma of 2 or less are within the upper 10 inches of this horizon. The C horizon has hue of 10YR or 7.5YR, value of 4 to 7, and chroma of 3 to 6.

Neotoma Series

The Neotoma series consists of deep, well drained, moderately rapidly permeable soils on side slopes in the uplands. These soils formed in a thin mantle of silty colluvium and in the underlying sandstone and siltstone residuum. Slopes range from 25 to 50 percent.

The Neotoma soils in this survey area have a base saturation of less than 35 percent directly above the lithic contact. This base saturation is lower than is definitive for the series. This difference, however, does not significantly alter the usefulness or behavior of the soils.

Neotoma soils commonly are adjacent to Brookside and Wellston soils. Brookside soils contain more clay throughout than the Neotoma soils and are less acid. Also, they are lower on the landscape. Wellston soils formed in 20 to 40 inches of loess or silty material and have a lower content of rock fragments than the Neotoma soils. They either are higher on the landscape than the Neotoma soils or are in the less sloping areas below the Neotoma soils.

Typical pedon of Neotoma stony silt loam, in a wooded area of the Neotoma-Wellston complex, 25 to 50 percent slopes, about 2 miles northwest of Rockwood; approximately 520 feet west and 2,000 feet north of the southeast corner of sec. 2, T. 8 S., R. 6 W.

A—0 to 3 inches; very dark brown (10YR 2/2) stony silt loam, very dark grayish brown (10YR 3/2) dry; weak medium granular structure; friable; about 15 percent rock fragments; slightly acid; abrupt smooth boundary.

E—3 to 6 inches; yellowish brown (10YR 5/4) flaggy silt loam; weak fine subangular blocky structure; friable; about 20 percent rock fragments; medium acid; clear smooth boundary.

BE—6 to 15 inches; yellowish brown (10YR 5/4) flaggy silt loam; weak fine and medium subangular blocky structure; friable; about 45 percent rock fragments; very strongly acid; clear wavy boundary.

Bt1—15 to 25 inches; yellowish brown (10YR 5/4) very flaggy silt loam; weak medium subangular blocky structure; friable; few distinct reddish brown (5YR 4/4) clay films on faces of peds and on coarse fragments; about 60 percent rock fragments; very strongly acid; clear irregular boundary.

Bt2—25 to 32 inches; yellowish brown (10YR 5/4) very flaggy loam; weak medium subangular blocky structure; friable; common distinct dark brown (7.5YR 4/4) clay films on faces of peds and on

coarse fragments; about 70 percent rock fragments; very strongly acid; clear irregular boundary.
BC—32 to 45 inches; yellowish brown (10YR 5/6) very flaggy silt loam; weak medium subangular blocky structure; friable; few distinct yellowish red (5YR 4/6) clay films on faces of peds and on coarse fragments; about 85 percent rock fragments; strongly acid; abrupt smooth boundary.
R—45 inches; interbedded hard siltstone and sandstone.

The solum ranges from 36 to 54 inches in thickness. The depth to consolidated bedrock ranges from 40 to 80 inches. The content of rock fragments throughout the solum ranges from 35 to 65 percent. In individual subhorizons, it ranges from 20 to 85 percent. The control section ranges from 8 to 25 percent clay.

The Bt horizon is mainly silt loam or loam but ranges from sandy loam to silty clay loam. It has hue of 10YR, 7.5YR, or 5YR, value of 4 or 5, and chroma of 4 to 6. It ranges from medium acid to extremely acid.

Oconee Series

The Oconee series consists of somewhat poorly drained, slowly permeable soils on the tops and sides of low ridges on till plains. These soils formed in loess. Slopes range from 0 to 5 percent.

Oconee soils are similar to Hurst soils and commonly are adjacent to Coulterville, Marine, and Piasa soils. Hurst soils formed in loess and in clayey lacustrine sediments. They are on terraces. Coulterville and Marine soils are in positions on the landscape similar to those of the Oconee soils. They have a surface layer that is lighter colored than that of the Oconee soils. Coulterville and Piasa soils have a high content of exchangeable sodium in the subsoil. The poorly drained Piasa soils are on broad flats.

Typical pedon of Oconee silt loam, 2 to 5 percent slopes, in a cultivated field about 2 miles south of Tilden; approximately 1,300 feet north and 90 feet west of the southeast corner of sec. 18, T. 4 S., R. 5 W.

Ap—0 to 6 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine granular structure; friable; neutral; clear smooth boundary.
A—6 to 9 inches; very dark grayish brown (10YR 3/2) silt loam; moderate thin platy structure; friable; few dark stains (iron and manganese oxides); neutral; abrupt smooth boundary.
E1—9 to 12 inches; dark grayish brown (10YR 4/2) silt loam; moderate medium platy structure; friable; few distinct light gray (10YR 7/1) silt coatings on faces of peds; medium acid; abrupt smooth boundary.
E2—12 to 16 inches; grayish brown (10YR 5/2) silt loam; moderate thin platy and moderate fine subangular blocky structure; friable; common distinct light gray (10YR 7/1) silt coatings on faces of peds; very strongly acid; clear smooth boundary.
Bt1—16 to 22 inches; brown (10YR 4/3) silty clay loam; common medium distinct grayish brown (10YR 5/2) mottles; moderate medium prismatic structure parting to moderate fine subangular blocky; firm; common distinct dark grayish brown (10YR 4/2) clay films and common distinct light gray (10YR 7/2) silt coatings on faces of peds; few yellowish brown (10YR 5/6) stains (iron and manganese oxides); very strongly acid; clear smooth boundary.
Bt2—22 to 28 inches; brown (10YR 4/3) silty clay loam; common medium distinct grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to moderate fine and medium subangular blocky; firm; many distinct very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) clay films and common light gray (10YR 7/2) silt coatings on faces of peds; common yellowish brown (10YR 5/6) stains and few dark concretions (iron and manganese oxides); very strongly acid; clear smooth boundary.
Bt3—28 to 33 inches; grayish brown (10YR 5/2) silty clay loam; common fine prominent strong brown (7.5YR 5/6) mottles; weak medium prismatic structure parting to weak medium subangular blocky; firm; many distinct very dark grayish brown (10YR 3/2) and dark grayish brown (10YR 4/2) clay films and common distinct light gray (10YR 7/2) silt coatings on faces of peds; common brownish yellow (10YR 6/8) stains and few dark concretions (iron and manganese oxides); medium acid; clear smooth boundary.
Bt4—33 to 38 inches; brown (10YR 5/3) and grayish brown (10YR 5/2) silty clay loam; many medium distinct brownish yellow (10YR 6/8) mottles; weak medium and coarse subangular blocky structure; firm; common distinct dark grayish brown (10YR 4/2) clay films and few distinct light gray (10YR 7/2) silt coatings on faces of peds; common dark stains and few concretions (iron and manganese oxides); medium acid; clear smooth boundary.
Bt5—38 to 42 inches; mottled grayish brown (10YR 5/2), gray (10YR 5/1), and brownish yellow (10YR 6/8) silt loam; weak medium and coarse subangular blocky structure; firm; few faint dark grayish brown (10YR 4/2) clay films and few distinct light gray (10YR 7/2) silt coatings on faces of peds; common dark stains and few concretions (iron and manganese oxides); slightly acid; clear smooth boundary.
BC—42 to 53 inches; mottled light brownish gray (10YR 6/2), brown (10YR 4/3), and brownish yellow (10YR 6/8) silt loam; massive; friable; common dark stains and concretions (iron and manganese oxides); neutral; gradual smooth boundary.
C—53 to 60 inches; light brownish gray (10YR 6/2) silt loam; many medium prominent strong brown (7.5YR

5/8) mottles; massive; friable; common yellowish red (5YR 4/6) stains and few dark concretions (iron and manganese oxides); mildly alkaline.

The solum is 40 to 60 inches thick. The control section ranges from 35 to 42 percent clay, but in some subhorizons the content of clay is as much as 45 percent.

The Ap or A horizon is 6 to 9 inches thick. It has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The E horizon has hue of 10YR, value of 4 to 7, and chroma generally of 1 or 2. If it is mottled, it has chroma of 3. The Bt horizon has hue of 10YR, value of 4 or 5, and chroma generally of 2 to 4. The upper part of this horizon has chroma of 1 or 2 in some subhorizons, but at least one subhorizon within 30 inches of the surface has chroma of 3 or 4 in the matrix. The Bt horizon is mottled throughout. It is dominantly silty clay loam or silty clay, but in some pedons it is silt loam in the lower part. It ranges from very strongly acid to medium acid in the upper part and from strongly acid to neutral in the lower part.

Okaw Series

The Okaw series consists of poorly drained, very slowly permeable soils on broad plains on terraces near the major streams. These soils formed in a thin mantle of loess or silty sediments and in the underlying clayey lacustrine sediments. Slopes range from 0 to 2 percent.

Okaw soils are similar to Rushville soils and commonly are adjacent to Colp, Hurst, and St. Charles soils. Rushville soils formed entirely in loess and are in the uplands. The moderately well drained Colp soils commonly are in more sloping areas. They contain somewhat less clay than the Okaw soils and are more stratified in the lower part of the solum. The somewhat poorly drained Hurst soils are on slight rises and broad ridges. The moderately well drained St. Charles soils are on the higher or more sloping parts of the landscape. They have less clay in the control section than the Okaw soils and are underlain by loamy outwash.

Typical pedon of Okaw silt loam, in a wooded area about 2.5 miles west of Baldwin; approximately 400 feet north and 1,060 feet west of the center of sec. 6, T. 5 S., R. 7 W.

A—0 to 4 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak and moderate medium granular structure; friable; medium acid; abrupt smooth boundary.

E1—4 to 10 inches; grayish brown (10YR 5/2) silt loam; weak medium platy structure; friable; very strongly acid; clear smooth boundary.

E2—10 to 13 inches; light gray (10YR 7/2) silt loam; very weak medium platy structure; friable, hard; very strongly acid; abrupt smooth boundary.

Btg1—13 to 16 inches; dark gray (10YR 4/1) silty clay loam; common medium distinct brown (10YR 5/3) mottles; moderate medium angular blocky structure; firm; few faint very dark gray (N 3/0) clay films on faces of peds; very strongly acid; clear smooth boundary.

2Btg2—16 to 20 inches; dark gray (10YR 4/1) silty clay; many medium distinct brown (10YR 5/3) and yellowish brown (10YR 5/6) mottles; weak medium prismatic structure; very firm; common distinct very dark gray (N 3/0) clay films on faces of peds; very strongly acid; clear smooth boundary.

2Btg3—20 to 29 inches; dark gray (10YR 4/1) silty clay; common fine faint brown (10YR 5/3) mottles; weak medium and coarse prismatic structure; very firm; many distinct dark gray (10YR 4/1) clay films on faces of peds; very strongly acid; abrupt smooth boundary.

2Btg4—29 to 37 inches; grayish brown (2.5Y 5/2) silty clay; weak coarse prismatic structure; very firm; many faint dark grayish brown (10YR 4/2) clay films on faces of peds; common fine dark concretions (iron and manganese oxides); very strongly acid; clear smooth boundary.

2Btg5—37 to 46 inches; grayish brown (2.5Y 5/2) silty clay; common medium distinct yellowish brown (10YR 5/6) mottles; weak and moderate medium and coarse prismatic and angular blocky structure; very firm; common faint grayish brown (10YR 5/2) clay films on faces of peds; common fine dark stains and concretions (iron and manganese oxides); slightly acid; clear smooth boundary.

2BCg—46 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam; common medium distinct pale brown (10YR 6/3) and prominent strong brown (7.5YR 5/6) mottles; common thick cleavage planes; firm; few faint brown (7.5YR 5/3) clay films in cleavage planes; common fine dark stains and concretions (iron and manganese oxides); neutral.

The solum ranges from 40 to 50 inches in thickness. The control section ranges from 40 to 60 percent clay and averages less than 15 percent sand.

The surface soil commonly is silt loam, but in some pedons it is silty clay loam. It is 10 to 20 inches thick. The 2Bt horizon has hue of 2.5Y or 10YR, value of 4 to 6, and chroma of 2 or less. It is mainly silty clay, but in some pedons it is silty clay loam or clay. It generally is very strongly acid to medium acid, but in some pedons the lower part is slightly acid. Some pedons have a 2C horizon. This horizon is clay, silty clay, or silty clay loam and commonly is stratified.

Parkville Series

The Parkville series consists of somewhat poorly drained soils on flood plains along the major streams.

These soils formed in clayey slack-water sediments over loamy alluvium. Permeability is very slow in the upper part of the profile and moderately rapid in the lower part. Slopes range from 0 to 3 percent.

The Parkville soils in this survey area are taxadjuncts to the series because they do not have a contrasting particle-size class within a vertical distance of 5 inches. This difference, however, does not significantly alter the usefulness or behavior of the soils.

Parkville soils commonly are adjacent to Darwin, Fults, Haynie, and Landes soils. The poorly drained Darwin and Fults soils are in the lower positions on the flood plains. They are clayey to a greater depth than the Parkville soils. The moderately well drained Haynie and well drained Landes soils are in the higher areas. They average less than 18 percent clay throughout.

Typical pedon of Parkville silty clay, 0 to 3 percent slopes, in a cultivated field about 2 miles south of Modoc; Illinois State Plane Coordinates 486,850 feet north and 549,600 feet east (Illinois West Zone), T. 6 S., R. 8 W.

Ap—0 to 5 inches; very dark grayish brown (10YR 3/2) silty clay, dark grayish brown (10YR 4/2) dry; moderate fine granular structure; firm; about 13 percent sand; neutral; abrupt smooth boundary.

AC—5 to 14 inches; very dark grayish brown (10YR 3/2) silty clay, dark grayish brown (10YR 4/2) dry; strong medium angular blocky structure; very firm; about 14 percent sand; slight effervescence; neutral; abrupt smooth boundary.

2C1—14 to 21 inches; dark brown (10YR 4/3) silt loam; common medium faint dark grayish brown (10YR 4/2) mottles; massive; friable; few vertical cleavage planes; about 24 percent sand; slight effervescence; mildly alkaline; abrupt wavy boundary.

2C2—21 to 31 inches; brown (10YR 5/3) very fine sandy loam; common medium faint grayish brown (10YR 5/2) mottles; massive; very friable; few worm casts; about 48 percent sand; strong effervescence; mildly alkaline; gradual smooth boundary.

2C3—31 to 43 inches; pale brown (10YR 6/3) silt loam; common medium faint brown (10YR 5/3) and few fine distinct yellowish brown (10YR 5/4) mottles; weak horizontal bedding planes; massive; very friable; few worm casts; about 29 percent sand; strong effervescence; mildly alkaline; gradual smooth boundary.

2C4—43 to 60 inches; light brownish gray (10YR 6/2) very fine sandy loam; few fine distinct strong brown (7.5YR 4/6) mottles; single grained; loose; few worm casts; about 62 percent sand; violent effervescence; mildly alkaline.

The Ap or A horizon has hue of 10YR or 2.5Y, value of 2 or 3, and chroma of 1 to 3. It is silty clay or silty clay loam. The AC horizon also is silty clay or silty clay loam. It has hue of 10YR or 2.5Y, value of 2 to 4, and chroma of 2 or 3. The 2C horizon is silt loam, very fine sandy loam, or loamy very fine sand. In some pedons it has thin strata in the lower part.

Piasa Series

The Piasa series consists of poorly drained, very slowly permeable soils on broad Illinoian till plains. These soils formed in loess. They have a high content of exchangeable sodium in the subsoil. Slopes range from 0 to 2 percent.

Piasa soils are similar to Huey soils and commonly are adjacent to Oconee soils. Huey soils do not have a mollic epipedon. The content of clay in their control section is less than 35 percent. The somewhat poorly drained Oconee soils are in the slightly higher landscape positions. They are more acid in the Bt horizon than the Piasa soils and do not have a natric horizon.

Typical pedon of Piasa silt loam, in a cultivated field about 2 miles southwest of Red Bud; approximately 20 feet north and 645 feet west of the center of sec. 15, T. 4 S., R. 8 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak medium granular structure; friable; neutral; abrupt smooth boundary.

E—9 to 12 inches; grayish brown (10YR 5/2) silt loam; weak thin platy structure; friable; common light brownish gray (10YR 6/2) silt coatings on faces of peds; neutral; abrupt smooth boundary.

Btg1—12 to 16 inches; grayish brown (10YR 5/2) silty clay loam; common fine faint brown (10YR 5/3) mottles; moderate medium prismatic structure parting to weak and moderate medium and coarse angular blocky; firm; many distinct dark grayish brown (10YR 4/2) clay films and common light gray (10YR 7/2) silt coatings on faces of peds; mildly alkaline; clear smooth boundary.

Btg2—16 to 24 inches; grayish brown (10YR 5/2) silty clay loam; common fine faint brown (10YR 5/3) mottles; moderate medium and coarse prismatic structure parting to weak coarse angular blocky; firm; dark grayish brown (10YR 4/2) ped exteriors; many distinct very dark gray (10YR 3/1) clay and organic films on faces of peds; moderately alkaline; clear smooth boundary.

Btg3—24 to 31 inches; grayish brown (10YR 5/2) silty clay loam; moderate medium and coarse prismatic structure parting to weak coarse subangular blocky; firm; many distinct dark grayish brown (10YR 4/2) clay films and light gray (10YR 7/2) silt coatings on faces of peds; slight effervescence; moderately alkaline; clear smooth boundary.

Btg4—31 to 42 inches; grayish brown (2.5Y 5/2) silty clay loam; few medium distinct yellowish brown (10YR 5/4) mottles; moderate coarse prismatic structure parting to weak coarse subangular blocky; firm and friable; discontinuous thin grayish brown (2.5Y 5/2) clay films and light gray (10YR 7/2) silt coatings on faces of peds; strong effervescence; moderately alkaline; clear smooth boundary.

Btg5—42 to 51 inches; grayish brown (2.5Y 5/2) silty clay loam; common medium distinct yellow (10YR 7/8) and common medium prominent reddish yellow (7.5YR 6/8) mottles; weak coarse subangular structure; firm and friable; few faint gray (10YR 6/1) clay films on faces of peds; few dark stains and concretions (iron and manganese oxides); moderately alkaline; gradual smooth boundary.

Cg—51 to 60 inches; mottled grayish brown (2.5Y 5/2), gray (10YR 5/1), yellow (10YR 7/8), and reddish yellow (7.5YR 6/8) silt loam; massive; firm and friable; light gray (10YR 7/2) silt coatings in crevices; few dark stains and concretions (iron and manganese oxides); moderately alkaline.

The solum is 40 to 60 inches thick. The control section ranges from 35 to 43 percent clay.

The Ap or A horizon is 7 to 10 inches thick. It has hue of 10YR, value of 2 or 3, and chroma of 1 or 2. The E horizon has hue of 10YR, value of 4 or 5, and chroma of 1 or 2. The Btg horizon has hue of 10YR to 5Y, value of 4 or 5, and chroma of 2 or less. It is mainly silty clay loam, but in some pedons it has subhorizons of silty clay or silt loam. It is slightly acid to strongly alkaline. The content of exchangeable sodium is 15 percent or more within 10 inches of the top of the Btg horizon. In some pedons the BC and C horizons have secondary lime concretions.

Raddle Series

The Raddle series consists of moderately well drained, moderately permeable soils on low terraces adjacent to bluffs and on ridges and natural levees on flood plains along the major streams. These soils formed in silty or loamy sediments. Slopes range from 0 to 3 percent.

Raddle soils are similar to Landes soils and commonly are adjacent to Darwin, Landes, Parkville, and Tice soils. The poorly drained Darwin soils are in the lower areas on the flood plains. The well drained Landes soils are in landscape positions similar to those of the Raddle soils. Their control section averages more than 15 percent fine sand or coarser sand and less than 18 percent clay. The somewhat poorly drained Parkville and Tice soils are in the slightly lower landscape positions. They have more clay in the solum than the Raddle soils.

Typical pedon of Raddle silt loam, 0 to 3 percent slopes, in a cultivated field about 2 miles southwest of Prairie du Rocher; Illinois State Plane Coordinates 504,300 feet north and 517,800 feet east (Illinois West Zone), T. 5 S., R. 8 W.

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

A—9 to 20 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure; very friable; common fine roots; neutral; gradual smooth boundary.

Bw1—20 to 30 inches; dark brown (10YR 4/3) silt loam; weak medium prismatic structure parting to weak medium subangular blocky; friable; many distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds; common fine roots; neutral; gradual smooth boundary.

Bw2—30 to 36 inches; dark brown (10YR 4/3) silt loam; weak medium prismatic structure; friable; common distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds; common fine roots; neutral; gradual smooth boundary.

Bw3—36 to 49 inches; dark yellowish brown (10YR 4/4) silt loam; common medium distinct light brownish gray (10YR 6/2) and few fine faint yellowish brown (10YR 5/4) mottles; weak medium prismatic structure; friable; common distinct dark grayish brown (10YR 4/2) coatings on faces of peds and along root channels; common fine dark accumulations (iron and manganese oxides); few fine roots; mildly alkaline; clear smooth boundary.

BC—49 to 60 inches; dark grayish brown (10YR 4/2) silty clay loam that has thin strata of silt loam; few fine distinct yellowish brown (10YR 5/6) and light brownish gray (10YR 6/2) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; mildly alkaline.

The mollic epipedon is 10 to 24 inches thick. The solum is 42 to more than 60 inches thick. The control section ranges from 18 to 24 percent clay and averages less than 15 percent fine sand or coarser sand. It is medium acid to neutral.

The A horizon typically is silt loam, but the range includes loam and very fine sandy loam. The Bw horizon is dominantly silt loam, loam, or very fine sandy loam, but in some pedons it has strata of clay loam or silty clay loam below a depth of 42 inches. Some pedons have a C horizon. This horizon is silt loam or silty clay loam and has strata of loamy very fine sand. Mottles with chroma of 2 or less are below a depth of 30 inches. A buried soil is within a depth of 48 inches in some pedons.

Roby Series

The Roby series consists of somewhat poorly drained soils on broad terraces near the major streams. These soils formed in stratified, loamy sediments. Permeability is moderate in the upper part of the profile and moderately rapid in the lower part. Slopes range from 1 to 5 percent.

Roby soils are similar to Whitaker soils and commonly are adjacent to Bloomfield, Kendall, Martinsville, and Whitaker soils. The somewhat excessively drained Bloomfield and well drained Martinsville soils are on the higher ridges or on side slopes below the Roby soils. Bloomfield soils have a Bt horizon consisting of lamellae. Kendall, Martinsville, and Whitaker soils average more than 18 percent clay in the control section. Kendall and Whitaker soils are in the slightly lower landscape positions.

Typical pedon of Roby fine sandy loam, 1 to 5 percent slopes, in a cultivated field about 3 miles northwest of Ellis Grove; Illinois State Plane Coordinates 498,000 feet north and 562,750 feet east (Illinois West Zone), T. 6 S., R. 8 W.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) fine sandy loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure parting to weak medium platy; very friable; neutral; abrupt smooth boundary.

E—9 to 13 inches; dark brown (10YR 4/3) fine sandy loam; weak medium platy structure parting to moderate medium granular; very friable; neutral; clear smooth boundary.

BE—13 to 16 inches; dark brown (10YR 4/3) fine sandy loam; weak and moderate fine and medium subangular blocky structure; very friable; few faint pale brown (10YR 6/3) coatings of very fine sand on faces of peds; few dark stains (iron and manganese oxides); slightly acid; clear smooth boundary.

Bt1—16 to 21 inches; brown (10YR 5/3) fine sandy loam; common medium faint grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; very friable; common faint dark brown (10YR 4/3) clay films on faces of peds; common dark stains (iron and manganese oxides); medium acid; clear smooth boundary.

Bt2—21 to 27 inches; brown (10YR 5/3) loam; many coarse distinct light brownish gray (10YR 6/2) and common coarse prominent strong brown (7.5YR 5/6) mottles; strong medium subangular blocky structure; friable; common faint grayish brown (10YR 5/2) and dark brown (10YR 4/3) clay films on faces of peds; medium acid; abrupt smooth boundary.

Bt3—27 to 31 inches; brown (10YR 5/3) clay loam; many medium distinct brown (7.5YR 5/4) and common fine faint grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure parting to weak medium prismatic; firm; many distinct dark brown (10YR 4/3) clay films on faces of peds; many distinct light brownish gray (10YR 6/2) coatings of very fine sand on faces of peds; common fine dark stains and concretions (iron and manganese oxides); slightly acid; abrupt smooth boundary.

Bt4—31 to 41 inches; brown (10YR 5/3) loam; common fine distinct grayish brown (10YR 5/2) mottles; strong medium subangular blocky structure parting to weak medium prismatic; friable; many distinct dark brown (10YR 4/3) clay films on faces of peds; many faint light brownish gray (10YR 6/2) coatings of very fine sand on faces of peds; many fine dark stains and concretions (iron and manganese oxides); neutral; clear smooth boundary.

BC—41 to 49 inches; grayish brown (10YR 5/2) fine sandy loam; many medium and coarse distinct yellowish brown (10YR 5/4) mottles; weak medium prismatic structure parting to weak medium subangular blocky; friable; common faint dark brown (10YR 4/3) clay films and common faint light brownish gray (10YR 6/2) coatings of very fine sand on faces of peds; many fine dark stains and concretions (iron and manganese oxides); neutral; gradual smooth boundary.

C—49 to 60 inches; stratified grayish brown (10YR 5/2) fine sandy loam and dark brown (10YR 4/3) loamy fine sand; many medium distinct dark yellowish brown (10YR 4/4) and common medium distinct grayish brown (10YR 5/2) mottles; massive; friable, nonsticky; many fine dark stains and concretions (iron and manganese oxides); neutral.

The thickness of the solum ranges from 40 to 60 inches. Unless limed, the upper part of the solum is medium acid or strongly acid. The lower part ranges from medium acid to mildly alkaline.

The Ap horizon commonly is loam or fine sandy loam, but in some pedons it is loamy fine sand or sandy loam. The E horizon is loamy fine sand or sandy loam. The Bt horizon is fine sandy loam, sandy loam, or loam. It ranges from 12 to 18 percent clay and from 45 to 80 percent sand. Mottles with chroma of 2 or less are in the upper 10 inches of the B horizon. The C horizon is stratified sand to loam. It ranges from medium acid to mildly alkaline, and some pedons have free carbonates.

Rocher Series

The Rocher series consists of somewhat excessively drained, moderately rapidly permeable soils on flood plains along the major streams. These soils formed in loamy or sandy sediments. Slopes range from 1 to 5 percent.

Rocher soils commonly are adjacent to the moderately well drained Haynie and well drained Landes soils. The adjacent soils are slightly lower on the flood plains than the Rocher soils or are farther from the rivers. Haynie soils have more silt and very fine sand in the control section than the Rocher soils. Landes soils have a mollic epipedon and typically have a lower content of sandy material throughout than the Rocher soils.

Typical pedon of Rocher very fine sandy loam, frequently flooded, 1 to 5 percent slopes, in a cultivated field about 7 miles southeast of Prairie du Rocher; Illinois State Plane Coordinates 484,480 feet north and 540,490 feet east (Illinois West Zone), T. 6 S., R. 8 W.

Ap—0 to 5 inches; dark brown (10YR 4/3) very fine sandy loam, pale brown (10YR 6/3) dry; weak medium and coarse granular structure; very friable; common fine roots; slight effervescence; mildly alkaline; clear smooth boundary.

C1—5 to 11 inches; brown (10YR 5/3) very fine sandy loam; massive; very friable; common fine roots; slight effervescence; mildly alkaline; clear smooth boundary.

C2—11 to 32 inches; light yellowish brown (10YR 6/4) loamy very fine sand; single grained; very friable; few fine roots; slight effervescence; mildly alkaline; gradual smooth boundary.

C3—32 to 53 inches; yellowish brown (10YR 5/4) loamy very fine sand; single grained; loose; slight effervescence; mildly alkaline; gradual smooth boundary.

C4—53 to 60 inches; light yellowish brown (10YR 6/4) loamy fine sand; single grained; loose; slight effervescence; mildly alkaline.

The solum is less than 10 inches thick. The control section is mildly alkaline or moderately alkaline and has free carbonates throughout. It averages less than 18 percent clay. It ranges from 55 to 85 percent total sand and averages 15 percent or more fine sand or coarser sand. The content of clay combined with that of silt and that of very fine sand averages more than 40 percent.

The A horizon is loam, very fine sandy loam, or loamy very fine sand. The C horizon is mainly loamy very fine sand or loamy fine sand in the upper part and loamy fine sand or fine sand in the lower part, but it has thin strata of loam, very fine sandy loam, and fine sandy loam in many pedons and has strata of silt loam below a depth of 40 inches in some pedons. Mottles with chroma of 2 or less are below a depth of 40 inches in some pedons.

Rushville Series

The Rushville series consists of poorly drained, very slowly permeable soils in nearly level or slightly depressional areas on till plains. These soils formed in loess. Slopes range from 0 to 2 percent.

The Rushville soils in this survey area contain more clay in the control section and are slightly more acid in the upper part of the solum than is definitive for the series. These differences, however, do not significantly alter the usefulness or behavior of the soils.

Rushville soils are similar to Okaw soils and commonly are adjacent to Marine and Stoy soils. The somewhat poorly drained Marine and Stoy soils are slightly higher on the landscape than the Rushville soils. Also, Stoy soils have less clay in the control section. Okaw soils formed in loess and clayey lacustrine deposits and are on terraces.

Typical pedon of Rushville silt loam, in a cultivated field about 3 miles south of Tilden; approximately 1,100 feet south and 135 feet east of the center of sec. 19, T. 4 S., R. 5 W.

Ap—0 to 10 inches; grayish brown (10YR 5/2) and dark grayish brown (10YR 4/2) silt loam, light gray (10YR 7/2) and light brownish gray (10YR 6/2) dry; weak medium granular structure; friable; many fine dark stains and concretions (iron and manganese oxides); common fine roots; medium acid; abrupt smooth boundary.

E—10 to 13 inches; light brownish gray (10YR 6/2) and light gray (10YR 7/2) silt loam; weak and moderate medium platy structure; friable; many fine and medium dark stains and concretions (iron and manganese oxides); few fine roots; strongly acid; abrupt wavy boundary.

B/E—13 to 15 inches; grayish brown (10YR 5/2) silty clay loam (B part); moderate fine subangular blocky structure; friable; few faint grayish brown (10YR 5/2) clay films on faces of peds; common prominent light gray (10YR 7/2) silt coatings on faces of peds and fillings in vertical cracks (E part); few fine roots; extremely acid; abrupt smooth boundary.

Btg1—15 to 26 inches; light brownish gray (2.5Y 6/2) silty clay; moderate medium prismatic structure parting to moderate medium and coarse angular blocky; very firm; many distinct clay films and common distinct light gray (10YR 7/2) silt coatings on faces of peds; few fine roots; extremely acid; clear smooth boundary.

Btg2—26 to 35 inches; grayish brown (10YR 5/2) silty clay; common coarse distinct yellowish brown (10YR 5/4 and 5/6) mottles; moderate medium prismatic structure parting to weak coarse angular blocky; very firm; many faint and distinct grayish brown (10YR 5/2) clay films on faces of peds; very strongly acid; clear smooth boundary.

Btg3—35 to 43 inches; grayish brown (10YR 5/2) silty clay loam; many medium distinct light brownish gray (10YR 6/2) and common coarse distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to weak coarse subangular blocky; firm; common faint and distinct grayish brown (10YR 5/2) clay films on faces of peds; very strongly acid; clear smooth boundary.

Btg4—43 to 54 inches; grayish brown (10YR 5/2) silty clay loam; many coarse prominent reddish yellow (7.5YR 6/8) mottles; moderate coarse subangular blocky structure; firm; few faint grayish brown (10YR 5/2) clay films on vertical faces of peds; dark stains on vertical faces of peds (iron and manganese oxides); medium acid; gradual smooth boundary.

BCg—54 to 60 inches; grayish brown (10YR 5/2) silty clay loam; common medium prominent strong brown (7.5YR 4/6 and 5/6) mottles; weak coarse subangular blocky structure; friable; dark stains on faces of peds (iron and manganese oxides); slightly acid.

The thickness of the solum ranges from 40 to more than 60 inches. The loess is more than 60 inches thick. The control section ranges from 35 to 48 percent clay, but in some subhorizons the content of clay is higher. The content of sand averages less than 5 percent to a depth of 45 inches or more.

The surface soil is 11 to 18 inches thick. The A or Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 1 or 2. The E horizon has hue of 10YR, value of 6 or 7, and chroma of 2. The Bt horizon has chroma of 2 or less and is mottled. It is silty clay loam or silty clay. It ranges from medium acid to extremely acid.

Schuline Series

The Schuline series consists of moderately well drained soils on broad ridgetops and side slopes in areas that formerly were surface mined. The landscape has been excavated, reclaimed, and graded. In most areas it has been covered with the surface soil material that was removed before coal was mined. Permeability is slow in the upper part of the profile and moderately slow in the lower part. These soils formed in a mixture of fine-earth material, mainly glacial till, and some coarse fragments, mostly glacial pebbles. Slopes range from 1 to 12 percent.

Schuline soils are similar to Lenzburg and Swanwick soils and commonly are adjacent to those soils. Lenzburg soils are mainly in the older, more rolling or hilly surface-mined areas. They have more rock fragments than the Schuline soils. Also, the rock fragments generally are larger. Swanwick soils are in landscape positions similar to those of the Schuline soils. They have a lower content of sand and coarse fragments than the Schuline soils and are not calcareous in the control section.

Typical pedon of Schuline silt loam, 1 to 5 percent slopes, in a hay field about 2.25 miles north of Percy; approximately 480 feet north and 1,100 feet west of the center of sec. 35, T. 5 S., R. 5 W.

Ap—0 to 3 inches; mixed yellowish brown (10YR 5/4) and strong brown (7.5YR 5/6) silt loam, very pale brown (10YR 7/3) dry; moderate fine granular and moderate thick platy structure; friable; about 22 percent sand and 5 percent coarse fragments; slight effervescence; moderately alkaline; abrupt smooth boundary.

AC—3 to 13 inches; mixed dark yellowish brown (10YR 4/4), grayish brown (10YR 5/2), strong brown (7.5YR 5/6), and light gray (10YR 7/1) clay loam; strong medium subangular blocky and moderate medium platy structure; firm; about 25 percent sand and 5 percent coarse fragments; common dark stains (iron and manganese oxides); slight effervescence; moderately alkaline; clear wavy boundary.

C1—13 to 35 inches; mixed grayish brown (10YR 5/2), strong brown (7.5YR 5/8), and dark brown (7.5YR 4/4) clay loam; massive; firm; about 21 percent sand and 5 percent coarse fragments; slight effervescence; mildly alkaline; abrupt smooth boundary.

C2—35 to 40 inches; mixed yellowish brown (10YR 5/4), light gray (10YR 7/2), brown (10YR 5/3), and dark yellowish brown (10YR 4/4) loam; massive; friable; about 42 percent sand and 5 percent coarse fragments; slight effervescence; moderately alkaline; clear wavy boundary.

C3—40 to 51 inches; mixed black (N 2/0), light gray (10YR 7/1), brownish yellow (10YR 6/6), brown (10YR 5/3), yellowish red (5YR 5/6), and reddish yellow (7.5YR 6/6) loam; massive; friable; about 37 percent sand and 20 percent coarse fragments; slight effervescence; mildly alkaline; clear wavy boundary.

C4—51 to 60 inches; mixed grayish brown (10YR 5/2), light brownish gray (10YR 6/2), brownish yellow (10YR 6/6), strong brown (7.5YR 5/8), and dark yellowish brown (10YR 4/6) loam; massive; friable; about 35 percent sand and 10 percent coarse fragments; slight effervescence; mildly alkaline.

These soils have been reclaimed to a depth of 5 feet or more. The content of coarse fragments in the control section typically is less than 10 percent but ranges from 0 to 15 percent. The coarse fragments are dominantly pebbles, but a few are stones. The content of fine sand or coarser sand combined with the content of coarse fragments is more than 15 percent. The content of clay ranges from 18 to 35 percent. Subhorizons have a moist bulk density of less than 1.8 grams per cubic centimeter. The control section is mildly alkaline or moderately alkaline. Scattered soil fragments and isolated peds of relict genetic horizons from premined soils are throughout the profile.

The A horizon is mainly silt loam or silty clay loam, but in some pedons it is loam or clay loam. The C horizon is dominantly loam, silt loam, silty clay loam, or clay loam, but sandy or clayey pockets or lenses are in some pedons and in other pedons layers of silty clay are below a depth of 48 inches. Cleavage planes forming an apparent structure are in the upper part of some pedons. The individual layers within the C horizon vary in number and thickness, and the colors generally are mixed. Some strata, pockets, or soil fragments below a depth of 48 inches do not contain free carbonates. In some pedons the content of organic carbon decreases irregularly with increasing depth because of mixing and because of the presence of flakes and fragments of coal or other carbonaceous material.

St. Charles Series

The St. Charles series consists of moderately well drained, moderately permeable soils on ridges and side slopes on terraces near the major streams. These soils formed in loess or silty material and in the underlying stratified outwash. Slopes range from 1 to 15 percent.

St. Charles soils are similar to Alford, Hosmer, and Westmore soils and commonly are adjacent to Colp, Hurst, Kendall, and Martinsville soils. Alford and Hosmer soils formed entirely in loess. Westmore soils formed in loess and in sandstone and siltstone residuum. The moderately well drained Colp and somewhat poorly drained Hurst soils contain more clay in the control section than the St. Charles soils. Colp soils are in landscape positions similar to those of the St. Charles soils. Hurst soils are in the slightly lower landscape positions. The somewhat poorly drained Kendall soils have mottles with chroma of 2 or less within 10 inches of the upper boundary of the argillic horizon. They are in nearly level areas on the terraces. Martinsville soils have more sand in the solum than the St. Charles soils. Also, they formed in a thinner mantle of loess. They are in landscape positions similar to those of the St. Charles soils, but they commonly are nearer to the streams.

Typical pedon of St. Charles silt loam, 1 to 7 percent slopes, in a wheat field about 3.5 miles northeast of Evansville; approximately 400 feet east and 100 feet south of the northwest corner of sec. 9, T. 5 S., R. 7 W.

Ap—0 to 7 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; many fine and very fine roots; slightly acid; abrupt smooth boundary.

E—7 to 11 inches; yellowish brown (10YR 5/4) silt loam; moderate medium subangular blocky and platy structure; firm; common fine and very fine roots; slightly acid; clear smooth boundary.

BE—11 to 16 inches; yellowish brown (10YR 5/4) silt loam; moderate medium subangular blocky structure; firm; few faint dark yellowish brown (10YR 4/4) clay films on faces of peds; common fine and very fine roots; neutral; clear smooth boundary.

Bt1—16 to 29 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium and fine subangular blocky structure; firm; common distinct dark yellowish brown (10YR 4/4) and brownish yellow (10YR 6/6) clay films and very pale brown (10YR 7/3) silt coatings on faces of peds; few fine and very fine roots; neutral; clear smooth boundary.

Bt2—29 to 40 inches; yellowish brown (10YR 5/4) silty clay loam; few fine faint yellowish brown (10YR 5/8) mottles; strong medium prismatic structure parting to moderate medium subangular blocky; firm; many distinct dark brown (7.5YR 4/4) and light yellowish brown (10YR 6/4) clay films and common very pale brown (10YR 7/3) silt coatings on faces of peds; few fine and very fine roots; strongly acid; clear smooth boundary.

2Bt3—40 to 48 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct grayish brown (10YR 5/2), few fine faint yellowish brown (10YR 5/8), and few fine distinct strong brown (7.5YR 5/8) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; many distinct dark yellowish brown (10YR 4/4) and light yellowish brown (10YR 6/4) clay films on faces of peds; strongly acid; clear smooth boundary.

2BC—48 to 56 inches; yellowish brown (10YR 5/4) silt loam; many medium distinct grayish brown (10YR 5/2) and common medium distinct strong brown (7.5YR 5/8) mottles; weak fine prismatic structure parting to weak medium subangular blocky; firm; few faint dark brown (7.5YR 4/4) clay films on vertical faces of peds; about 17 percent sand; common dark stains and accumulations (iron and manganese oxides); medium acid; clear smooth boundary.

2C—56 to 60 inches; yellowish brown (10YR 5/4) silt loam that has thin strata of very fine sandy loam; common medium distinct grayish brown (10YR 5/2) and strong brown (7.5YR 5/8) mottles; massive; friable; about 26 percent sand; few dark stains and accumulations (iron and manganese oxides); medium acid.

The thickness of the solum ranges from 45 to 60 inches. The thickness of the overlying loess or silty material ranges from 40 to 55 inches. The control section ranges from 27 to 35 percent clay and averages less than 10 percent sand.

The surface soil is 8 to 16 inches thick. It is dominantly silt loam. In eroded areas, however, the Ap horizon may be silty clay loam and commonly has been mixed with the E horizon. The Bt horizon is mainly silty clay loam, but some subhorizons are silt loam. This horizon has mottles with chroma of 2 or less in the lower part. It ranges from neutral to strongly acid. The 2Bt and 2BC horizons are silt loam, loam, fine sandy loam, or silty clay loam. The content of sand in these horizons ranges from 10 to 30 percent. The 2C horizon is dominantly silt loam or loam but has thin strata that have more sand or more clay, or both.

Stoy Series

The Stoy series consists of somewhat poorly drained, slowly permeable soils on drainage divides, broad ridgetops, and side slopes on till plains. These soils formed in loess. Slopes range from 0 to 10 percent.

The Stoy soils in this survey area have Bt subhorizons that are higher in content of clay than is definitive for the series. This difference, however, does not significantly alter the usefulness or behavior of the soils.

Stoy soils are similar to Marine and Muren soils and commonly are adjacent to Coulterville, Hosmer, Marine, and Rushville soils. Marine soils are characterized by an abrupt textural change and do not have a brittle layer. They commonly are on the broader ridges. The moderately well drained Muren soils do not have a brittle layer. Coulterville soils have a high content of exchangeable sodium in the Bt horizon. They are mainly in landscape positions similar to those of the Stoy soils, but they commonly are in areas that were formerly prairie. The moderately well drained Hosmer soils are on the slightly higher knolls and ridgetops or on the steeper side slopes. The poorly drained Rushville soils are in slight depressions.

Typical pedon of Stoy silt loam, 0 to 2 percent slopes, in a field of alfalfa about 3 miles west of Sparta; approximately 2,653 feet east and 521 feet south of the northwest corner of sec. 9, T. 5 S., R. 6 W.

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, medium, and coarse roots; neutral; abrupt smooth boundary.

E—7 to 12 inches; brown (10YR 5/3) silt loam; moderate medium subangular blocky and platy structure; friable; many fine, medium, and coarse roots; slightly acid; clear smooth boundary.

BE—12 to 18 inches; yellowish brown (10YR 5/6) silt loam; moderate medium subangular blocky structure; friable; few faint dark yellowish brown (10YR 4/4) clay films and common faint brown (10YR 5/3) silt coatings on faces of peds; many fine, medium, and coarse roots; very strongly acid; clear smooth boundary.

Bt1—18 to 22 inches; yellowish brown (10YR 5/4) silt loam; few fine faint grayish brown (10YR 5/2) and common fine distinct yellowish brown (10YR 5/8) mottles; weak fine prismatic structure parting to moderate medium subangular blocky; firm; common distinct dark yellowish brown (10YR 4/4) clay films and many brown (10YR 5/3) silt coatings on faces of peds; common fine and medium roots; few fine and medium rounded dark accumulations (iron and manganese oxides); very strongly acid; clear wavy boundary.

Bt2—22 to 27 inches; yellowish brown (10YR 5/4) silty clay loam; common medium faint yellowish brown (10YR 5/8) mottles; weak fine prismatic structure parting to moderate medium subangular blocky; firm; common distinct dark yellowish brown (10YR 4/4) clay films and many prominent light gray (10YR 7/2) silt coatings on faces of peds; common fine and medium roots; few fine and medium dark accumulations (iron and manganese oxides); very strongly acid; clear smooth boundary.

Bt3—27 to 38 inches; grayish brown (10YR 5/2) silty clay loam; moderate fine distinct yellowish brown (10YR 5/8) and dark yellowish brown (10YR 4/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; very firm; many distinct dark yellowish brown (10YR 4/4) clay films and common distinct light yellowish brown (10YR 6/4) silt coatings on faces of peds; common fine and medium roots; few fine and medium dark accumulations (iron and manganese oxides); very strongly acid; gradual smooth boundary.

Btx—38 to 45 inches; grayish brown (10YR 5/2) silty clay loam; moderate medium distinct yellowish brown (10YR 5/8) and dark yellowish brown (10YR 4/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; very firm; brittle in part of mass; dark grayish brown (10YR 4/2) ped exteriors; many distinct dark yellowish brown (10YR 4/4) clay films on vertical faces of some peds, common and faint on faces of other peds; few faint light yellowish brown (10YR 6/4) silt coatings on faces of peds; common fine and medium roots; few fine and medium dark accumulations (iron and manganese oxides); very strongly acid; gradual smooth boundary.

BC—45 to 53 inches; yellowish brown (10YR 5/4) silty clay loam; many medium distinct yellowish brown (10YR 5/8), dark yellowish brown (10YR 4/6), and grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; few faint dark yellowish brown (10YR 4/4) clay films and light brownish gray (10YR 6/2) silt coatings on faces of peds; few fine roots; few fine and medium dark accumulations (iron and manganese oxides); strongly acid; gradual wavy boundary.

C—53 to 60 inches; yellowish brown (10YR 5/4) silt loam; many medium distinct yellowish brown (10YR 5/8), dark yellowish brown (10YR 4/6), and grayish brown (10YR 5/2) mottles; massive; firm; common fine and medium dark accumulations (iron and manganese oxides); very few fine roots; strongly acid.

The solum ranges from 44 to more than 60 inches in thickness. The depth to the Btx horizon is typically about 35 inches but ranges from 25 to 40 inches. The control section ranges from 27 to 38 percent clay and commonly averages less than 5 percent sand.

The surface soil is 8 to 16 inches thick in uneroded areas. In some eroded areas, the E horizon has been mixed with the Ap horizon. The Ap or A1 horizon has hue of 10YR, value of 4, and chroma of 2 or 3. The Bt horizon has hue of 10YR, value of 4 to 6, and chroma of

2 to 4. The Btx horizon is partly or mostly firm or very firm and brittle. It has medium or coarse prismatic structure that parts to angular or subangular blocky. The Bt and Btx horizons are very strongly acid or strongly acid. The BC horizon has fragic properties in some pedons.

Swanwick Series

The Swanwick series consists of moderately well drained, slowly permeable soils on broad ridgetops, in slight basins, and on side slopes in areas that formerly were surface mined. The landscape has been excavated, graded, and reclaimed. In most areas it has been covered with surface soil material that was removed before coal was mined. These soils formed in at least 48 inches of fine-earth material from the subsoil and substratum of former soils. Slopes range from 0 to 10 percent.

Swanwick soils are similar to Lenzburg and Schuline soils and commonly are adjacent to those soils. Lenzburg and Schuline soils are calcareous in the control section. Lenzburg soils are mainly in the older, more rolling or hilly surface-mined areas. They have a higher content of coarse fragments than the Swanwick soils. Schuline soils are in landscape positions similar to those of the Swanwick soils. They have more sand throughout than the Swanwick soils.

Typical pedon of Swanwick silt loam, 0 to 3 percent slopes, in a hay field about 5 miles northwest of Sparta; approximately 1,000 feet north and 1,200 feet west of the southeast corner of sec. 16, T. 4 S., R. 6 W.

Ap—0 to 9 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular and moderate medium platy structure; friable; slightly hard; many fine roots; about 10 percent sand and 3 percent coarse fragments; neutral; clear smooth boundary.

AC—9 to 12 inches; mixed yellowish brown (10YR 5/4), light brownish gray (10YR 6/2), and reddish yellow (7.5YR 6/8) silty clay loam; thick platy clods that have horizontal cleavage planes; massive; firm, hard; common fine roots; few concretions and common dark stains on faces of clods (iron and manganese oxides); about 6 percent sand and 6 percent coarse fragments; mildly alkaline; clear smooth boundary.

2C1—12 to 27 inches; mixed dark grayish brown (10YR 4/2), brown (10YR 5/3), light brownish gray (10YR 6/2), reddish yellow (7.5YR 6/8), and grayish brown (10YR 5/2) silty clay loam; compact soil layers that have horizontal cleavage planes; massive; firm, hard; common fine roots; about 5 percent sand and 6 percent coarse fragments; mildly alkaline; gradual smooth boundary.

2C2—27 to 40 inches; mixed yellowish brown (10YR 5/4) and reddish yellow (7.5YR 6/8) silty clay loam; compact soil layers that have horizontal cleavage planes; massive; firm, very hard; few fine roots; about 4 percent sand and 8 percent coarse fragments; strongly acid; abrupt smooth boundary.

2C3—40 to 49 inches; mixed yellowish brown (10YR 5/4) and reddish yellow (7.5YR 6/8) silty clay loam; massive; slightly hard, friable and firm; few fine roots; few relict dark stains and concretions (iron and manganese oxides); about 11 percent sand and 4 percent coarse fragments; neutral; clear smooth boundary.

C4—49 to 60 inches; mixed brown (10YR 4/3) and dark gray (10YR 4/1) silty clay loam; massive; very firm; very few fine roots; about 20 percent sand and 6 percent coarse fragments; slight effervescence; mildly alkaline.

These soils have been reclaimed to a depth of 48 inches or more. In the control section, the content of coarse fragments is less than 10 percent, typically less than 5 percent, and the content of fine sand or coarser sand combined with the content of coarse fragments is less than 15 percent. The content of clay ranges from 18 to 35 percent. Subhorizons have a moist bulk density of less than 1.8 grams per cubic centimeter. Reaction is dominantly medium acid to neutral throughout the profile, but some subhorizons range from strongly acid to mildly alkaline. Scattered soil fragments and isolated peds of relict genetic horizons from premined soils are throughout the profile.

The A horizon mainly has weak or moderate, fine or medium, granular structure. In some pedons, however, it has thick platy structure in the lower part. The 2C horizon to a depth of at least 48 inches is mainly silty clay loam or silt loam, but in some pedons it has layers or pockets of loam and clay loam. Some pedons have layers of silty clay and gravelly or channery layers below a depth of about 48 inches. The individual layers within the 2C horizon vary in number and thickness, and the colors generally are mixed. The content of organic carbon decreases irregularly with increasing depth because of mixing or layering and because of the presence of flakes and fragments of coal or other carbonaceous material.

Tice Series

The Tice series consists of somewhat poorly drained, moderately permeable soils on flood plains. These soils formed in silty alluvium. Slopes range from 0 to 3 percent.

Tice soils are similar to Coffeen soils and commonly are adjacent to Coffeen, Darwin, and Raddle soils. Coffeen and Raddle soils have less clay in the solum than the Tice soils. Also, Coffeen soils are on flood plains that typically are adjacent to streams or to bluffs. The moderately well drained Raddle soils are on the higher parts of the landscape. The poorly drained Darwin soils are in the lower areas. They have more clay throughout than the Tice soils.

Typical pedon of Tice silt loam, 0 to 3 percent slopes, in a cultivated field about 1.25 miles west of Kaskaskia; Illinois State Plane Coordinates 457,650 feet north and 564,350 feet east (Illinois West Zone), T. 7 S., R. 8 W.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; friable; neutral; abrupt smooth boundary.

AB—9 to 15 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate fine and medium subangular blocky structure; friable; neutral; clear smooth boundary.

Bw1—15 to 24 inches; dark grayish brown (10YR 4/2) silt loam; moderate medium subangular blocky structure; common faint very dark grayish brown (10YR 3/2) organic coatings on faces of peds; firm; few medium dark accumulations (iron and manganese oxides); neutral; clear smooth boundary.

Bw2—24 to 32 inches; dark grayish brown (10YR 4/2) silty clay loam; few fine distinct dark yellowish brown (10YR 4/6) mottles; moderate medium subangular blocky structure; firm; common faint very dark grayish brown (10YR 3/2) organic coatings and common grayish brown (10YR 5/2) silt coatings on faces of peds; neutral; gradual smooth boundary.

BC—32 to 52 inches; dark grayish brown (10YR 4/2) silty clay loam; weak medium subangular blocky structure; firm; common grayish brown (10YR 5/2) silt coatings on faces of peds; neutral; gradual smooth boundary.

C—52 to 60 inches; dark grayish brown (10YR 4/2) silty clay loam; common fine distinct dark yellowish brown (10YR 4/6) and few fine distinct yellowish brown (10YR 5/4) mottles; massive; firm; common pressure faces; mildly alkaline.

The solum is 40 to 60 inches thick. The 10- to 40-inch control section ranges from medium acid to neutral. It ranges from 27 to 35 percent clay and averages less than 15 percent fine sand or coarser sand. The mollic epipedon is 10 to 20 inches thick.

The A horizon is silty clay loam or silt loam. In many pedons the BC and C horizons have strata of silt loam, loam, clay loam, fine sandy loam, or very fine sandy loam.

Ursa Series

The Ursa series consists of well drained, slowly permeable soils on side slopes and hillsides on dissected till plains. These soils formed in the Sangamon paleosol and, depending on the amount of truncation, the underlying glacial till. Slopes range from 10 to 50 percent.

Ursa soils commonly are adjacent to Alford, Blair, Hickory, Hosmer, and Westmore soils. Alford and Hosmer soils formed in loess on side slopes upslope from the Ursa soils. Blair and Hickory soils have less clay in the Bt horizon than the Ursa soils. They are on side slopes, generally downslope from the Ursa soils. Westmore soils have less clay in the control section than the Ursa soils and formed in loess or silty material and in sandstone and siltstone residuum. They are on the lower parts of the side slopes.

Typical pedon of Ursa silty clay loam, in an area of Alford-Ursa silty clay loams, 18 to 30 percent slopes, severely eroded, in a hay field about 1.5 miles northeast of Walsh; approximately 2,400 feet north and 500 feet west of the center of sec. 13, T. 5 S., R. 7 W.

Ap—0 to 6 inches; brown (7.5YR 5/4) silty clay loam, light brown (7.5YR 6/4) dry; weak medium subangular blocky structure; firm; many fine and medium roots; few thin brown (10YR 4/3) silt coatings on faces of peds; neutral; abrupt smooth boundary.

Bt1—6 to 12 inches; strong brown (7.5YR 5/6) silty clay loam; common medium distinct light brown (7.5YR 6/4), dark brown (7.5YR 4/4), and yellowish brown (10YR 5/4) mottles; moderate medium subangular blocky structure; firm; few distinct brown (7.5YR 5/4) clay films on faces of peds; about 12 percent sand; many fine and medium roots; very strongly acid; clear smooth boundary.

Bt2—12 to 21 inches; brown (7.5YR 5/4) silty clay loam; common coarse faint strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; very firm; many prominent dark brown (7.5YR 4/4) clay films on faces of peds; few dark stains (iron and manganese oxides); about 16 percent sand and 6 percent pebbles; common fine and medium roots; very strongly acid; clear smooth boundary.

Bt3—21 to 28 inches; brown (7.5YR 5/4) silty clay loam; common medium faint brown (7.5YR 5/2) and common coarse faint strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to weak medium subangular blocky; very firm; many prominent dark brown (7.5YR 4/4) clay films on faces of peds; few dark stains (iron and manganese oxides); about 16 percent sand and 6 percent pebbles; common fine and medium roots; very strongly acid; clear smooth boundary.

Bt4—28 to 36 inches; brown (7.5YR 5/4) and strong brown (7.5YR 5/6) clay loam; common medium distinct brown (7.5YR 5/2) and few fine distinct reddish brown (5YR 4/4) mottles; moderate medium prismatic structure parting to weak medium subangular blocky; firm; few distinct dark brown (7.5YR 4/4) clay films on faces of peds; few dark stains (iron and manganese oxides); about 24 percent sand and 7 percent pebbles; few fine and medium roots; medium acid; gradual smooth boundary.

Bt5—36 to 48 inches; strong brown (7.5YR 5/6) clay loam; common medium distinct brown (7.5YR 5/2) and few fine distinct reddish brown (5YR 4/4) mottles; weak medium prismatic structure parting to weak medium subangular blocky; friable; few distinct dark brown (7.5YR 4/4) clay films on faces of peds; few dark stains (iron and manganese oxides); about 28 percent sand and 8 percent pebbles; few fine roots; neutral; gradual smooth boundary.

BC—48 to 60 inches; brown (7.5YR 5/2) clay loam; common coarse distinct strong brown (7.5YR 5/6) mottles; weak medium and coarse subangular blocky structure; friable; few faint brown (7.5YR 5/2) clay films on faces of peds; about 28 percent sand and 8 percent pebbles; very few fine roots; neutral.

The thickness of the solum ranges from 48 to more than 60 inches. The control section ranges from 35 to 45 percent clay and from 15 to 35 percent sand and till pebbles.

The Ap or A horizon has hue of 7.5YR or 10YR, value of 3 to 5, and chroma of 2 to 6. Pedons in uneroded areas have A and E horizons. The thickness of the A horizon combined with that of the E horizon is 5 to 15 inches. These horizons are silt loam, silty clay loam, loam, or clay loam. The Bt horizon has hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 3 to 8. Within a depth of 40 inches, it commonly has relict mottles with chroma of 2 or less and also has mottles with hue of 5YR or redder. It is clay loam, silty clay loam, silty clay, or clay. In some pedons this horizon has flagstones, stones, or channers of sandstone, siltstone, or limestone. It ranges from very strongly acid to medium acid in the upper part and from medium acid to neutral in the lower part.

Wakeland Series

The Wakeland series consists of somewhat poorly drained, moderately permeable soils on bottom land, along overflow channels, and on alluvial fans. These soils formed in silty alluvium. Slopes range from 0 to 2 percent.

Wakeland soils are similar to Coffeen soils and commonly are adjacent to Birds, Coffeen, and Haymond soils on the landscape. The poorly drained Birds soils are slightly lower on the landscape than the Wakeland soils and typically are farther from streams. Also, they contain more clay and commonly contain less sand in the solum. Coffeen soils have a mollic epipedon. They are in landscape positions similar to those of the Wakeland soils. The well drained Haymond soils are on the higher parts of the landscape.

Typical pedon of Wakeland silt loam, in a cultivated field about 3 miles east of Sparta; approximately 79 feet north and 1,866 feet west of the southeast corner of sec. 3, T. 5 S., R. 5 W.

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

C—8 to 15 inches; brown (10YR 5/3) silt loam; few fine distinct yellowish brown (10YR 5/6) and common fine faint grayish brown (10YR 5/2) mottles; weak very fine subangular blocky structure; friable; common distinct dark grayish brown (10YR 4/2) coatings on faces of peds; few fine dark accumulations (iron and manganese oxides); neutral; clear smooth boundary.

Cg1—15 to 38 inches; grayish brown (10YR 5/2) silt loam; common medium distinct yellowish brown (10YR 5/6) and gray (10YR 6/1) mottles; massive; friable; common fine dark accumulations (iron and manganese oxides); neutral; gradual smooth boundary.

Cg2—38 to 60 inches; grayish brown (10YR 5/2) silt loam; many medium and coarse distinct gray (10YR 6/1) and dark yellowish brown (10YR 4/4) mottles; massive; friable; many fine and medium dark accumulations (iron and manganese oxides); neutral.

Reaction is medium acid to neutral throughout the profile. Some pedons have an AC horizon. The Ap and AC horizons have hue of 10YR, value of 4 or 5, and chroma of 2 or 3. Pedons in some uncultivated areas have a thinner and darker A horizon. The C horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 4 to a depth of 30 inches and hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 to 3 below a depth of 30 inches. It is dominantly silt loam, but some pedons have thin strata of loam or fine sandy loam below a depth of 40 inches.

Wellston Series

The Wellston series consists of well drained, moderately permeable soils on bedrock-controlled hillsides in the uplands. These soils formed in loess and in siltstone or sandstone residuum. Slopes range from 18 to 50 percent.

Wellston soils are similar to Alford and Westmore soils and commonly are adjacent to Alford, Neotoma, and Westmore soils. Alford soils formed entirely in loess and are on slopes above the Wellston soils. Neotoma soils are lower on the landscape than the Wellston soils. Also, they have a higher content of coarse fragments, and the fragments are higher in the profile. Westmore soils are in landscape positions similar to those of the Wellston soils. They formed in loess or silty material and in clayey residuum.

Typical pedon of Wellston silt loam, in a wooded area of Neotoma-Wellston complex, 25 to 50 percent slopes, about 4.5 miles southeast of Chester; approximately 1,835 feet west and 785 feet north of the center of sec. 26, T. 7 S., R. 6 W.

A—0 to 3 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; moderate medium granular structure; friable; about 5 percent sandstone channers; slightly acid; abrupt smooth boundary.
E—3 to 8 inches; yellowish brown (10YR 5/4) silt loam; weak medium platy structure; friable; about 3 percent sandstone channers; medium acid; clear smooth boundary.
Bt1—8 to 17 inches; strong brown (7.5YR 5/6) silty clay loam; moderate fine and medium subangular blocky structure; friable; many distinct dark brown (7.5YR 4/4) clay films on faces of peds; about 3 percent sandstone channers; strongly acid; clear smooth boundary.
Bt2—17 to 31 inches; strong brown (7.5YR 5/6) silt loam; moderate and strong medium subangular blocky structure; firm; common distinct dark brown (7.5YR 4/4) clay films on faces of peds; many distinct pinkish gray (7.5YR 6/2) silt coatings on vertical faces of peds; about 5 percent sandstone channers; strongly acid; gradual smooth boundary.
Bt3—31 to 43 inches; strong brown (7.5YR 5/6) silt loam; moderate medium and coarse subangular blocky structure; hard; common distinct dark brown (7.5YR 4/4) clay films on faces of peds; common distinct pinkish gray (7.5YR 6/2) silt coatings on vertical faces of peds; about 10 percent sandstone channers; medium acid; gradual smooth boundary.
2BC—43 to 49 inches; strong brown (7.5YR 5/6) channery silt loam; weak coarse subangular blocky structure; hard; few faint dark brown (7.5YR 4/4) clay films on faces of peds; common distinct pinkish gray (7.5YR 6/2) silt coatings on vertical faces of peds; few very dark gray (N 3/0) organic coatings lining root channels; about 20 percent sandstone channers; medium acid; clear irregular boundary.
2C—49 to 60 inches; brown (7.5YR 5/4) very channery loam; massive; friable; about 55 percent sandstone and siltstone channers and flagstones; strongly acid.

The thickness of the solum ranges from 35 to 50 inches. The depth to bedrock ranges from 42 to more than 60 inches. In the control section, the content of clay ranges from 18 to 35 percent and the content of fine sand or coarser sand combined with the content of coarse fragments less than 3 inches in diameter is less than 15 percent. The content of rock fragments ranges from less than 10 percent in the upper part of the solum to as much as 60 percent in the 2BC horizon. Reaction ranges from medium acid to very strongly acid in the subsoil and substratum.

The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is silt loam or silty clay loam. The 2Bt horizon is loam, silty clay loam, or clay loam or the gravelly or channery analogs of these textures. Lenses of sandy or clayey residuum are in some pedons. The 2C horizon is the gravelly, channery, very gravelly, or very channery analogs of loam, silt loam, clay loam, sandy clay loam, or sandy loam.

Westmore Series

The Westmore series consists of well drained soils on side slopes in hilly areas. These soils formed in loess or silty material and in shale and siltstone residuum. Permeability is moderate in the upper part of the profile and moderately slow or slow in the lower part. Slopes range from 18 to 35 percent.

Westmore soils are similar to Alford, Ursa, and Wellston soils and commonly are adjacent to those soils. Alford soils formed entirely in loess. They are upslope from the Westmore soils. Ursa and Wellston soils are in landscape positions similar to those of the Westmore soils. Ursa soils contain more clay and sand in the control section than the Westmore soils and formed in glacial till. Wellston soils contain less clay in the lower part of the solum than the Westmore soils and are underlain by sandstone and siltstone bedrock.

Typical pedon of Westmore silt loam, in a wooded area of Alford-Westmore silt loams, 18 to 35 percent slopes, about 3 miles southeast of Chester; approximately 1,550 feet south and 2,375 feet west of the northeast corner of sec. 33, T. 7 S., R. 6 W.

A—0 to 4 inches; brown (10YR 5/3) silt loam, pale brown (10YR 6/3) dry; weak medium granular structure in the upper part grading to moderate fine subangular blocky in the lower part; friable; neutral; clear wavy boundary.
E—4 to 7 inches; light yellowish brown (10YR 6/4) silt loam; moderate fine subangular blocky structure; very friable; strongly acid; clear irregular boundary.
BE—7 to 9 inches; light brown (7.5YR 6/4) silt loam; moderate fine and medium subangular blocky structure; friable; strongly acid; clear smooth boundary.
Bt1—9 to 15 inches; strong brown (7.5YR 5/6) silt loam; weak medium prismatic structure parting to moderate medium subangular blocky; friable; few faint strong brown (7.5YR 4/6) clay films and few very pale brown (10YR 7/3) silt coatings on faces of peds; strongly acid; clear smooth boundary.
Bt2—15 to 22 inches; strong brown (7.5YR 5/6) silty clay loam; weak medium prismatic structure parting to moderate medium subangular blocky; friable; many distinct strong brown (7.5YR 4/6) clay films and few faint very pale brown (10YR 7/3) silt coatings on faces of peds; medium acid; gradual smooth boundary.
Bt3—22 to 32 inches; yellowish brown (10YR 5/6) silty clay loam; weak medium prismatic structure parting

to moderate medium subangular blocky; firm; many distinct strong brown (7.5YR 5/6) clay films and few faint brown (10YR 5/3) silt coatings on faces of peds; medium acid; gradual wavy boundary.

2Bt4—32 to 43 inches; yellowish brown (10YR 5/4) silty clay loam; weak coarse subangular blocky structure; firm; few roots; common distinct dark yellowish brown (10YR 4/4) and strong brown (7.5YR 4/6) clay films on faces of peds; about 5 percent coarse fragments; slightly acid; clear wavy boundary.

2BC—43 to 54 inches; brownish yellow (10YR 6/8) and light yellowish brown (2.5Y 6/4) silty clay; common medium prominent yellowish red (5YR 4/6) mottles; weak coarse angular blocky structure; very firm; many stress surfaces; about 8 percent coarse fragments; neutral; gradual wavy boundary.

2C—54 to 60 inches; brownish yellow (10YR 6/8) and light yellowish brown (2.5Y 6/4) silty clay; massive; very firm; many small pressure faces; about 15 percent coarse fragments; strong effervescence; mildly alkaline.

The solum ranges from 40 to 60 inches in thickness. The depth to bedrock ranges from 48 to more than 60 inches. The silty mantle ranges from 20 to 36 inches in thickness. In the control section, the content of clay ranges from 25 to 35 percent and the content of fine sand or coarser sand combined with the content of coarse fragments less than 3 inches in diameter is less than 15 percent. The content of rock fragments ranges from 5 percent or less in the upper part of the solum to 25 percent in the lower part. The rock fragments are mainly channers of siltstone, but some are flagstones of sandstone or limestone. The upper part of the solum ranges from neutral to very strongly acid and the lower part from medium acid to mildly alkaline.

The Bt horizon has hue of 7.5YR or 10YR, value of 4 to 6, and chroma of 3 to 6. It is silt loam or silty clay loam. The 2Bt horizon has hue of 7.5YR to 2.5Y, value of 4 to 6, and chroma of 3 to 6. It is silty clay loam, silty clay, or clay and ranges from 35 to 60 percent clay. Most pedons show evidence of solifluction in the orientation of rock fragments and mixing of material weathered from different kinds of bedrock. A number of pedons have a stone line either at the top of the Bt horizon or between the Bt and 2Bt horizons.

Whitaker Series

The Whitaker series consists of somewhat poorly drained, moderately permeable soils on terraces near the major streams. These soils formed in loamy sediments. Slopes range from 1 to 5 percent.

Whitaker soils are similar to Kendall and Roby soils and commonly are adjacent to Hurst, Kendall, and Martinsville soils. Kendall soils formed in loess or silty material and in the underlying loamy sediments. They have less sand in the control section than the Whitaker soils. They are in landscape positions similar to those of the Whitaker soils, but they generally are farther from the streams. Roby soils have less clay throughout than the Whitaker soils. Hurst soils are more clayey than the Whitaker soils. They are in lower landscape positions. The well drained Martinsville soils are on the higher ridges or on side slopes above the Whitaker soils.

Typical pedon of Whitaker silt loam, 1 to 5 percent slopes, in a cultivated field about 3 miles northeast of Evansville; approximately 760 feet south and 760 feet east of the northwest corner of partial sec. 5, T. 5 S., R. 7 W.

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

E—10 to 15 inches; grayish brown (10YR 5/2) silt loam; few medium distinct strong brown (7.5YR 5/6) mottles; weak coarse subangular blocky structure; friable; slightly acid; clear smooth boundary.

BE—15 to 21 inches; light yellowish brown (10YR 6/4) silty clay loam; common fine distinct reddish yellow (7.5YR 6/6), strong brown (7.5YR 5/6), and grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; common distinct yellowish brown (10YR 5/4) clay films and light gray (10YR 7/2) silt coatings on faces of peds; strongly acid; clear smooth boundary.

Bt1—21 to 29 inches; pale brown (10YR 6/3) silty clay loam; common medium prominent yellowish red (5YR 5/8) and common medium distinct grayish brown (10YR 5/2) mottles; strong medium prismatic structure; firm; many distinct grayish brown (10YR 5/2) clay films and common faint light gray (10YR 7/2) silt coatings on faces of peds; strongly acid; clear smooth boundary.

Bt2—29 to 39 inches; pale brown (10YR 6/3) clay loam; common medium distinct grayish brown (10YR 5/2) and common medium prominent yellowish red (5YR 5/8) mottles; strong medium prismatic structure; firm; many distinct grayish brown (10YR 5/2) clay films on faces of peds; slightly acid; clear smooth boundary.

Bt3—39 to 47 inches; pale brown (10YR 6/3) clay loam; common medium prominent yellowish red (5YR 5/8) and common medium distinct grayish brown (10YR 5/2) mottles; strong medium prismatic structure; firm; few thin grayish brown (10YR 5/2) clay films on faces of peds; slightly acid; clear smooth boundary.

BC—47 to 51 inches; pale brown (10YR 6/3) clay loam; common medium distinct strong brown (7.5YR 5/6), yellowish brown (10YR 5/8), and grayish brown (10YR 5/2) mottles; weak medium prismatic structure; friable; few thin grayish brown (10YR 5/2) clay films on faces of peds; few fine dark accumulations (iron and manganese oxides); neutral; gradual smooth boundary.

C—51 to 60 inches; light brownish gray (10YR 6/2) loam; common medium distinct yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) mottles; massive; friable; few fine dark accumulations (iron and manganese oxides); neutral.

The solum ranges from 42 to 60 inches in thickness. The control section ranges from 18 to 33 percent clay and averages 15 percent or more fine sand or coarser sand.

The surface soil is 8 to 16 inches thick. The Ap horizon has value of 4 or 5 and chroma of 2 to 4. It is loam or silt loam. The Bt horizon has value of 4 to 6. It has a dominant chroma of 2, but at least one subhorizon within a depth of 30 inches has chroma of 3 or more. The Bt horizon is clay loam, loam, sandy clay loam, silty clay loam, or fine sandy loam. It ranges from strongly acid to neutral. The 2C horizon is fine sand, silt loam, sandy clay loam, or loam and is stratified in many pedons.

Formation of the Soils

Leon R. Follmer, associate geologist, Illinois State Geological Survey, helped prepare this section.

Soil forms throughout processes that act on deposited or accumulated geologic material. 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 that has existed since exposure of the parent material; (3) the type of organisms living on or in the soil; (4) the topography, or lay of the land; and (5) the length of time that the forces of soil formation have acted on the parent material. The five factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made about the effect on any factor unless conditions are specified for the other four.

Parent Material

Parent material is the unconsolidated mass in which the soils form. It determines the mineralogical and chemical composition of the soils. The parent materials in Randolph County are loess (windblown silty material), alluvium, lacustrine sediments, glacial deposits, material weathered from bedrock, and replaced overburden material in formerly mined areas. Figure 21 shows the relationship of the parent materials to some of the major soils in the county.

Loess is the most extensive parent material in the county. It blankets many of the other materials. It was deposited over glacial material during the Wisconsinan Glaciation, 75,000 to 10,000 years ago. The county has

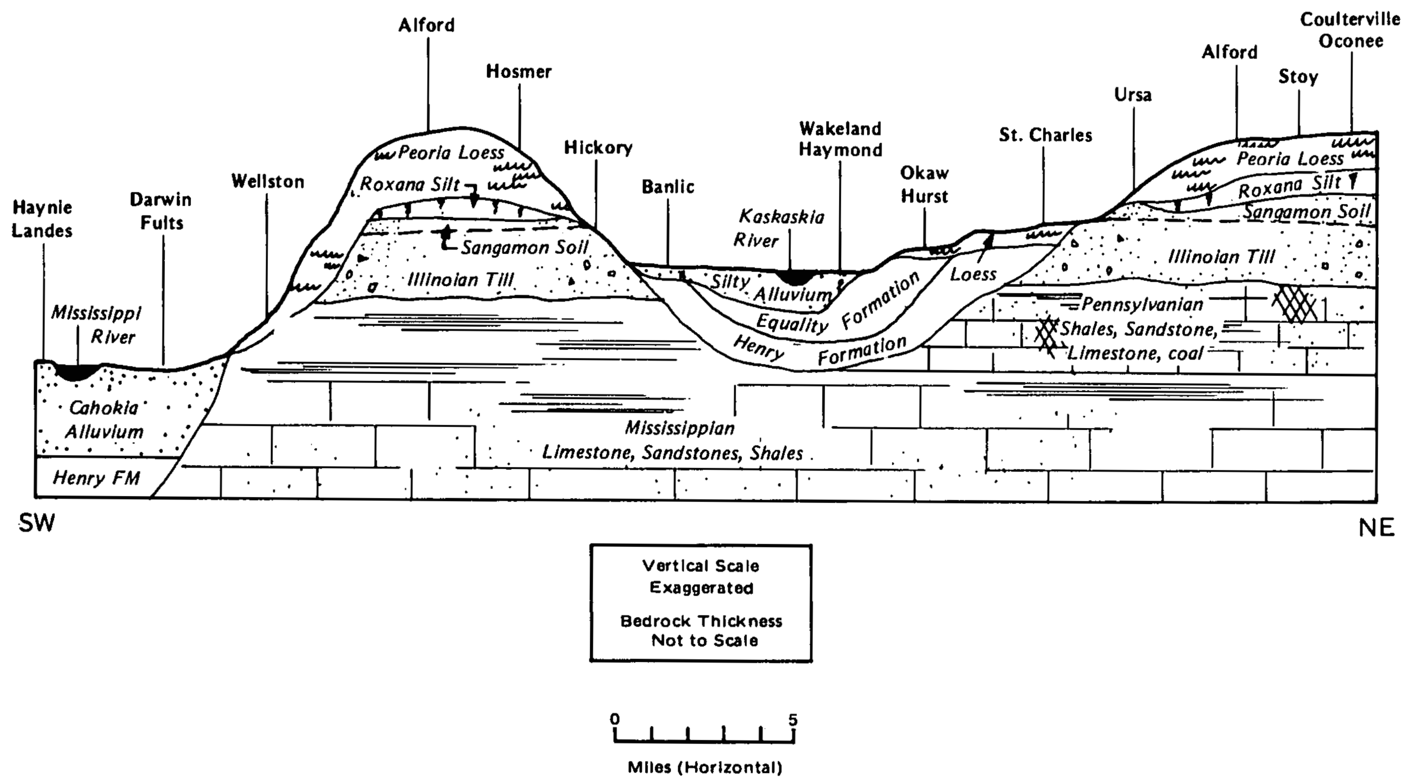


Figure 21.—A typical pattern of soils and parent materials in Randolph County.

two loess deposits. The upper unit is called Peoria Loess, and the lower unit is called Roxana Silt. The combined thickness of the two deposits ranges from about 25 feet along the bluffs adjacent to the valley of the Mississippi River to about 5 feet in the undissected areas of the till plain in the northeastern part of the county.

Alford, Hosmer, Marine, and Stoy soils formed in areas where the Peoria Loess is more than 60 inches thick. Roxana silt generally is pinker than the Peoria Loess and was weathered before it was covered by that loess. It is generally less permeable and more dense than the Peoria Loess because it has a higher content of coarse silt and clay. In areas where the Peoria Loess is less than 60 inches thick, the Roxana Silt has a greater influence on the modern soil.

The soils on flood plains in the county formed in alluvium. In many areas they still receive sediments. Cahokia Alluvium consists dominantly of silty to clayey material interbedded with thin layers of sandy material. Darwin and Fults soils formed in clayey slack-water sediments from the Mississippi River. These soils are on broad flats and low ridges. Wakeland and Haymond soils formed in silty material on flood plains and alluvial fans. Haynie, Landes, and Parkville soils formed in loamy, clayey, and silty alluvial deposits on very gently sloping or gently sloping ridges along the major rivers and overflow channels.

Lacustrine sediments were deposited by water along the Kaskaskia and Marys Rivers and their tributaries. These sediments occur as terraces formed in moderately fine textured or fine textured material of the Equality Formation, which is Wisconsinan in age. Hurst and Okaw soils formed partly in these clayey lacustrine deposits. In many areas the Equality Formation is underlain by material of the Henry Formation. St. Charles soils formed in thin deposits of loess and in the underlying silty or sandy material of the Henry Formation (*12*).

The Illinoian glacier covered most of Randolph County. It deposited material of the Glasford Formation (tills and related deposits), including interbedded outwash and the overlying accretion-gley deposits. The Sangamon Soil, a paleosol, formed in the Illinoian deposits. The Illinoian till ranges from coarse textured to fine textured, having large amounts of sand and gravel and of silt and clay. In some areas the coarse textured till is in the substratum. Hickory soils formed in medium textured till. Ursa soils formed in fine textured till. Most of the soils that formed in till have a loess mantle as much as 20 inches thick.

Some of the soils in the county formed in material weathered from sandstone, siltstone, mudstone, claystone, and limestone bedrock. The exposed bedrocks are either Mississippian or Pennsylvanian in age. Neotoma soils formed in material weathered from siltstone and sandstone. Brookside soils formed in material weathered from shale, siltstone, and limestone. Some soils formed in loess or other silty material and in the underlying material weathered from bedrock. Examples are the Westmore and Wellston soils. Wellston soils formed in loess and in siltstone and sandstone residuum. Westmore soils formed in silty material and in shale and siltstone residuum.

Soils in surface-mined areas formed in the material that results from the excavation and placement or replacement of overburden during mining activities. The undisturbed overburden consisted of the solum and substratum of the modern soil and the underlying bedrock. The overburden was removed when the area was surface mined for coal. Spoil banks, or cast overburden material, consists mainly of a mixture of glacial till and bedrock. Lenzburg and Morristown soils are on these spoil banks.

In some areas the overburden is removed and segregated. Two methods are used to segregate the soil material. When the first of these methods is applied, the upper loamy overburden is removed, mainly by a wheel, and placed on the cast overburden. It is then graded. Schuline soils are in the areas of loamy, calcareous material. Some areas have been covered with surface soil material that was removed before the coal was mined.

When the second method is applied, the soil material directly in front of the open pit is removed (fig. 22). First the surface layer is removed and stored. Then the subsoil and substratum are removed, commonly by a pan-scraper. The soil material is then carried to the area behind the open pit. At the same time, the cast overburden behind the pit is graded. Next, the soil material is placed over the cast overburden. Finally, the surface soil material that was removed before the coal was mined is replaced. Swanwick soils are reclaimed by this process.

Climate

Climate is an important soil-forming factor. It determines the rate of chemical reaction in the soil and the amount of water available for the weathering of minerals and the translocation of soil material. Climate also is largely responsible for the type of native vegetation on the soils. The humid climate of Randolph County favors weathering and the reduction in size of soil minerals and the downward movement of clay in the soil profile. The amount of rainfall also has influenced the removal, through leaching, of some of the basic elements in the profile. More detailed information about the climate is available under the heading "General Nature of the County."

Living Organisms

Plants and animals on or in the soil have had a major effect on soil formation in the county. The soils have a thick, dark surface soil formed under prairie grasses.

Figure 22.—A box cut in a surface-mined area. After coal is removed from the box cut, the soil material is replaced. Swanwick soils are in the reclaimed areas.

Examples are Oconee and Piasa soils. The soils that have a lighter colored surface soil formed where oak and hickory forests grew for long periods. Alford, Stoy, and Rushville are examples.

Topography

Topography influences water infiltration, percolation, runoff, and erosion. Under a given climate, the moisture status of most soils is largely controlled by topography and drainage. Where soils form in uniform, permeable, medium textured material, such as loess, natural drainage is closely related to slope. Well drained and moderately well drained soils, such as Alford and Hosmer soils, commonly are in sloping areas. The somewhat poorly drained Marine and Tice soils are in nearly level areas, and the poorly drained Rushville soils are in nearly level or slightly depressional areas.

Time

The formation of soils usually requires a long period. The age of soils is determined by the degree of profile development. Soils normally become more strongly developed with increased time of exposure to the weathering processes. Haymond soils, which formed in alluvium on bottom land, are an example of young soils. They still accumulate deposits of soil material during periods of flooding and have only weakly expressed horizons. Banlic soils also formed in alluvium, but they are less frequently flooded and thus have a more strongly expressed profile.

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Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedding planes. Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

Bedding system. A drainage system made by plowing, grading, or otherwise shaping the surface of a flat field. It consists of a series of low ridges separated by shallow, parallel dead furrows.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Box cut (mining). The initial cut in a property having no open side. The cut results in a highwall on both sides (*3*).

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Catsteps. Very small, irregular terraces on steep hillsides, especially in pasture, formed by the trampling of cattle or the slippage of saturated soil.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a channer.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.
Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.
Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.
Coarse textured soil. Sand or loamy sand.
Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.
Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.
Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.
Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.
Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.
Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.
Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.
Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.
Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.
Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.
Cut (mining). A longitudinal excavation made by a strip-mining machine to remove overburden in a single progressive line from one side or end of a specific property (*3*).
Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.
Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.
Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.
Depth to rock (in tables). Bedrock is too near the surface for the specified use.
Diversion (or diversion terrace). A ridge of earth generally a terrace, built to protect downslope areas by diverting runoff from its natural course.
Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils commonly are 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 commonly are 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 commonly are level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

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.

Forb. Any herbaceous plant not a grass or a sedge.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

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 up to 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Highwall (mining). The unexcavated face of exposed overburden and coal in a surface mine or the face or bank on the uphill side of a contour strip-mine excavation.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, any plowed or disturbed surface layer.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) granular, prismatic, or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake in inches per hour is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

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 (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash 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.*

Pan, traffic. A subsurface horizon or soil layer having a higher bulk density and a lower total porosity than the layer directly above or below as a result of pressure that has been applied by machinery during tillage or by other artificial means (*7*).

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.

Pit, borrow. A pit or bank from which earth is taken for use in filling or embanking (*3*).

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor filter (in tables). Because of rapid permeability the soil may not adequately filter effluent from a waste disposal system.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

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.

Saprolite (soil science). Unconsolidated residual material underlying the soil and grading to hard bedrock below.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the substratum. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

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.

Slick spot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil is generally silty or clayey, is slippery when wet, and is low in productivity.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na^{+} to $Ca^{++} + Mg^{++}$. The degrees of sodicity are—

	SAR
Slight	less than 13:1
Moderate	13-30:1
Strong	more than 30:1

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.

Spoil bank. A bank where spoil or overburden material is deposited prior to backfilling (*3*).

Stone line. A concentration of coarse fragments in a soil. Generally it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to soil blowing and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The forms principal 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 soil blowing and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

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. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from about 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons. It includes all subdivisions of these horizons.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Till plain. An extensive flat to undulating area underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

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 meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.