USDA United States Department of Agriculture

Natural Resources Conservation Service

In cooperation with the Illinois Agricultural Experiment Station

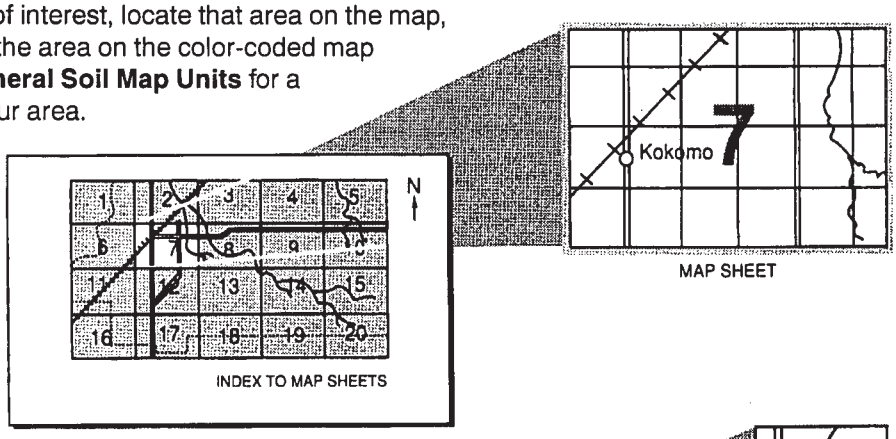
Soil Survey of Clay County, Illinois

How to Use This Soil Survey

General Soil Map

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

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

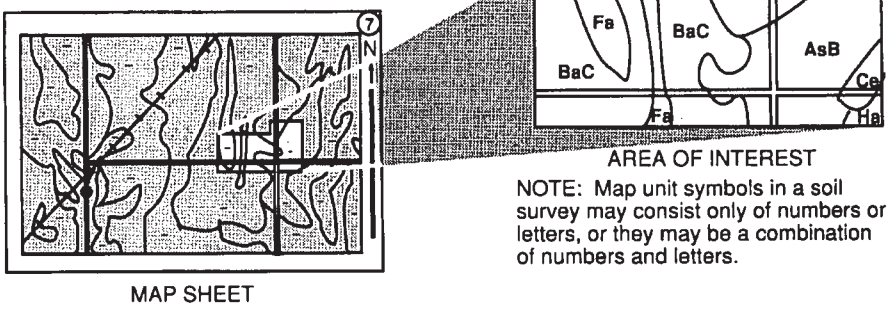


Detailed Soil Maps

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

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

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



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

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

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (formerly the Soil Conservation Service) has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1991. Soil names and descriptions were approved in 1993. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1991. This survey was made cooperatively by the Natural Resources Conservation Service and the Illinois Agricultural Experiment Station. It is part of the technical assistance furnished to the Clay County Soil and Water Conservation District. Financial support was provided by the Clay County Board and the Illinois Department of Agriculture.

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

This soil survey is Illinois Agricultural Experiment Station Soil Report 163.

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Cover: The Little Wabash River in an area of Birds silt loam, frequently flooded.

Contents

Issued 1998

Foreword

This soil survey contains information that can be used in land-planning programs in Clay 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 Natural Resources Conservation Service or the Cooperative Extension Service.

William J. Gradle
State Conservationist
Natural Resources Conservation Service

Soil Survey of
Clay County, Illinois

By Tonie J. Endres, Natural Resources Conservation Service

Soils surveyed by Tonie J. Endres, Laurie L. King, and Mark E. Matusiak,
Natural Resources Conservation Service, and Terry D. Pittman, Clay County

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

CLAY COUNTY is in southeastern Illinois (fig. 1). The total area of the county is 300,430 acres, or about 469 square miles. The county is bounded on the north by Effingham and Jasper Counties, on the west by Fayette and Marion Counties, on the south by Wayne County, and on the east by Richland and Jasper Counties. In 1980, the population of Clay County was 15,283 (U.S. Department of Commerce, 1982). Louisville is the county seat.

This soil survey updates the survey of Clay County published in 1911 (Hopkins and others, 1911). It provides more recent information and has larger maps, which show the soils in greater detail.

General Nature of the County

This section provides some general information about Clay County. It describes history and development; farming and industry; natural resources; physiography, relief, and drainage; and climate.

History and Development

Settlement of the survey area began in the early 1800's (Clay County Historical Society, 1969). The first settler was John McCawley, who built a cabin in 1810 in what is now Clay City Township. Clay County was formally established by an act of the Legislature on December 23, 1824. The county was named after Henry Clay, an American statesman and patriot from Kentucky. Many of the first settlers in Clay County came from Kentucky.

The Little Wabash River was once the primary means by which farmers shipped their produce to markets. Starting in the mid 1800's, the railroads provided farmers with additional markets and faster shipments. Clay County currently has an extensive network of railroads and highways. Interstate 57 and State Highway 37 run diagonally through the northwest corner of the county. U.S. Highway 50 runs east-west, and U.S. Highway 45 runs north-south. The Flora Municipal Airport is the primary source of air transportation for the county.

Farming and Industry

Crop production has long been a major activity in the county. In 1990, 49,400 acres in Clay County was planted to corn, 85,500 acres to soybeans, 48,300 acres to winter wheat, 500 acres to oats, and 6,100 acres to sorghum. About 7,400 acres was used for the production of hay (Illinois Department of Agriculture, 1991). Cattle and hogs are the main kinds of livestock. In 1990, the county had 9,600 head of cattle and 29,400 hogs and pigs.

Several industries are located in the county, mostly in the Flora area. These include manufacturers of automotive equipment, corrugated and plastic containers, electronic components, and wood finishing products.

Natural Resources

Subsurface natural resources in the county include coal, limestone, and oil. Approximately 4.1 billion tons of coal is underground (Treworgy and Bargh, 1982). Most of the coal resources in the county have a

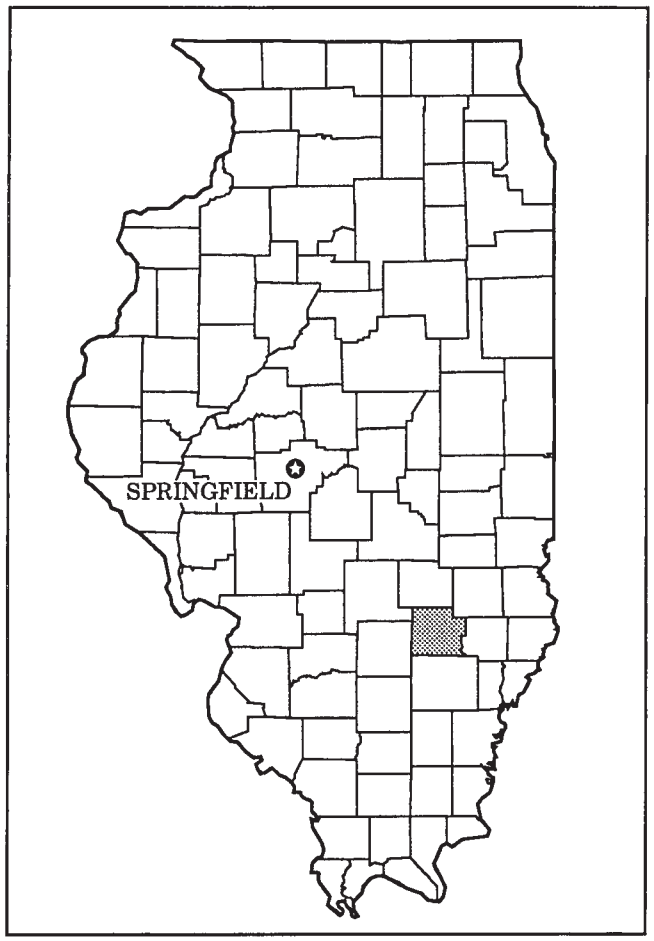

Figure 1.—Location of Clay County in Illinois.

moderate or low development potential. The coal is at a depth of about 1,000 feet. There are no active coal mines in the county.

Outcrops of Omega limestone occur primarily in the valleys of Dismal and Crooked Creeks and tributary streams (Grogan and Lamar, 1940). The thickness of the limestone varies but is commonly 2 to 4 feet. Most outcrops are not of major importance as commercial sources of limestone because of the thinness of the limestone, the thickness of the overburden, or both.

In 1988, about 1,091,929 barrels of crude oil were produced in the county. Cumulative production of crude oil for Clay County through 1988 is about 148 million barrels.

Physiography, Relief, and Drainage

Most of the present surface materials and landforms are the result of the two most recent glacial stages, the Illinoian and the Wisconsinan (Willman and others, 1975). Deposits from the Illinoian glacial stage cover the entire county. These glacial deposits modified the previously existing landscape. They range from 25 to 50 feet in thickness throughout most of the county (Piskin and Bergstrom, 1975). Glaciers from the most recent glacial stage, the Wisconsinan, did not reach Clay County; however, windblown silty material, or loess, was deposited in the area during the Woodfordian glacial substage of the Wisconsinan. In nearly level and gently sloping areas, this layer of loess ranges from 30 to 50 inches in thickness. In the more sloping areas, the loess is typically less than 20 inches thick.

Underneath the glacial deposits are Pennsylvanian-aged formations of sandstone, siltstone, limestone, and shale bedrock (Willman and others, 1975; Grogan and Lamar, 1940). In some parts of the county, material weathered from these formations is at the surface or within a depth of 5 feet. Exposures of bedrock occur along some of the streams in these areas.

The highest elevation in the county, about 644 feet above sea level, is in section 7 of Oskaloosa Township. The lowest elevation, in an area where the Little Wabash River leaves the county, is about 395 feet above sea level. It is in section 18 of the southern part of Clay City Township.

Most of the county drains toward the southeast into the Little Wabash River. Parts of Xenia, Songer, and Oskaloosa Townships drain southwest into the Skillet Fork River. Drainage ditches along Big Muddy Creek and the Little Wabash River help to prevent flood damage in areas of cropland and also minimize wetness. Subsurface drains or surface ditches, or a combination of both, have been installed in most areas of poorly drained or somewhat poorly drained soils.

Climate

Table 1 gives data on temperature and precipitation for the survey area as recorded at Flora in the period 1961 to 1990. 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 31.7 degrees F and the average daily minimum temperature is 22.4 degrees. The lowest temperature on record, which occurred at Flora on February 10, 1982, is -25 degrees. In summer, the average temperature is 75.0 degrees and the average daily maximum temperature is 87.2 degrees. The highest recorded temperature,

which occurred at Flora on June 25, 1988, is 104 degrees.

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

The total annual precipitation is 41.54 inches. Of this, 22.66 inches, or 55 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 11.46 inches. The heaviest 1-day rainfall during the period of record was 5.30 inches at Flora on May 7, 1961.

The average seasonal snowfall is 10.8 inches. The greatest snow depth at any one time during the period of record was 16.0 inches. On the average, 18 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.

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 biological activity.

The soils in the survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil is associated with a particular kind of landform or with a segment of the landform. By observing the soils in the survey area and relating their position to specific segments of the landform, 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 a considerable degree of accuracy the kind of soil at a specific location on the landform.

Commonly, individual soils 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-landform 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, reaction, 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 interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are 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 are 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 predict with a fairly high degree of

accuracy 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.

Some of the soil names and boundaries on the soil maps in this soil survey do not agree with those on the maps in the soil surveys of adjoining counties. Differences are the result of variations in the extent of the major soils in the survey areas. They do not necessarily affect broad land use planning.

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 two or three 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 landform 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 in 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 landform. 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.

Soil Descriptions

1. Cisne-Hoyleton-Huey Association

Nearly level and gently sloping, poorly drained and somewhat poorly drained soils that formed in loess and in the underlying mix of loess and glacial till; on uplands

This association consists of soils on till plains and knolls. Slopes range from 0 to 5 percent.

This association makes up about 50 percent of the county. It is about 36 percent Cisne soils, 22 percent Hoyleton soils, 5 percent Huey soils, and 37 percent soils of minor extent (fig. 2).

The nearly level, poorly drained Cisne soils are on interfluves of till plains. Typically, the surface layer is dark brown, friable silt loam about 7 inches thick. The subsurface layer is friable silt loam about 12 inches thick. It is grayish brown in the upper part and light brownish gray and mottled in the lower part. The subsoil extends to a depth of 60 inches or more. It is mottled. The upper part is light brownish gray, very firm silty clay, and the lower part is light brownish gray, firm silty clay loam.

The nearly level and gently sloping, somewhat poorly drained Hoyleton soils are on summits, interfluves, and backslopes of till plains and knolls. Typically, the surface layer is dark brown, friable silt loam about 8 inches thick. The subsurface layer is brown, friable silt loam about 4 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is yellowish brown, friable silty clay loam. The next part is brown and light brownish gray, mottled, firm silty clay. The lower part is grayish brown, mottled, firm silty clay loam.

The nearly level, poorly drained Huey soils are on interfluves of till plains. Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsoil extends to a depth of 60 inches or more. It is mottled. The upper part is light gray and light brownish gray, friable and firm silt loam. The next part is light brownish gray and light gray, firm silty clay loam. The lower part is light gray, very firm clay loam.

Of minor extent in this association are Atlas, Blair, Bluford, Darmstadt, Holton, Newberry, Shiloh, and Wynoose soils. The somewhat poorly drained Atlas and Blair soils formed in a mix of loess and glacial till and in the underlying glacial till. They are on backslopes of till plains. The somewhat poorly drained Bluford and Darmstadt soils are on summits, interfluves, and backslopes of till plains and knolls. Bluford soils have a light colored surface layer. Darmstadt soils have a high concentration of exchangeable sodium in the subsoil. The somewhat poorly drained Holton soils formed in alluvium. They are on flood plains. The poorly drained Newberry and Shiloh soils are in depressions on till plains and are subject to ponding. The poorly drained Wynoose soils have a light colored surface layer. They are on interfluves of till plains.

Most areas of this association are used for cultivated crops. The Cisne soils are moderately suited to cultivated crops, the Hoyleton soils are well suited, and the Huey soils are poorly suited. The seasonal high water table in all areas and the hazard of erosion in sloping areas of the Hoyleton soils are the main management concerns. In addition, the high content of exchangeable sodium in the subsoil of the Huey soils reduces the availability and uptake of

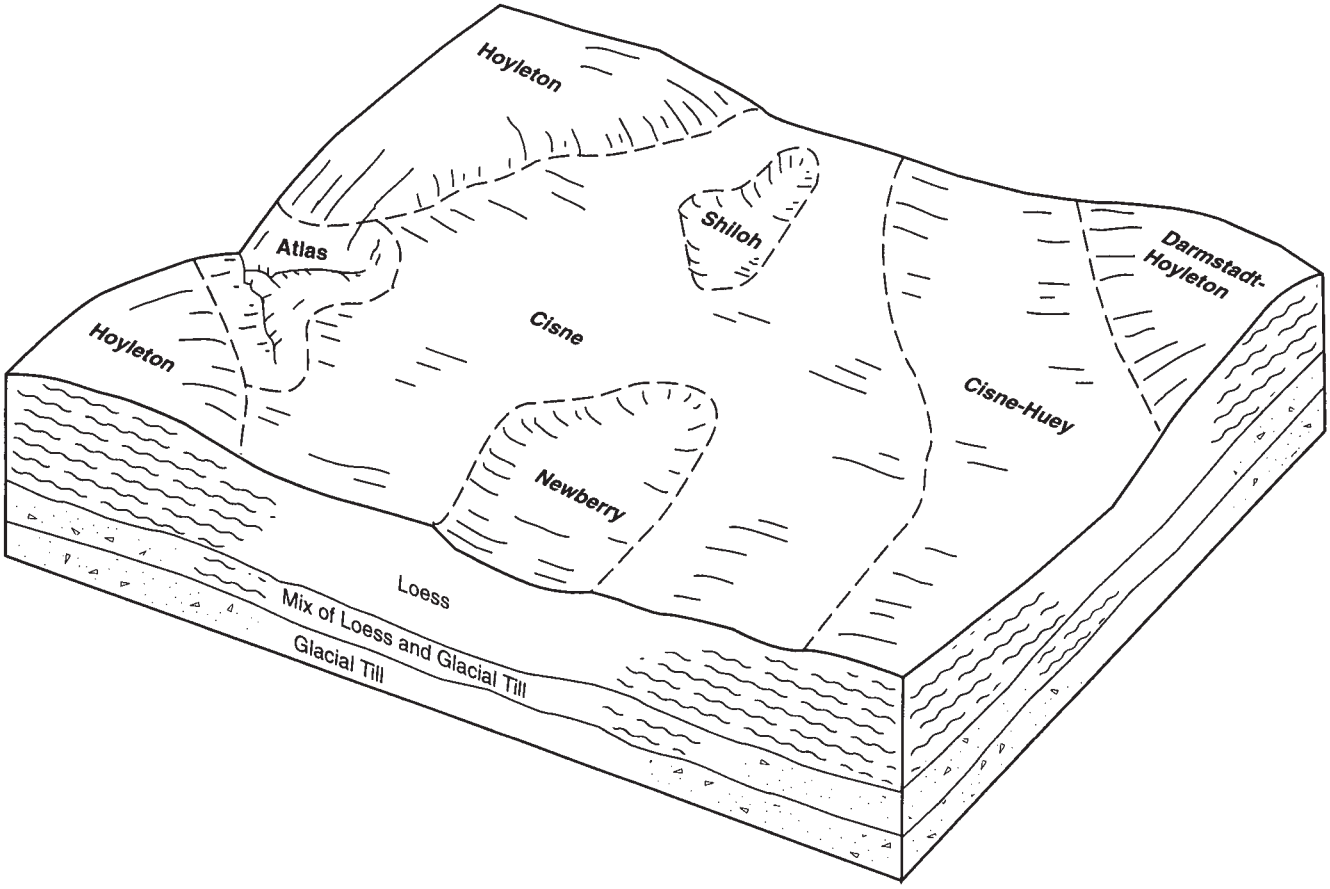

Figure 2.—Typical pattern of soils and parent material in the Cisne-Hoyleton-Huey association.

some plant nutrients. It also results in moisture stress during dry periods and excess water during wet periods.

The Cisne and Hoyleton soils are poorly suited to use as sites for dwellings and septic tank absorption fields. The seasonal high water table, the shrink-swell potential, and restricted permeability are limitations. The Huey soils are generally unsuited to use as sites for dwellings and septic tank absorption fields because of ponding.

2. Bluford-Hickory-Ava Association

Nearly level to very steep, somewhat poorly drained to well drained soils that formed in loess and in the underlying mix of loess and glacial till or entirely in glacial till; on uplands

This association consists of soils on knolls and till plains. Slopes range from 0 to 60 percent.

This association makes up about 38 percent of the county. It is about 43 percent Bluford soils, 18 percent Hickory soils, 15 percent Ava soils, and 24 percent soils of minor extent (fig. 3).

The nearly level and gently sloping, somewhat poorly drained Bluford soils formed in loess and in the underlying mix of loess and glacial till. They are on summits, interfluves, and backslopes of till plains and knolls. Typically, the surface layer is brown, friable silt loam about 7 inches thick. The subsurface layer is yellowish brown, mottled, friable silt loam about 5 inches thick. The subsoil extends to a depth of 60 inches or more. It is mottled. The upper part is brown and grayish brown, firm and very firm silty clay loam and silty clay. The next part is light brownish gray, firm and slightly brittle silty clay loam. The lower part is grayish brown and dark gray, firm clay loam.

The moderately steep to very steep, moderately well drained and well drained Hickory soils formed in glacial till. They are on backslopes of till plains. Typically, the surface layer is very dark grayish brown, friable loam about 2 inches thick. The

subsurface layer is dark yellowish brown, friable loam about 7 inches thick. The subsoil is about 35 inches thick. It is yellowish brown clay loam. The upper part is friable, and the lower part is firm. The substratum to a depth of 60 inches or more is brown, very firm, calcareous clay loam.

The gently sloping and moderately sloping, moderately well drained Ava soils formed in loess and in the underlying mix of loess and glacial till. They are on interfluves, summits, and backslopes of till plains and knolls. Typically, the surface layer is dark grayish brown, friable silt loam about 5 inches thick. It has been thinned by erosion. The subsoil extends to a depth of 60 inches or more. In sequence downward, it is yellowish brown, friable silt loam and firm silty clay loam; brown, mottled, firm silty clay loam; pale brown, mottled, very firm and brittle loam; and pale brown, mottled, firm loam.

Of minor extent in this association are Atlas, Blair, Frondorf, Gosport, and Holton soils. The somewhat poorly drained Atlas and Blair soils formed in a mix of loess and glacial till and in the underlying glacial till. They are on backslopes of till plains. The well drained Frondorf soils and the moderately well drained Gosport soils are also on backslopes. Frondorf soils formed mostly in residuum derived from sandstone and siltstone. Gosport soils formed mostly in residuum derived from shale. The somewhat poorly drained Holton soils formed in alluvium. They are on flood plains.

Most areas of this association are used for cultivated crops. Some areas are used for pasture and hay or as woodland. The less sloping soils are well suited to cultivated crops and to pasture and hay. They are moderately suited or well suited to woodland. The steeper soils range from moderately suited to generally unsuited to cultivated crops and to pasture and hay, depending on the slope. They are generally well suited or moderately suited to woodland. The seasonal high water table in the Bluford soils and the hazard of erosion in sloping areas of the Ava, Bluford, and Hickory soils are the main management concerns affecting cultivated crops and pasture and hay. In areas of the Bluford

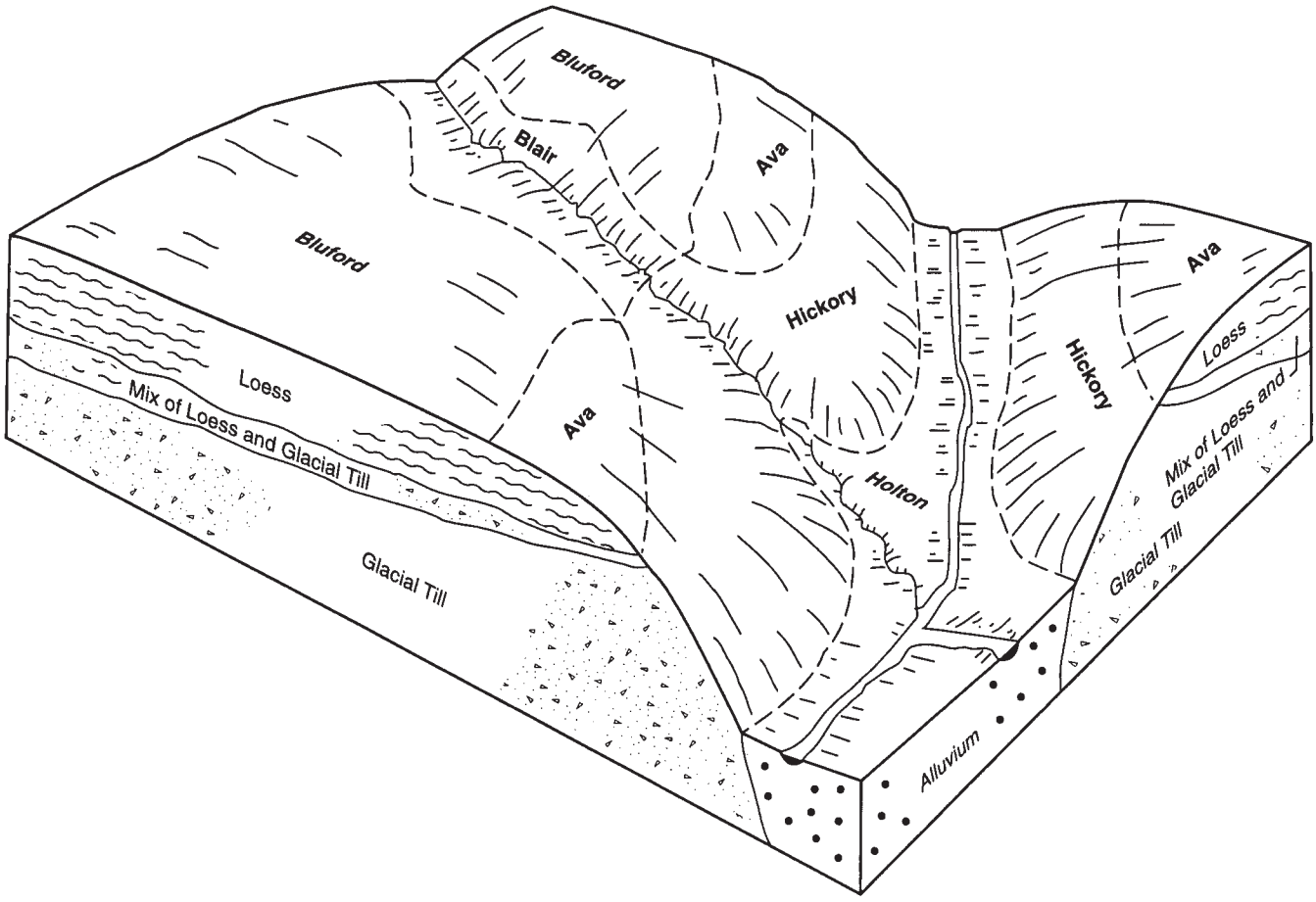

Figure 3.—Typical pattern of soils and parent material in the Bluford-Hickory-Ava association.

soils used as woodland, equipment limitations and the windthrow hazard are management concerns. In steep and very steep areas of the Hickory soils, the hazard of erosion and equipment limitations are concerns.

The Bluford and Ava soils are poorly suited or moderately suited to use as sites for dwellings. They are poorly suited to use as sites for septic tank absorption fields. The seasonal high water table, the shrink-swell potential, and restricted permeability are limitations. The moderately sloping Hickory soils are moderately suited to use as sites for dwellings and septic tank absorption fields. The shrink-swell potential, the slope, the seasonal high water table, and moderate permeability are limitations. The steep and very steep Hickory soils are generally unsuited to these uses because of the slope.

3. Wakeland-Birds-Wirt Association

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

This association consists of soils on flood plains and natural levees along the major streams and tributaries. The soils are subject to frequent flooding. Slopes range from 0 to 2 percent.

This association makes up about 6 percent of the county. It is about 50 percent Wakeland soils, 32 percent Birds soils, 10 percent Wirt soils, and 8 percent soils of minor extent.

The somewhat poorly drained Wakeland soils are on flood plains. Typically, the surface layer is dark grayish brown, friable silt loam about 6 inches thick. The substratum to a depth of 60 inches or more is mottled, friable silt loam. The upper part is grayish brown and has thin bands of light gray. The lower part is light brownish gray.

The poorly drained Birds soils are on flood plains. Typically, the surface layer is dark grayish brown, friable silt loam about 6 inches thick. The subsurface layer is dark grayish brown, mottled, friable silt loam about 4 inches thick. The substratum extends to a depth of 60 inches or more. It is mottled. The upper part is light brownish gray, friable silt loam. The lower part is light gray, firm silty clay loam.

The well drained Wirt soils are on natural levees. Typically, the surface layer is dark yellowish brown, very friable loam about 8 inches thick. The subsurface layer is dark yellowish brown, very friable fine sandy loam about 4 inches thick. The subsoil is about 12 inches thick. It is stratified dark brown, very friable fine sandy loam and yellowish brown, very friable loamy fine sand. The substratum to a depth of 60 inches or more is stratified dark brown, very friable fine sandy loam and yellowish brown, loose loamy fine sand and fine sand.

Of minor extent in this association are Creal, Petrolia, and Racoon soils. The somewhat poorly drained Creal soils are on footslopes of till plains. They have a subsoil of silty clay loam and clay loam. The poorly drained and very poorly drained Petrolia soils have a surface layer and substratum of silty clay loam. They are on flood plains and in backswamps and channels. The poorly drained Racoon soils are on treads of stream terraces. They are rarely flooded.

Most areas of this association are used for cultivated crops or as woodland. Some areas are used for pasture and hay. The soils are well suited or moderately suited to cultivated crops and to pasture and hay. The Wakeland soils are moderately suited to woodland, the Birds soils are poorly suited, and the Wirt soils are well suited. The flooding and the seasonal high water table in the Wakeland and Birds soils are the main management concerns in areas used for cultivated crops or for pasture and hay. Equipment limitations, seedling mortality, and the windthrow hazard are concerns in areas of the Wakeland and Birds soils used as woodland.

The soils in this association are generally unsuited to use as sites for dwellings or septic tank absorption fields because of the hazard of flooding.

4. Bonnie-Belknap-Piopolis Association

Nearly level, very poorly drained to somewhat poorly drained soils that formed in alluvium; on flood plains

This association consists of soils on flood plains and in backswamps and channels along the major streams. The soils are subject to frequent flooding. Slopes range from 0 to 2 percent.

This association makes up about 6 percent of the county. It is about 45 percent Bonnie soils, 28 percent Belknap soils, 19 percent Piopolis soils, and 8 percent soils of minor extent.

The poorly drained Bonnie soils are on flood plains. Typically, the surface layer is dark grayish brown, mottled, friable silt loam about 9 inches thick. The subsurface layer is light brownish gray, mottled, firm silt loam about 4 inches thick. The substratum extends to a depth of 60 inches or more. It is mottled and firm. The upper part is light brownish gray silt loam. The next part is stratified light brownish gray and light gray silt loam. The lower part is grayish brown silty clay loam stratified with thin bands of light gray silt loam.

The somewhat poorly drained Belknap soils are on flood plains. Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick.

The substratum to a depth of 60 inches or more is mottled, friable silt loam. The upper part is brown, the next part is light brownish gray, and the lower part is light brownish gray and has thin bands of light gray.

The poorly drained and very poorly drained Piopolis soils are on flood plains and in backswamps and channels. Typically, the surface layer is dark grayish brown, mottled, firm silty clay loam about 6 inches thick. The subsurface layer is gray, mottled, firm silty clay loam about 6 inches thick. The substratum to a depth of 60 inches or more is mottled, firm silty clay loam. The upper part is light brownish gray and light gray, and the lower part is grayish brown.

Of minor extent in this association are Creal, Racoon, and Wirt soils. The somewhat poorly drained Creal soils are on footslopes of till plains. They have a subsoil of silty clay loam and clay loam. The poorly drained Racoon soils are on treads of stream terraces. They are subject to rare flooding. The well drained Wirt soils are on natural levees. They formed in loamy and sandy alluvium.

Most areas of this association are used for cultivated crops or as woodland. The Belknap soils are moderately suited to cultivated crops and to woodland. The poorly drained Bonnie and Piopolis soils are moderately suited to cultivated crops and poorly suited to woodland. The very poorly drained Piopolis soils are generally unsuited to cultivated crops because of ponding. Also, they are poorly suited to woodland. The seasonal high water table and the flooding are the main management concerns in areas used for cultivated crops. Equipment limitations, seedling mortality, and the windthrow hazard are concerns in areas used as woodland.

The soils in this association are generally unsuited to use as sites for dwellings or septic tank absorption fields because of the hazard of flooding.

Broad Land Use Considerations

The soils in Clay County range widely in their suitability for major land uses. They are used mainly for cultivated crops. Other uses include pasture, hay, woodland, wildlife habitat, recreation, and urban development.

Corn, soybeans, and winter wheat are grown most extensively in associations 1, 3, and 4. These associations generally are moderately suited or well suited to cultivated crops. Wetness is a limitation on most of the major soils, such as Belknap, Birds, Bonnie, Cisne, Hoyleton, and Wakeland soils. Also, flooding can delay planting or damage crops in areas of associations 3 and 4. Erosion is a hazard in sloping areas of Hoyleton soils. Huey soils have a high content of exchangeable sodium in the subsoil, which results in reduced yields.

Most of the areas used for grasses and legumes for pasture and hay are in associations 2 and 3. These associations generally are moderately suited or well suited to pasture and hay. Wetness is a limitation in most of the nearly level areas. Erosion is a hazard in the sloping areas. Flooding can delay planting or damage plants in areas of association 3.

Most of the woodland is in associations 2, 3, and 4. The main tree species in association 2 are white oak, red oak, shagbark hickory, sugar maple, black walnut, elm, and yellow-poplar. The main tree species in associations 3 and 4 are cottonwood, silver maple, pin oak, sycamore, and sweetgum. Ava soils and the moderately steep Hickory soils are well suited to woodland. Areas of Hickory soils that are steep or very steep are moderately suited or poorly suited because of the hazard of erosion and equipment limitations. The somewhat poorly drained soils, such as Belknap, Bluford, and Wakeland soils, are moderately suited to woodland. Equipment limitations and the windthrow hazard are the main concerns in areas of these soils. Poorly drained or very poorly drained soils, such as Birds, Bonnie, and Piopolis soils, are poorly suited to woodland because of equipment limitations, seedling mortality, and the windthrow hazard.

The potential for the development of habitat for selected types of wildlife is generally good throughout the county. Association 1 is well suited or moderately suited to habitat for openland wildlife. Associations 2 and 3 are well suited to habitat for woodland wildlife, and in some areas they are well suited or moderately suited to habitat for openland wildlife. Association 4 is well suited or moderately suited to habitat for woodland wildlife. In some areas it is well suited to habitat for wetland wildlife.

The soils in the county range from well suited to poorly suited to recreational uses, such as camp and picnic areas, paths and trails, and playgrounds. The suitability depends partly on the intensity of the expected use. The major soils in association 1 generally are poorly suited to most recreational uses because of wetness and restricted permeability. Hoyleton soils, however, are moderately suited to paths and trails and to picnic areas. The major soils in association 2 generally are poorly suited or moderately suited to most recreational uses because of wetness, restricted permeability, or the slope. Associations 3 and 4 are poorly suited to most recreational uses because of the flooding.

Sites for dwellings and septic tank absorption

fields are mostly in associations 1 and 2. The major soils in association 1 generally are poorly suited to these uses because of the seasonal high water table, restricted permeability, and the shrink-swell potential. The major soils in association 2 generally are poorly suited or moderately suited to these uses. The seasonal high water table, restricted permeability, the slope, and the shrink-swell potential are limitations. Associations 3 and 4 are generally unsuited to use as sites for dwellings and septic tank absorption fields because of the hazard of flooding.

Detailed Soil Map Units

The map units on the detailed soil maps in 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 is given under the heading "Use and Management of the Soils."

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

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

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

Soils of one series can differ in texture of the surface layer or of the substratum. They also can differ in slope, stoniness, reaction, 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, Hoyleton silt loam, 2 to 5 percent slopes, is a phase of the Hoyleton 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. Cisne-Huey complex is an example.

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

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. The map unit Oil-waste land, brine damaged, 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 "Contents") 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

2—Cisne silt loam

Composition

Cisne and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Till plains
Landform position: Interfluves
Slope range: 0 to 2 percent
Size of areas: 3 to more than 1,000 acres
Major use: Cropland

Soil Properties and Qualities

Drainage class: Poorly drained
Permeability: Very slow
Parent material: Loess and the underlying mix of loess and glacial till
Runoff: Slow
Available water capacity: Moderate
Depth to the seasonal high water table: Less than 1 foot

Organic matter content: Moderate
Erosion hazard: Slight
Shrink-swell potential: High
Potential for frost action: High

Typical Profile

Surface layer:
0 to 7 inches—dark brown, friable silt loam

Subsurface layer:
7 to 12 inches—grayish brown, friable silt loam
12 to 19 inches—light brownish gray, mottled, friable silt loam

Subsoil:
19 to 32 inches—light brownish gray, mottled, very firm silty clay
32 to 60 inches—light brownish gray, mottled, firm silty clay loam

Inclusions

Contrasting inclusions:
• Huey soils, which have a natric horizon; in landform positions similar to those of the Cisne soil
• The somewhat poorly drained Darmstadt and Hoyleton soils in the slightly higher positions
• Newberry and Shiloh soils, which are subject to ponding; in depressions below the Cisne soil

Similar soils:
• Soils that have a lighter colored surface layer

Use and Management

Cropland

Suitability: Moderately suited
Management considerations:
• Measures that maintain the drainage system are needed. Surface ditches help to overcome the wetness (fig. 4).
• Tilling when the soil is wet causes surface cloddiness and compaction and reduces the rate of water infiltration.
• Returning crop residue to the soil, regularly adding other organic material, and minimizing tillage increase the rate of water infiltration and help to maintain tilth and the content of organic matter.
• Winter wheat is subject to frost heave in some years.

Dwellings

Suitability: Poorly suited
Management considerations:
• Onsite investigation is needed.
• Installing subsurface tile drains near the foundation can lower the water table.
• Extending the footings below the subsoil or reinforcing the foundation helps to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Suitability: Poorly suited
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Interpretive Groups

Land capability classification: IIIw

3A—Hoyleton silt loam, 0 to 2 percent slopes

Composition

Hoyleton and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Till plains
Landform position: Summits and interfluves
Size of areas: 3 to 350 acres
Major use: Cropland

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Permeability: Slow
Parent material: Loess and the underlying mix of loess and glacial till
Runoff: Slow
Available water capacity: High
Depth to the seasonal high water table: 1 to 3 feet
Organic matter content: Moderate
Erosion hazard: Slight
Shrink-swell potential: High
Potential for frost action: High

Typical Profile

Surface layer:
0 to 8 inches—dark brown, friable silt loam

Subsurface layer:
8 to 12 inches—brown, friable silt loam

Subsoil:
12 to 17 inches—yellowish brown, friable silty clay loam
17 to 33 inches—brown and light brownish gray, mottled, firm silty clay
33 to 60 inches—grayish brown, mottled, firm silty clay loam

Figure 4.—A shallow surface ditch reduces wetness in this area of Cisne silt loam.

Inclusions

Contrasting inclusions:
- The poorly drained Cisne soils in the lower positions
- Darmstadt soils, which have a natric horizon; in landform positions similar to those of the Hoyleton soil

Similar soils:
- Soils that have a lighter colored surface layer

Use and Management

Cropland

Suitability: Well suited
Management considerations:
- Surface ditches help to overcome the wetness.
- In areas where slopes are very long, erosion 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, reduces the rate of water infiltration, and causes excessive runoff and erosion.
- Returning crop residue to the soil, regularly adding other organic material, and minimizing tillage increase the rate of water infiltration and help to maintain tilth and the content of organic matter.

Dwellings

Suitability: Poorly suited
Management considerations:
- Onsite investigation is needed.
- Installing subsurface tile drains near the foundation can lower the water table.

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

Septic tank absorption fields

Suitability: Poorly suited
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Interpretive Groups

Land capability classification: IIw

3B—Hoyleton silt loam, 2 to 5 percent slopes

Composition

Hoyleton and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Knolls and till plains
Landform position: Summits, interfluves, and backslopes
Size of areas: 3 to 220 acres
Major use: Cropland

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Permeability: Slow
Parent material: Loess and the underlying mix of loess and glacial till
Runoff: Medium
Available water capacity: High
Depth to the seasonal high water table: 1 to 3 feet
Organic matter content: Moderate
Erosion hazard: Moderate
Shrink-swell potential: High
Potential for frost action: High

Typical Profile

Surface layer:
0 to 8 inches—dark brown, friable silt loam

Subsurface layer:
8 to 12 inches—yellowish brown, friable silt loam

Subsoil:
12 to 18 inches—brown, firm silty clay loam
18 to 53 inches—grayish brown, mottled, very firm silty clay and firm silty clay loam
53 to 60 inches—yellowish brown, mottled, firm clay loam

Inclusions

Contrasting inclusions:
• Darmstadt soils, which have a natric horizon; in landform positions similar to those of the Hoyleton soil
• The moderately well drained Richview soils in the higher positions

Similar soils:
• Soils that have a lighter colored surface layer
• Soils that are eroded and have a thinner surface layer

Use and Management

Cropland

Suitability: Well suited
Management considerations:
• Surface ditches help to overcome the wetness.
• A system of conservation tillage that leaves crop residue on the surface after planting, terraces, and contour farming help to control erosion.
• Tilling when the soil is wet causes surface cloddiness and compaction, reduces the rate of water infiltration, and causes excessive runoff and erosion.
• Returning crop residue to the soil, regularly adding other organic material, and minimizing tillage increase the rate of water infiltration and help to maintain tilth and the content of organic matter.

Dwellings

Suitability: Poorly suited
Management considerations:
• Onsite investigation is needed.
• Installing either tile drains near the foundation or interceptor drains higher on the slopes than the building can lower the water table and intercept seepage water.
• Extending the footings below the subsoil or reinforcing the foundation helps to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Suitability: Poorly suited
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Interpretive Groups

Land capability classification: IIe

3B2—Hoyleton silt loam, 2 to 5 percent slopes, eroded

Composition

Hoyleton and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Knolls and till plains
Landform position: Backslopes
Size of areas: 3 to 170 acres
Major uses: Cropland; pasture and hay

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Permeability: Slow
Parent material: Loess and the underlying mix of loess and glacial till
Runoff: Medium
Available water capacity: High
Depth to the seasonal high water table: 1 to 3 feet
Organic matter content: Moderate
Erosion hazard: Moderate
Shrink-swell potential: High
Potential for frost action: High

Typical Profile

Surface layer:
0 to 8 inches—very dark grayish brown, friable silt loam

Subsoil:
8 to 12 inches—brown, mottled, friable silty clay loam
12 to 44 inches—brown and grayish brown, mottled, very firm silty clay and firm silty clay loam
44 to 60 inches—pale brown, mottled, firm silt loam

Inclusions

Contrasting inclusions:
• Blair soils on moderately sloping backslopes below the Hoyleton soil
• Darmstadt soils, which have a natric horizon; in landform positions similar to those of the Hoyleton soil

Similar soils:
• Soils that have a lighter colored surface layer
• Soils that have less clay in the subsoil
• Soils that are severely eroded and have a surface layer of silty clay loam

Use and Management

Cropland

Suitability: Well suited
Management considerations:
• Surface ditches help to overcome the wetness.
• A system of conservation tillage that leaves crop residue on the surface after planting, terraces, and contour farming help to control erosion.
• Tilling when the soil is wet causes surface cloddiness and compaction, reduces the rate of water infiltration, and causes excessive runoff and erosion.
• Returning crop residue to the soil, regularly adding other organic material, and minimizing tillage increase the rate of water infiltration and help to maintain tilth and the content of organic matter.

Pasture and hay

Suitability: Well suited
Management considerations:
• A cover of grasses and legumes helps to control erosion and maintains good tilth.
• Surface ditches help to overcome the wetness.
• Proper stocking rates, rotation grazing, deferred grazing when the soil is wet, and proper applications of lime and fertilizer help to keep the pasture in good condition.
• Alsike clover, reed canarygrass, ladino clover, tall fescue, red clover, and bromegrass are suited to this soil. Suitable warm-season grasses include big bluestem, indiangrass, and switchgrass.
• The plants should not be grazed or clipped until they are sufficiently established.

Dwellings

Suitability: Poorly suited
Management considerations:
• Onsite investigation is needed.
• Installing either tile drains near the foundation or interceptor drains higher on the slopes than the building can lower the water table and intercept seepage water.
• Extending the footings below the subsoil or reinforcing the foundation helps to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Suitability: Poorly suited
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Interpretive Groups

Land capability classification: IIe

4B—Richview silt loam, 2 to 5 percent slopes

Composition

Richview and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Knolls
Landform position: Summits and backslopes
Size of areas: 3 to 20 acres
Major uses: Cropland; pasture and hay

Soil Properties and Qualities

Drainage class: Moderately well drained
Permeability: Moderate
Parent material: Loess and the underlying mix of loess and glacial till
Runoff: Medium
Available water capacity: High
Depth to the seasonal high water table: 4 to 6 feet
Organic matter content: Moderate
Erosion hazard: Moderate
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 8 inches—very dark grayish brown, friable silt loam

Subsurface layer:
8 to 12 inches—dark yellowish brown, friable silty clay loam

Subsoil:
12 to 26 inches—yellowish brown, friable silty clay loam
26 to 33 inches—yellowish brown, mottled, firm silty clay loam
33 to 49 inches—dark yellowish brown, mottled, firm clay loam

Substratum:
49 to 60 inches—yellowish brown, firm sandy loam

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Hoyleton soils in landform positions similar to or slightly lower than those of the Richview soil

Similar soils:
• Soils that have a lighter colored surface layer
• Soils that are eroded and have a thinner surface layer

Use and Management

Cropland

Suitability: Well suited
Management considerations:
• A system of conservation tillage that leaves crop residue on the surface after planting, terraces, and contour farming help to control erosion.
• Tilling when the soil is wet causes surface cloddiness and compaction, reduces the rate of water infiltration, and causes excessive runoff and erosion.
• Returning crop residue to the soil, regularly adding other organic material, and minimizing tillage increase the rate of water infiltration and help to maintain tilth and the content of organic matter.

Pasture and hay

Suitability: Well suited
Management considerations:
• A cover of grasses and legumes helps to control erosion and maintains good tilth.
• Proper stocking rates, rotation grazing, deferred grazing when the soil is wet, and proper applications of lime and fertilizer help to keep the pasture in good condition.
• Alfalfa, orchardgrass, tall fescue, red clover, and bromegrass are suited to this soil. Suitable warm-season grasses include big bluestem, indiangrass, and switchgrass.
• The plants should not be grazed or clipped until they are sufficiently established.

Dwellings

Suitability: Moderately suited
Management considerations:
• Onsite investigation is needed.
• Extending the footings below the subsoil or reinforcing the foundation helps to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Suitability: Moderately suited
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Interpretive Groups

Land capability classification: IIe

4C2—Richview silt loam, 5 to 10 percent slopes, eroded

Composition

Richview and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Knolls
Landform position: Backslopes
Size of areas: 3 to 60 acres
Major uses: Cropland; pasture and hay

Soil Properties and Qualities

Drainage class: Moderately well drained
Permeability: Moderate
Parent material: Loess and the underlying mix of loess and glacial till
Runoff: Medium
Available water capacity: High
Depth to the seasonal high water table: 4 to 6 feet
Organic matter content: Moderate
Erosion hazard: Severe
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 7 inches—very dark grayish brown, friable silt loam

Subsoil:
7 to 17 inches—yellowish brown and brown, friable and firm silty clay loam
17 to 30 inches—brown, mottled, firm silty clay loam
30 to 48 inches—dark yellowish brown, mottled, firm clay loam
48 to 60 inches—yellowish brown, firm sandy loam

Inclusions

Contrasting inclusions:
• The well drained Frondorf soils on backslopes below the Richview soil
• The somewhat poorly drained Hoyleton soils in the slightly lower positions

Similar soils:
• Soils that have more sand in the upper part of the subsoil
• Soils that are severely eroded and have a surface layer of silty clay loam

Use and Management

Cropland

Suitability: Moderately suited
Management considerations:
• A system of conservation tillage that leaves crop residue on the surface after planting, terraces, contour farming, and a crop rotation that includes 1 or more years of forage crops help to control erosion.
• Tilling when the soil is wet causes surface cloddiness and compaction, reduces the rate of water infiltration, and causes excessive runoff and erosion.
• Returning crop residue to the soil, regularly adding other organic material, and minimizing tillage increase the rate of water infiltration and help to maintain tilth and the content of organic matter.

Pasture and hay

Suitability: Well suited
Management considerations:
• A cover of grasses and legumes helps to control erosion and maintains good tilth.
• Proper stocking rates, rotation grazing, deferred grazing when the soil is wet, and proper applications of lime and fertilizer help to keep the pasture in good condition.
• Alfalfa, orchardgrass, tall fescue, red clover, and bromegrass are suited to this soil. Suitable warm-season grasses include big bluestem, indiangrass, and switchgrass.
• The plants should not be grazed or clipped until they are sufficiently established.

Dwellings

Suitability: Moderately suited
Management considerations:
• Onsite investigation is needed.
• Extending the footings below the subsoil or reinforcing the foundation helps to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Suitability: Moderately suited
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Interpretive Groups

Land capability classification: IIIe

5C2—Blair silt loam, 5 to 10 percent slopes, eroded

Composition

Blair and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Till plains
Landform position: Backslopes
Size of areas: 3 to 190 acres
Major uses: Cropland, pasture and hay, woodland

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Permeability: Moderately slow
Parent material: Mix of loess and glacial till and the underlying glacial till
Runoff: Medium
Available water capacity: High
Depth to the seasonal high water table: 1.5 to 3.5 feet
Organic matter content: Moderately low
Erosion hazard: Severe
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 5 inches—dark grayish brown, friable silt loam

Subsoil:
5 to 8 inches—yellowish brown, firm clay loam
8 to 34 inches—brown and grayish brown, mottled, firm silty clay loam and clay loam
34 to 60 inches—light gray and gray, mottled, very firm clay loam

Inclusions

Contrasting inclusions:
• Grantfork soils, which have a high content of exchangeable sodium in the subsoil; in landform positions similar to those of the Blair soil
• The moderately well drained Hickory soils in the more sloping positions

Similar soils:
• Soils that are not eroded, have a thicker surface layer, and have a subsurface layer
• Soils that have more clay in the subsoil
• Soils that have slopes of less than 5 percent
• Soils that are severely eroded and have a surface layer of silty clay loam

Use and Management

Cropland

Suitability: Moderately suited
Management considerations:
• Contour farming, a system of conservation tillage that leaves crop residue on the surface after planting, and a crop rotation that includes 1 or more years of forage crops help to control erosion.
• Tilling when the soil is wet causes surface cloddiness and compaction, reduces the rate of water infiltration, and causes excessive runoff and erosion.
• Returning crop residue to the soil, regularly adding other organic material, and minimizing tillage increase the rate of water infiltration and help to maintain tilth and the content of organic matter.

Pasture and hay

Suitability: Well suited
Management considerations:
• A cover of grasses and legumes helps to control erosion and maintains good tilth.
• Proper stocking rates, rotation grazing, deferred grazing when the soil is wet, and proper applications of lime and fertilizer help to keep the pasture in good condition.
• Alsike clover, reed canarygrass, ladino clover, tall fescue, red clover, and bromegrass are suited to this soil. Suitable warm-season grasses include big bluestem, indiangrass, and switchgrass.
• The plants should not be grazed or clipped until they are sufficiently established.

Woodland

Suitability: Well suited
Management considerations:
• 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.
• Protection from fire minimizes injury to trees and maintains the leaf mulch.

Dwellings

Suitability: Moderately suited
Management considerations:
• Onsite investigation is needed.
• Installing either tile drains near the foundation or interceptor drains higher on the slopes than the building can lower the water table and intercept seepage water.
• Extending the footings below the subsoil or reinforcing the foundation helps to prevent the

structural damage caused by shrinking and swelling.

Septic tank absorption fields

Suitability: Poorly suited
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 4A

5C3—Blair silty clay loam, 5 to 10 percent slopes, severely eroded

Composition

Blair and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Till plains
Landform position: Backslopes
Size of areas: 3 to 95 acres
Major uses: Cropland; pasture and hay

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Permeability: Moderately slow
Parent material: Mix of loess and glacial till
Runoff: Rapid
Available water capacity: High
Depth to the seasonal high water table: 1.5 to 3.5 feet
Organic matter content: Low
Erosion hazard: Severe
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 8 inches—yellowish brown, friable silty clay loam

Subsoil:
8 to 45 inches—light brownish gray, mottled, firm and very firm clay loam
45 to 60 inches—light gray, mottled, firm clay loam

Inclusions

Contrasting inclusions:
• Grantfork soils, which have a high content of exchangeable sodium in the subsoil; in landform positions similar to those of the Blair soil
• The moderately well drained Hickory soils in the more sloping positions

Similar soils:
• Soils that have less sand in the upper part of the subsoil
• Soils that have more clay in the subsoil
• Soils that have a surface layer of silt loam

Use and Management

Cropland

Suitability: Poorly suited
Management considerations:
• Contour farming, a system of conservation tillage that leaves crop residue on the surface after planting, and a crop rotation that is dominated by forage crops help to control erosion.
• Preparing a good seedbed is difficult because of surface crusting and cloddiness.
• Using a no-till method of seeding and seeding on the contour help in establishing seedlings and in controlling erosion.
• Tilling when the soil is wet causes surface cloddiness and compaction, reduces the rate of water infiltration, and causes excessive runoff and erosion.
• Returning crop residue to the soil, regularly adding other organic material, and minimizing tillage increase the rate of water infiltration and help to maintain tilth and the content of organic matter.

Pasture and hay

Suitability: Moderately suited
Management considerations:
• A cover of grasses and legumes helps to control erosion and improves tilth.
• Proper stocking rates, rotation grazing, deferred grazing when the soil is wet, and proper applications of lime and fertilizer help to keep the pasture in good condition.
• Preparing a good seedbed is difficult because of surface crusting and cloddiness.
• Using a no-till method of seeding or pasture renovation and seeding on the contour help in establishing forage species and in controlling erosion.
• Alsike clover, reed canarygrass, ladino clover, tall fescue, red clover, and bromegrass are suited to this soil. Suitable warm-season grasses include big bluestem, indiangrass, and switchgrass.
• The plants should not be grazed or clipped until they are sufficiently established.

Dwellings

Suitability: Moderately suited

Management considerations:
• Onsite investigation is needed.
• Installing either tile drains near the foundation or interceptor drains higher on the slopes than the building can lower the water table and intercept seepage water.
• Extending the footings below the subsoil or reinforcing the foundation helps to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Suitability: Poorly suited
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Interpretive Groups

Land capability classification: IVe

7C2—Atlas silt loam, 5 to 10 percent slopes, eroded

Composition

Atlas and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Till plains
Landform position: Backslopes
Size of areas: 3 to 240 acres
Major uses: Cropland, pasture and hay, woodland

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Permeability: Very slow
Parent material: Mix of loess and glacial till and the underlying glacial till
Runoff: Rapid
Available water capacity: Moderate
Depth to the seasonal high water table: 0.5 foot to 2.0 feet
Organic matter content: Moderately low
Erosion hazard: Severe
Shrink-swell potential: High
Potential for frost action: High

Typical Profile

Surface layer:
0 to 5 inches—brown, friable silt loam

Subsurface layer:
5 to 9 inches—grayish brown, mottled, friable silt loam

Subsoil:
9 to 14 inches—brown, mottled, firm silty clay loam
14 to 40 inches—light brownish gray and light gray, mottled, very firm silty clay
40 to 60 inches—gray, mottled, very firm clay

Inclusions

Contrasting inclusions:
• Grantfork soils, which have a high content of exchangeable sodium in the subsoil; in landform positions similar to those of the Atlas soil
• The moderately well drained Hickory soils in the more sloping positions

Similar soils:
• Soils that have less clay in the upper part of the subsoil
• Soils that are severely eroded and have a surface layer of silty clay loam

Use and Management

Cropland

Suitability: Moderately suited
Management considerations:
• Contour farming, a system of conservation tillage that leaves crop residue on the surface after planting, and a crop rotation that includes 1 or more years of forage crops help to control erosion.
• Tilling when the soil is wet causes surface cloddiness and compaction, reduces the rate of water infiltration, and causes excessive runoff and erosion.
• Returning crop residue to the soil, regularly adding other organic material, and minimizing tillage increase the rate of water infiltration and help to maintain tilth and the content of organic matter.

Pasture and hay

Suitability: Moderately suited
Management considerations:
• A cover of grasses and legumes helps to control erosion and maintains good tilth.
• Proper stocking rates, rotation grazing, deferred grazing when the soil is wet, and proper applications of lime and fertilizer help to keep the pasture in good condition.
• Alsike clover, reed canarygrass, ladino clover, tall fescue, red clover, and bromegrass are suited to this soil. Suitable warm-season grasses include big bluestem, indiangrass, and switchgrass.
• The plants should not be grazed or clipped until they are sufficiently established.

Woodland

Suitability: Moderately suited

Management considerations:
• The use of equipment is limited to periods when the soil is firm enough for adequate support.
• Using a harvesting method that does not leave the remaining trees isolated or widely spaced and removing only high-value trees from a strip 50 feet wide along the western and southern edges of the woodland reduce the windthrow hazard.
• 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.
• Protection from fire minimizes injury to trees and maintains the leaf mulch.

Dwellings

Suitability: Poorly suited
Management considerations:
• Onsite investigation is needed.
• Installing either tile drains near the foundation or interceptor drains higher on the slopes than the building can lower the water table and intercept seepage water.
• Extending the footings below the subsoil or reinforcing the foundation helps to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Suitability: Poorly suited
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 4C

7C3—Atlas silty clay loam, 5 to 10 percent slopes, severely eroded

Composition

Atlas and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Till plains
Landform position: Backslopes
Size of areas: 3 to 120 acres
Major uses: Cropland; pasture and hay

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Permeability: Very slow
Parent material: Glacial till
Runoff: Rapid
Available water capacity: Moderate
Depth to the seasonal high water table: 0.5 foot to 2.0 feet
Organic matter content: Low
Erosion hazard: Severe
Shrink-swell potential: High
Potential for frost action: High

Typical Profile

Surface layer:
0 to 4 inches—brown, firm silty clay loam

Subsoil:
4 to 8 inches—brown, mottled, firm clay loam
8 to 22 inches—gray, mottled, firm clay loam
22 to 60 inches—light gray, mottled, very firm clay

Inclusions

Contrasting inclusions:
• Grantfork soils, which have a high content of exchangeable sodium in the subsoil; in landform positions similar to those of the Atlas soil
• The moderately well drained Hickory soils in the more sloping positions

Similar soils:
• Soils that have less clay in the upper part of the subsoil
• Soils that have a surface layer of silt loam

Use and Management

Cropland

Suitability: Poorly suited
Management considerations:
• Contour farming, a system of conservation tillage that leaves crop residue on the surface after planting, and a crop rotation that is dominated by forage crops help to control erosion.
• Preparing a good seedbed is difficult because of surface crusting and cloddiness.
• Using a no-till method of seeding and seeding on the contour help in establishing seedlings and in controlling erosion.
• Tilling when the soil is wet causes surface cloddiness and compaction, reduces the rate of water infiltration, and causes excessive runoff and erosion.
• Returning crop residue to the soil, regularly adding other organic material, and minimizing tillage increase the rate of water infiltration and help to maintain tilth and the content of organic matter.

Pasture and hay

Suitability: Poorly suited
Management considerations:
• A cover of grasses and legumes helps to control erosion and improves tilth.
• Proper stocking rates, rotation grazing, deferred grazing when the soil is wet, and proper applications of lime and fertilizer help to keep the pasture in good condition.
• Preparing a good seedbed is difficult because of surface crusting and cloddiness.
• Using a no-till method of seeding or pasture renovation and seeding on the contour help in establishing forage species and in controlling erosion.
• Alsike clover, reed canarygrass, ladino clover, tall fescue, red clover, and bromegrass are suited to this soil. Suitable warm-season grasses include big bluestem, indiangrass, and switchgrass.
• The plants should not be grazed or clipped until they are sufficiently established.

Dwellings

Suitability: Poorly suited
Management considerations:
• Onsite investigation is needed.
• Installing either tile drains near the foundation or interceptor drains higher on the slopes than the building can lower the water table and intercept seepage water.
• Extending the footings below the subsoil or reinforcing the foundation helps to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Suitability: Poorly suited
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Interpretive Groups

Land capability classification: IVe

7D2—Atlas silt loam, 10 to 18 percent slopes, eroded

Composition

Atlas and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Till plains
Landform position: Backslopes
Size of areas: 3 to 65 acres
Major uses: Cropland, pasture and hay, woodland

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Permeability: Very slow
Parent material: Mix of loess and glacial till and the underlying glacial till
Runoff: Rapid
Available water capacity: Moderate
Depth to the seasonal high water table: 0.5 foot to 2.0 feet
Organic matter content: Moderately low
Erosion hazard: Severe
Shrink-swell potential: High
Potential for frost action: High

Typical Profile

Surface layer:
0 to 6 inches—dark grayish brown, friable silt loam

Subsoil:
6 to 11 inches—brown, mottled, firm silty clay loam
11 to 60 inches—gray and light gray, mottled, very firm clay loam

Inclusions

Contrasting inclusions:
• The moderately well drained and well drained Hickory soils in landform positions similar to or more sloping than those of the Atlas soil
• The moderately well drained Gosport soils, which formed mainly in residuum derived from shale; in landform positions similar to those of the Atlas soil or on the lower parts of the slope below the Atlas soil
• Holton and Wakeland soils on flood plains

Similar soils:
• Soils that are not eroded, have a thicker surface layer, and have a subsurface layer
• Soils that have less clay in the upper part of the subsoil
• Soils that are severely eroded and have a surface layer of silty clay loam or clay loam

Use and Management

Cropland

Suitability: Poorly suited
Management considerations:
• Contour farming, a system of conservation tillage that leaves crop residue on the surface after planting, and a crop rotation that is dominated by forage crops help to control erosion.
• Tilling when the soil is wet causes surface

cloddiness and compaction, reduces the rate of water infiltration, and causes excessive runoff and erosion.
• Returning crop residue to the soil, regularly adding other organic material, and minimizing tillage increase the rate of water infiltration and help to maintain tilth and the content of organic matter.

Pasture and hay

Suitability: Moderately suited
Management considerations:
• A cover of grasses and legumes helps to control erosion and maintains good tilth.
• Proper stocking rates, rotation grazing, deferred grazing when the soil is wet, and proper applications of lime and fertilizer help to keep the pasture in good condition.
• Using a no-till method of seeding or pasture renovation and seeding on the contour help in establishing forage species and in controlling erosion.
• Alsike clover, reed canarygrass, ladino clover, tall fescue, red clover, and bromegrass are suited to this soil. Suitable warm-season grasses include big bluestem, indiangrass, and switchgrass.
• The plants should not be grazed or clipped until they are sufficiently established.

Woodland

Suitability: Moderately suited
Management considerations:
• The use of equipment is limited to periods when the soil is firm enough for adequate support.
• Using a harvesting method that does not leave the remaining trees isolated or widely spaced and removing only high-value trees from a strip 50 feet wide along the western and southern edges of the woodland reduce the windthrow hazard.
• 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.
• Protection from fire minimizes injury to trees and maintains the leaf mulch.

Dwellings

Suitability: Poorly suited
Management considerations:
• Onsite investigation is needed.
• Installing either tile drains near the foundation or interceptor drains higher on the slopes than the building can lower the water table and intercept seepage water.
• Extending the footings below the subsoil or reinforcing the foundation helps to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Suitability: Poorly suited
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: 4C

7D3—Atlas silty clay loam, 10 to 18 percent slopes, severely eroded

Composition

Atlas and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Till plains
Landform position: Backslopes
Size of areas: 3 to 40 acres
Major uses: Cropland; pasture and hay

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Permeability: Very slow
Parent material: Glacial till
Runoff: Rapid
Available water capacity: Moderate
Depth to the seasonal high water table: 0.5 foot to 2.0 feet
Organic matter content: Low
Erosion hazard: Severe
Shrink-swell potential: High
Potential for frost action: High

Typical Profile

Surface layer:
0 to 4 inches—brown, firm silty clay loam

Subsoil:
4 to 7 inches—brown, mottled, firm clay loam
7 to 60 inches—grayish brown and light gray, mottled, very firm clay loam and clay

Inclusions

Contrasting inclusions:
• The moderately well drained and well drained Hickory soils in landform positions similar to or more sloping than those of the Atlas soil
• The moderately well drained Gosport soils, which formed mainly in residuum derived from shale; in

landform positions similar to those of the Atlas soil or on the lower parts of the slope below the Atlas soil
• Holton and Wakeland soils on flood plains

Similar soils:
• Soils that have less clay in the upper part of the subsoil
• Soils that have a surface layer of silt loam or clay loam

Use and Management

Cropland

Suitability: Generally unsuited because of the slope and the severe hazard of erosion

Pasture and hay

Suitability: Poorly suited
Management considerations:
• A cover of grasses and legumes helps to control erosion and improves tilth.
• Proper stocking rates, rotation grazing, deferred grazing when the soil is wet, and proper applications of lime and fertilizer help to keep the pasture in good condition.
• Preparing a good seedbed is difficult because of surface crusting and cloddiness.
• Using a no-till method of seeding or pasture renovation and seeding on the contour help in establishing forage species and in controlling erosion.
• Alsike clover, reed canarygrass, ladino clover, tall fescue, red clover, and bromegrass are suited to this soil. Suitable warm-season grasses include big bluestem, indiangrass, and switchgrass.
• The plants should not be grazed or clipped until they are sufficiently established.

Dwellings

Suitability: Poorly suited
Management considerations:
• Onsite investigation is needed.
• Installing either tile drains near the foundation or interceptor drains higher on the slopes than the building can lower the water table and intercept seepage water.
• Extending the footings below the subsoil or reinforcing the foundation helps to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Suitability: Poorly suited
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Interpretive Groups

Land capability classification: VIe

8D2—Hickory silt loam, 10 to 18 percent slopes, eroded

Composition

Hickory and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Till plains
Landform position: Backslopes
Size of areas: 3 to 110 acres
Major uses: Cropland, pasture and hay, woodland

Soil Properties and Qualities

Drainage class: Moderately well drained
Permeability: Moderate
Parent material: Glacial till
Runoff: Rapid
Available water capacity: High
Depth to the seasonal high water table: 4 to 6 feet
Organic matter content: Moderately low
Erosion hazard: Severe
Shrink-swell potential: Moderate
Potential for frost action: Moderate

Typical Profile

Surface layer:
0 to 3 inches—dark grayish brown, friable silt loam

Subsoil:
3 to 6 inches—yellowish brown, friable clay loam
6 to 47 inches—yellowish brown, firm clay loam
47 to 60 inches—brown, mottled, firm clay loam

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Atlas soils in landform positions similar to those of the Hickory soil or in the less sloping positions above the Hickory soil
• Gosport soils and the well drained Frondorf soils, which formed mainly in residuum derived from bedrock; in landform positions similar to those of the Hickory soil or on the lower parts of the slope below the Hickory soil
• The somewhat poorly drained Holton soils on flood plains

Similar soils:
• Soils that are not eroded, have a thicker surface layer, and have a subsurface layer

• Soils that have less sand in the upper part of the subsoil
• Soils that are severely eroded and have a surface layer of clay loam

Use and Management

Cropland

Suitability: Moderately suited
Management considerations:
• Contour farming, a system of conservation tillage that leaves crop residue on the surface after planting, and a crop rotation that includes 1 or more years of forage crops help to control erosion.
• Tilling when the soil is wet causes surface cloddiness and compaction, reduces the rate of water infiltration, and causes excessive runoff and erosion.
• Returning crop residue to the soil, regularly adding other organic material, and minimizing tillage increase the rate of water infiltration and help to maintain tilth and the content of organic matter.

Pasture and hay

Suitability: Moderately suited
Management considerations:
• A cover of grasses and legumes helps to control erosion and maintains good tilth.
• Proper stocking rates, rotation grazing, deferred grazing when the soil is wet, and proper applications of lime and fertilizer help to keep the pasture in good condition.
• Using a no-till method of seeding or pasture renovation and seeding on the contour help in establishing forage species and in controlling erosion.
• Alfalfa, orchardgrass, tall fescue, red clover, and bromegrass are suited to this soil. Suitable warm-season grasses include big bluestem, indiangrass, and switchgrass.
• The plants should not be grazed or clipped until they are sufficiently established.

Woodland

Suitability: Well suited
Management considerations:
• 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.
• Protection from fire minimizes injury to trees and maintains the leaf mulch.

Dwellings

Suitability: Moderately suited
Management considerations:
• Onsite investigation is needed.
• Land shaping by cutting and filling helps to overcome the slope.
• Extending the footings below the subsoil or reinforcing the foundation helps to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Suitability: Moderately suited
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 5A

8D3—Hickory clay loam, 10 to 18 percent slopes, severely eroded

Composition

Hickory and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Till plains
Landform position: Backslopes
Size of areas: 3 to 40 acres
Major uses: Cropland; pasture and hay

Soil Properties and Qualities

Drainage class: Moderately well drained
Permeability: Moderate
Parent material: Glacial till
Runoff: Rapid
Available water capacity: High
Depth to the seasonal high water table: 4 to 6 feet
Organic matter content: Low
Erosion hazard: Severe
Shrink-swell potential: Moderate
Potential for frost action: Moderate

Typical Profile

Surface layer:
0 to 5 inches—yellowish brown, friable clay loam

Subsoil:
5 to 33 inches—yellowish brown, firm clay loam
33 to 40 inches—brown, firm clay loam

Substratum:
40 to 60 inches—brown, mottled, very firm, calcareous loam

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Atlas soils in landform positions similar to those of the Hickory soil or in the less sloping positions above the Hickory soil
• Gosport soils and the well drained Frondorf soils, which formed mainly in residuum derived from bedrock; in landform positions similar to those of the Hickory soil or on the lower parts of the slope below the Hickory soil
• The somewhat poorly drained Holton soils on flood plains

Similar soils:
• Soils that have calcareous till within a depth of 40 inches
• Soils that have less sand in the upper part of the subsoil
• Soils that have a surface layer of loam

Use and Management

Cropland

Suitability: Poorly suited
Management considerations:
• Contour farming, a system of conservation tillage that leaves crop residue on the surface after planting, and a crop rotation that is dominated by forage crops help to control erosion.
• Preparing a good seedbed is difficult because of surface crusting and cloddiness.
• Using a no-till method of seeding and seeding on the contour help in establishing seedlings and in controlling erosion.
• Tilling when the soil is wet causes surface cloddiness and compaction, reduces the rate of water infiltration, and causes excessive runoff and erosion.
• Returning crop residue to the soil, regularly adding other organic material, and minimizing tillage increase the rate of water infiltration and help to maintain tilth and the content of organic matter.

Pasture and hay

Suitability: Moderately suited
Management considerations:
• A cover of grasses and legumes helps to control erosion and improves tilth.
• Proper stocking rates, rotation grazing, deferred grazing when the soil is wet, and proper applications of lime and fertilizer help to keep the pasture in good condition.
• Preparing a good seedbed is difficult because of surface crusting and cloddiness.
• Using a no-till method of seeding or pasture renovation and seeding on the contour help in establishing forage species and in controlling erosion.
• Alfalfa, orchardgrass, tall fescue, red clover, and bromegrass are suited to this soil. Suitable warm-season grasses include big bluestem, indiangrass, and switchgrass.
• The plants should not be grazed or clipped until they are sufficiently established.

Dwellings

Suitability: Moderately suited
Management considerations:
• Onsite investigation is needed.
• Land shaping by cutting and filling helps to overcome the slope.
• Extending the footings below the subsoil or reinforcing the foundation helps to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Suitability: Moderately suited
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Interpretive Groups

Land capability classification: IVe

8F—Hickory loam, 18 to 35 percent slopes

Composition

Hickory and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Till plains
Landform position: Backslopes
Size of areas: 3 to 150 acres
Major uses: Pasture and hay, woodland

Soil Properties and Qualities

Drainage class: Well drained
Permeability: Moderate
Parent material: Glacial till
Runoff: Rapid
Available water capacity: High
Depth to the seasonal high water table: More than 6 feet
Organic matter content: Moderately low
Erosion hazard: Severe
Shrink-swell potential: Moderate

Potential for frost action: Moderate

Typical Profile

Surface layer:
0 to 2 inches—very dark grayish brown, friable loam

Subsurface layer:
2 to 9 inches—dark yellowish brown, friable loam

Subsoil:
9 to 16 inches—yellowish brown, friable clay loam
16 to 44 inches—yellowish brown, firm clay loam

Substratum:
44 to 60 inches—brown, very firm, calcareous clay loam

Inclusions

Contrasting inclusions:
- Frondorf soils and the moderately well drained Gosport soils, which formed mainly in residuum derived from bedrock; in landform positions similar to those of the Hickory soil or on the lower parts of the slope below the Hickory soil
- The somewhat poorly drained Atlas soils in the less sloping positions above the Hickory soil
- The moderately well drained Ava soils on gently sloping interfluves above the Hickory soil
- The somewhat poorly drained Holton soils on flood plains

Similar soils:
- Soils that have calcareous till within a depth of 40 inches
- Soils that have a seasonal high water table within a depth of 6 feet
- Soils that have slopes of less than 18 percent or more than 35 percent

Use and Management

Cropland

Suitability: Generally unsuited because of the slope

Pasture and hay

Suitability: Moderately suited
Management considerations:
- A cover of grasses and legumes helps to control erosion and maintains good tilth.
- Proper stocking rates, rotation grazing, deferred grazing when the soil is wet, and proper applications of lime and fertilizer help to keep the pasture in good condition.
- A no-till method of seeding or pasture renovation helps in establishing forage species and in controlling erosion.
- Alfalfa, orchardgrass, tall fescue, red clover, and bromegrass are suited to this soil. Suitable warm-season grasses include big bluestem, indiangrass, and switchgrass.
- The plants should not be grazed or clipped until they are sufficiently established.

Woodland

Suitability: Moderately suited
Management considerations:
- The slope increases the hazard of erosion and limits the use of equipment.
- The use of machinery is limited to periods when the soil is firm enough for adequate support.
- Placing logging roads and skid trails on or nearly on the contour, skidding logs or trees uphill with a cable and winch, using grass firebreaks, and seeding bare areas to grass or to a grass-legume mixture after logging has been completed help to control erosion.
- 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.
- Protection from fire minimizes injury to trees and maintains the leaf mulch.

Dwellings

Suitability: Generally unsuited because of the slope

Septic tank absorption fields

Suitability: Generally unsuited because of the slope

Interpretive Groups

Land capability classification: VIe
Woodland ordination symbol: 5R

8F3—Hickory clay loam, 18 to 35 percent slopes, severely eroded

Composition

Hickory and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Till plains
Landform position: Backslopes
Size of areas: 3 to 30 acres
Major use: Pasture and hay

Soil Properties and Qualities

Drainage class: Well drained
Permeability: Moderate
Parent material: Glacial till

Runoff: Rapid
Available water capacity: High
Depth to the seasonal high water table: More than 6 feet
Organic matter content: Low
Erosion hazard: Severe
Shrink-swell potential: Moderate
Potential for frost action: Moderate

Typical Profile

Surface layer:
0 to 2 inches—dark yellowish brown, firm clay loam

Subsoil:
2 to 38 inches—yellowish brown, firm clay loam
38 to 45 inches—brown, firm clay loam

Substratum:
45 to 60 inches—yellowish brown, firm, calcareous loam

Inclusions

Contrasting inclusions:
• Frondorf soils and the moderately well drained Gosport soils, which formed mainly in residuum derived from bedrock; in landform positions similar to those of the Hickory soil or on the lower parts of the slope below the Hickory soil
• The somewhat poorly drained Holton soils on flood plains

Similar soils:
• Soils that have calcareous till within a depth of 40 inches
• Soils that have a seasonal high water table within a depth of 6 feet
• Soils that have a surface layer of loam

Use and Management

Cropland

Suitability: Generally unsuited because of the slope

Pasture and hay

Suitability: Poorly suited
Management considerations:
• A cover of grasses and legumes helps to control erosion and improves tilth.
• Proper stocking rates, rotation grazing, deferred grazing when the soil is wet, and proper applications of lime and fertilizer help to keep the pasture in good condition.
• Preparing a good seedbed is difficult because of surface crusting and cloddiness.
• A no-till method of seeding or pasture renovation helps in establishing forage species and in controlling erosion.
• Alfalfa, orchardgrass, tall fescue, red clover, and bromegrass are suited to this soil. Suitable warm-season grasses include big bluestem, indiangrass, and switchgrass.
• The plants should not be grazed or clipped until they are sufficiently established.

Dwellings

Suitability: Generally unsuited because of the slope

Septic tank absorption fields

Suitability: Generally unsuited because of the slope

Interpretive Groups

Land capability classification: VIe

8G—Hickory loam, 35 to 60 percent slopes

Composition

Hickory and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Till plains
Landform position: Backslopes
Size of areas: 3 to 75 acres
Major use: Woodland

Soil Properties and Qualities

Drainage class: Well drained
Permeability: Moderate
Parent material: Glacial till
Runoff: Rapid
Available water capacity: High
Depth to the seasonal high water table: More than 6 feet
Organic matter content: Moderately low
Erosion hazard: Severe
Shrink-swell potential: Moderate
Potential for frost action: Moderate

Typical Profile

Surface layer:
0 to 2 inches—dark grayish brown, friable loam

Subsurface layer:
2 to 6 inches—brown, friable loam

Subsoil:
6 to 13 inches—brown, friable loam

13 to 40 inches—dark yellowish brown and yellowish brown, firm clay loam

Substratum:
40 to 60 inches—yellowish brown, firm, calcareous loam

Inclusions

Contrasting inclusions:
• Frondorf soils and the moderately well drained Gosport soils, which formed mainly in residuum derived from bedrock; in landform positions similar to those of the Hickory soil or on the lower parts of the slope below the Hickory soil
• The moderately well drained Ava soils on gently sloping interfluves above the Hickory soil
• The somewhat poorly drained Holton soils on flood plains

Similar soils:
• Soils that have calcareous till within a depth of 40 inches
• Soils that are on nearly vertical escarpments or that have slopes of less than 35 percent

Use and Management

Cropland

Suitability: Generally unsuited because of the slope

Woodland

Suitability: Poorly suited
Management considerations:
• The slope increases the hazard of erosion and limits the use of equipment.
• The use of machinery is limited to periods when the soil is firm enough for adequate support.
• Placing logging roads and skid trails on or nearly on the contour, skidding logs or trees uphill with a cable and winch, using grass firebreaks, and seeding bare areas to grass or to a grass-legume mixture after logging has been completed help to control erosion.
• 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.
• Protection from fire minimizes injury to trees and maintains the leaf mulch.

Dwellings

Suitability: Generally unsuited because of the slope

Septic tank absorption fields

Suitability: Generally unsuited because of the slope

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: 5R

12—Wynoose silt loam

Composition

Wynoose and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Till plains
Landform position: Interfluves
Slope range: 0 to 2 percent
Size of areas: 3 to more than 1,000 acres
Major uses: Cropland, pasture and hay, woodland

Soil Properties and Qualities

Drainage class: Poorly drained
Permeability: Very slow
Parent material: Loess and the underlying mix of loess and glacial till
Runoff: Slow
Available water capacity: Moderate
Depth to the seasonal high water table: Less than 1 foot
Organic matter content: Moderately low
Erosion hazard: Slight
Shrink-swell potential: High
Potential for frost action: High

Typical Profile

Surface layer:
0 to 6 inches—dark grayish brown, friable silt loam

Subsurface layer:
6 to 21 inches—light brownish gray, mottled, friable silt loam

Subsoil:
21 to 41 inches—light brownish gray, mottled, very firm silty clay
41 to 60 inches—light brownish gray, mottled, firm clay loam

Inclusions

Contrasting inclusions:
• Huey soils, which have a natric horizon; in landform positions similar to those of the Wynoose soil
• The somewhat poorly drained Bluford soils in the slightly higher positions
• Soils that are subject to ponding for brief periods; in depressions below the Wynoose soil

Similar soils:
- Soils that have a darker surface layer
- Soils that have less clay in the subsoil

Use and Management

Cropland

Suitability: Moderately suited
Management considerations:
- Measures that maintain the drainage system are needed. Surface ditches help to overcome the wetness.
- Tilling when the soil is wet causes surface cloddiness and compaction and reduces the rate of water infiltration.
- Returning crop residue to the soil, regularly adding other organic material, and minimizing tillage increase the rate of water infiltration and help to maintain tilth and the content of organic matter.
- Winter wheat and hay crops are subject to frost heave in some years.

Pasture and hay

Suitability: Well suited
Management considerations:
- A cover of grasses and legumes helps to maintain good tilth.
- The wetness limits the choice of plants and the period of grazing or cutting.
- Surface ditches help to overcome the wetness.
- Proper stocking rates, rotation grazing, deferred grazing when the soil is wet, and proper applications of lime and fertilizer help to keep the pasture in good condition.
- Alsike clover, reed canarygrass, ladino clover, tall fescue, red clover, and bromegrass are suited to this soil. Suitable warm-season grasses include big bluestem, indiangrass, and switchgrass.
- The plants should not be grazed or clipped until they are sufficiently established.

Woodland

Suitability: Poorly suited
Management considerations:
- The use of equipment is limited to periods when the soil is firm enough for adequate support.
- Planting mature stock and planting on ridges reduce the seedling mortality rate. Some replanting may be necessary.
- Using a harvesting method that does not leave the remaining trees isolated or widely spaced and removing only high-value trees from a strip 50 feet wide along the western and southern edges of the woodland reduce the windthrow hazard.
- 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.
- Protection from fire minimizes injury to trees and maintains the leaf mulch.

Dwellings

Suitability: Poorly suited
Management considerations:
- Onsite investigation is needed.
- Installing subsurface tile drains near the foundation can lower the water table.
- Extending the footings below the subsoil or reinforcing the foundation helps to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Suitability: Poorly suited
Management considerations:
- Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Interpretive Groups

Land capability classification: IIIw
Woodland ordination symbol: 4W

13A—Bluford silt loam, 0 to 2 percent slopes

Composition

Bluford and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Till plains
Landform position: Summits and interfluves
Size of areas: 3 to 595 acres
Major uses: Cropland, pasture and hay, woodland

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Permeability: Slow
Parent material: Loess and the underlying mix of loess and glacial till
Runoff: Slow
Available water capacity: High
Depth to the seasonal high water table: 0.5 foot to 2.0 feet
Organic matter content: Moderately low
Erosion hazard: Slight
Shrink-swell potential: High
Potential for frost action: High

Typical Profile

Surface layer:
0 to 7 inches—brown, friable silt loam

Subsurface layer:
7 to 12 inches—yellowish brown, mottled, friable silt loam

Subsoil:
12 to 38 inches—brown and grayish brown, mottled, firm and very firm silty clay loam and silty clay
38 to 45 inches—light brownish gray, mottled, firm and slightly brittle silty clay loam
45 to 60 inches—grayish brown and dark gray, mottled, firm clay loam

Inclusions

Contrasting inclusions:
• The moderately well drained Ava soils in the higher positions
• Darmstadt soils, which have a natric horizon; in landform positions similar to those of the Bluford soil
• The poorly drained Wynoose soils in the slightly lower positions

Similar soils:
• Soils that have a darker surface layer
• Soils that have less clay in the subsoil

Use and Management

Cropland

Suitability: Well suited
Management considerations:
• Surface ditches help to overcome the wetness.
• In areas where slopes are very long, erosion 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, reduces the rate of water infiltration, and causes excessive runoff and erosion.
• Returning crop residue to the soil, regularly adding other organic material, and minimizing tillage increase the rate of water infiltration and help to maintain tilth and the content of organic matter.

Pasture and hay

Suitability: Well suited
Management considerations:
• A cover of grasses and legumes helps to maintain good tilth.
• The wetness limits the choice of plants and the period of grazing or cutting.
• Surface ditches help to overcome the wetness.
• Proper stocking rates, rotation grazing, deferred grazing when the soil is wet, and proper applications of lime and fertilizer help to keep the pasture in good condition.
• Alsike clover, reed canarygrass, ladino clover, tall fescue, red clover, and bromegrass are suited to this soil. Suitable warm-season grasses include big bluestem, indiangrass, and switchgrass.
• The plants should not be grazed or clipped until they are sufficiently established.

Woodland

Suitability: Moderately suited
Management considerations:
• The use of equipment is limited to periods when the soil is firm enough for adequate support.
• Using a harvesting method that does not leave the remaining trees isolated or widely spaced and removing only high-value trees from a strip 50 feet wide along the western and southern edges of the woodland reduce the windthrow hazard.
• 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.
• Protection from fire minimizes injury to trees and maintains the leaf mulch.

Dwellings

Suitability: Poorly suited
Management considerations:
• Onsite investigation is needed.
• Installing subsurface tile drains near the foundation can lower the water table.
• Extending the footings below the subsoil or reinforcing the foundation helps to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Suitability: Poorly suited
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: 4A

13B—Bluford silt loam, 2 to 5 percent slopes

Composition

Bluford and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Till plains and knolls
Landform position: Summits, interfluves, and backslopes
Size of areas: 3 to 95 acres
Major uses: Cropland, pasture and hay, woodland

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Permeability: Slow
Parent material: Loess and the underlying mix of loess and glacial till
Runoff: Medium
Available water capacity: High
Depth to the seasonal high water table: 0.5 foot to 2.0 feet
Organic matter content: Moderately low
Erosion hazard: Moderate
Shrink-swell potential: High
Potential for frost action: High

Typical Profile

Surface layer:
0 to 8 inches—dark grayish brown, friable silt loam

Subsurface layer:
8 to 14 inches—light brownish gray, mottled, friable silt loam

Subsoil:
14 to 19 inches—brown, mottled, friable silty clay loam
19 to 44 inches—light brownish gray, mottled, very firm silty clay and firm silty clay loam
44 to 60 inches—light brownish gray, mottled, very firm and slightly brittle silty clay loam

Inclusions

Contrasting inclusions:
• Darmstadt soils, which have a natric horizon; in landform positions similar to those of the Bluford soil
• The moderately well drained Ava soils in landform positions similar to or slightly higher than those of the Bluford soil

Similar soils:
• Soils that are eroded and have a thinner surface layer
• Soils that have less clay in the subsoil

Use and Management

Cropland

Suitability: Well suited
Management considerations:
• Surface ditches help to overcome the wetness.
• A system of conservation tillage that leaves crop residue on the surface after planting, terraces, and contour farming help to control erosion.
• Tilling when the soil is wet causes surface cloddiness and compaction, reduces the rate of water infiltration, and causes excessive runoff and erosion.
• Returning crop residue to the soil, regularly adding other organic material, and minimizing tillage increase the rate of water infiltration and help to maintain tilth and the content of organic matter.

Pasture and hay

Suitability: Well suited
Management considerations:
• A cover of grasses and legumes helps to control erosion and maintains good tilth.
• Surface ditches help to overcome the wetness.
• Proper stocking rates, rotation grazing, deferred grazing when the soil is wet, and proper applications of lime and fertilizer help to keep the pasture in good condition.
• Alsike clover, reed canarygrass, ladino clover, tall fescue, red clover, and bromegrass are suited to this soil. Suitable warm-season grasses include big bluestem, indiangrass, and switchgrass.
• The plants should not be grazed or clipped until they are sufficiently established.

Woodland

Suitability: Moderately suited
Management considerations:
• The use of equipment is limited to periods when the soil is firm enough for adequate support.
• Using a harvesting method that does not leave the remaining trees isolated or widely spaced and removing only high-value trees from a strip 50 feet wide along the western and southern edges of the woodland reduce the windthrow hazard.
• 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.
• Protection from fire minimizes injury to trees and maintains the leaf mulch.

Dwellings

Suitability: Poorly suited
Management considerations:
• Onsite investigation is needed.
• Installing either tile drains near the foundation or interceptor drains higher on the slopes than the building can lower the water table and intercept seepage water.
• Extending the footings below the subsoil or

reinforcing the foundation helps to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Suitability: Poorly suited
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Interpretive Groups

Land capability classification: IIe
Woodland ordination symbol: 4A

13B2—Bluford silt loam, 2 to 5 percent slopes, eroded

Composition

Bluford and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Till plains and knolls
Landform position: Backslopes
Size of areas: 3 to 240 acres
Major uses: Cropland, pasture and hay, woodland

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Permeability: Slow
Parent material: Loess and the underlying mix of loess and glacial till
Runoff: Medium
Available water capacity: High
Depth to the seasonal high water table: 0.5 foot to 2.0 feet
Organic matter content: Moderately low
Erosion hazard: Moderate
Shrink-swell potential: High
Potential for frost action: High

Typical Profile

Surface layer:
0 to 6 inches—brown, friable silt loam

Subsoil:
6 to 14 inches—brown, mottled, firm silty clay loam
14 to 40 inches—grayish brown, mottled, very firm and firm silty clay loam
40 to 60 inches—grayish brown, mottled, very firm and slightly brittle silty clay loam and clay loam

Inclusions

Contrasting inclusions:
• Darmstadt soils, which have a natric horizon; in landform positions similar to those of the Bluford soil
• Atlas soils, which formed mainly in glacial till; in the more sloping positions

Similar soils:
• Soils that are not eroded, have a thicker surface layer, and have a subsurface layer
• Soils that have less clay in the subsoil
• Soils that have more sand in the upper part of the subsoil

Use and Management

Cropland

Suitability: Well suited
Management considerations:
• Surface ditches help to overcome the wetness.
• A system of conservation tillage that leaves crop residue on the surface after planting, terraces, and contour farming help to control erosion.
• Tilling when the soil is wet causes surface cloddiness and compaction, reduces the rate of water infiltration, and causes excessive runoff and erosion.
• Returning crop residue to the soil, regularly adding other organic material, and minimizing tillage increase the rate of water infiltration and help to maintain tilth and the content of organic matter.

Pasture and hay

Suitability: Well suited
Management considerations:
• A cover of grasses and legumes helps to control erosion and maintains good tilth.
• Surface ditches help to overcome the wetness.
• Proper stocking rates, rotation grazing, deferred grazing when the soil is wet, and proper applications of lime and fertilizer help to keep the pasture in good condition.
• Alsike clover, reed canarygrass, ladino clover, tall fescue, red clover, and bromegrass are suited to this soil. Suitable warm-season grasses include big bluestem, indiangrass, and switchgrass.
• The plants should not be grazed or clipped until they are sufficiently established.

Woodland

Suitability: Moderately suited
Management considerations:
• The use of equipment is limited to periods when the soil is firm enough for adequate support.
• Using a harvesting method that does not leave the

remaining trees isolated or widely spaced and removing only high-value trees from a strip 50 feet wide along the western and southern edges of the woodland reduce the windthrow hazard.
• 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.
• Protection from fire minimizes injury to trees and maintains the leaf mulch.

Dwellings

Suitability: Poorly suited
Management considerations:
• Onsite investigation is needed.
• Installing either tile drains near the foundation or interceptor drains higher on the slopes than the building can lower the water table and intercept seepage water.
• Extending the footings below the subsoil or reinforcing the foundation helps to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Suitability: Poorly suited
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Interpretive Groups

Land capability classification: IIe
Woodland ordination symbol: 4A

14B—Ava silt loam, 2 to 5 percent slopes

Composition

Ava and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Till plains and knolls
Landform position: Interfluves and summits
Size of areas: 3 to 160 acres
Major uses: Cropland, pasture and hay, woodland

Soil Properties and Qualities

Drainage class: Moderately well drained
Permeability: Moderate in the upper part; very slow in the lower part
Parent material: Loess and the underlying mix of loess and glacial till
Runoff: Medium
Available water capacity: High
Depth to the seasonal high water table: 1.5 to 3.5 feet
Organic matter content: Moderately low
Erosion hazard: Moderate
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 7 inches—brown, friable silt loam

Subsurface layer:
7 to 11 inches—yellowish brown, friable silt loam

Subsoil:
11 to 27 inches—yellowish brown, friable and firm silty clay loam
27 to 36 inches—yellowish brown, mottled, very firm silty clay loam
36 to 60 inches—brown, mottled, very firm and brittle silty clay loam and loam

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Bluford soils in landform positions similar to or slightly lower than those of the Ava soil

Similar soils:
• Soils that are eroded and have a thinner surface layer
• Soils that have a darker surface layer
• Soils that have slopes of less than 2 percent

Use and Management

Cropland

Suitability: Well suited
Management considerations:
• A system of conservation tillage that leaves crop residue on the surface after planting, terraces, and contour farming help to control erosion.
• Tilling when the soil is wet causes surface cloddiness and compaction, reduces the rate of water infiltration, and causes excessive runoff and erosion.
• Returning crop residue to the soil, regularly adding other organic material, and minimizing tillage increase the rate of water infiltration and help to maintain tilth and the content of organic matter.

Pasture and hay

Suitability: Well suited
Management considerations:
• A cover of grasses and legumes helps to control erosion and maintains good tilth.
• Proper stocking rates, rotation grazing, deferred

grazing when the soil is wet, and proper applications of lime and fertilizer help to keep the pasture in good condition.
• Alfalfa, orchardgrass, tall fescue, red clover, and bromegrass are suited to this soil. Suitable warm-season grasses include big bluestem, indiangrass, and switchgrass.
• The plants should not be grazed or clipped until they are sufficiently established.

Woodland

Suitability: Well suited
Management considerations:
• 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.
• Protection from fire minimizes injury to trees and maintains the leaf mulch.

Dwellings

Suitability: Moderately suited
Management considerations:
• Onsite investigation is needed.
• Installing either tile drains near the foundation or interceptor drains higher on the slopes than the building can lower the water table and intercept seepage water.
• Extending the footings below the subsoil or reinforcing the foundation helps to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Suitability: Poorly suited
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Interpretive Groups

Land capability classification: IIe
Woodland ordination symbol: 4A

14C2—Ava silt loam, 5 to 10 percent slopes, eroded

Composition

Ava and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Till plains and knolls
Landform position: Backslopes
Size of areas: 3 to 75 acres
Major uses: Cropland, pasture and hay, woodland

Soil Properties and Qualities

Drainage class: Moderately well drained
Permeability: Moderate in the upper part; very slow in the lower part
Parent material: Loess and the underlying mix of loess and glacial till
Runoff: Medium
Available water capacity: High
Depth to the seasonal high water table: 1.5 to 3.5 feet
Organic matter content: Moderately low
Erosion hazard: Severe
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 5 inches—dark grayish brown, friable silt loam

Subsoil:
5 to 19 inches—yellowish brown, friable silt loam and firm silty clay loam
19 to 30 inches—brown, mottled, firm silty clay loam
30 to 52 inches—pale brown, mottled, very firm and brittle loam
52 to 60 inches—pale brown, mottled, firm loam

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Bluford soils in the less sloping positions
• Hickory soils, which formed in glacial till; in the more sloping positions

Similar soils:
• Soils that are not eroded, have a thicker surface layer, and have a subsurface layer
• Soils that have a darker surface layer
• Soils that are severely eroded and have a surface layer of silty clay loam

Use and Management

Cropland

Suitability: Moderately suited
Management considerations:
• A system of conservation tillage that leaves crop residue on the surface after planting, terraces, contour farming, and a crop rotation that includes 1 or more years of forage crops help to control erosion.
• Tilling when the soil is wet causes surface cloddiness and compaction, reduces the rate of water infiltration, and causes excessive runoff and erosion.
• Returning crop residue to the soil, regularly adding

other organic material, and minimizing tillage increase the rate of water infiltration and help to maintain tilth and the content of organic matter.

Pasture and hay

Suitability: Well suited
Management considerations:
• A cover of grasses and legumes helps to control erosion and maintains good tilth.
• Proper stocking rates, rotation grazing, deferred grazing when the soil is wet, and proper applications of lime and fertilizer help to keep the pasture in good condition.
• Alfalfa, orchardgrass, tall fescue, red clover, and bromegrass are suited to this soil. Suitable warm-season grasses include big bluestem, indiangrass, and switchgrass.
• The plants should not be grazed or clipped until they are sufficiently established.

Woodland

Suitability: Well suited
Management considerations:
• 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.
• Protection from fire minimizes injury to trees and maintains the leaf mulch.

Dwellings

Suitability: Moderately suited
Management considerations:
• Onsite investigation is needed.
• Installing either tile drains near the foundation or interceptor drains higher on the slopes than the building can lower the water table and intercept seepage water.
• Extending the footings below the subsoil or reinforcing the foundation helps to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Suitability: Poorly suited
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Interpretive Groups

Land capability classification: IIIe
Woodland ordination symbol: 4A

14C3—Ava silty clay loam, 5 to 10 percent slopes, severely eroded

Composition

Ava and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Till plains and knolls
Landform position: Backslopes
Size of areas: 3 to 45 acres
Major uses: Cropland; pasture and hay

Soil Properties and Qualities

Drainage class: Moderately well drained
Permeability: Moderate in the upper part; very slow in the lower part
Parent material: Loess and the underlying mix of loess and glacial till
Runoff: Rapid
Available water capacity: High
Depth to the seasonal high water table: 1.5 to 3.5 feet
Organic matter content: Low
Erosion hazard: Severe
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 7 inches—mixed brown and yellowish brown, firm silty clay loam

Subsoil:
7 to 24 inches—yellowish brown, firm silty clay loam
24 to 34 inches—brown, mottled, very firm silty clay loam
34 to 60 inches—brown, mottled, very firm and brittle clay loam

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Atlas soils, which formed mainly in glacial till; in landform positions similar to those of the Ava soil
• Hickory soils, which formed in glacial till; in the more sloping positions

Similar soils:
• Soils that have more sand in the upper part of the subsoil

• Soils that have a surface layer of silt loam

Use and Management

Cropland

Suitability: Poorly suited
Management considerations:
• A system of conservation tillage that leaves crop residue on the surface after planting, terraces, contour farming, and a crop rotation that is dominated by forage crops help to control erosion.
• Preparing a good seedbed is difficult because of surface crusting and cloddiness.
• Using a no-till method of seeding and seeding on the contour help in establishing seedlings and in controlling erosion.
• Tilling when the soil is wet causes surface cloddiness and compaction, reduces the rate of water infiltration, and causes excessive runoff and erosion.
• Returning crop residue to the soil, regularly adding other organic material, and minimizing tillage increase the rate of water infiltration and help to maintain tilth and the content of organic matter.

Pasture and hay

Suitability: Moderately suited
Management considerations:
• A cover of grasses and legumes helps to control erosion and improves tilth.
• Proper stocking rates, rotation grazing, deferred grazing when the soil is wet, and proper applications of lime and fertilizer help to keep the pasture in good condition.
• Preparing a good seedbed is difficult because of surface crusting and cloddiness.
• Using a no-till method of seeding or pasture renovation and seeding on the contour help in establishing forage species and in controlling erosion.
• Alfalfa, orchardgrass, tall fescue, red clover, and bromegrass are suited to this soil. Suitable warm-season grasses include big bluestem, indiangrass, and switchgrass.
• The plants should not be grazed or clipped until they are sufficiently established.

Dwellings

Suitability: Moderately suited
Management considerations:
• Onsite investigation is needed.
• Installing either tile drains near the foundation or interceptor drains higher on the slopes than the building can lower the water table and intercept seepage water.
• Extending the footings below the subsoil or reinforcing the foundation helps to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Suitability: Poorly suited
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Interpretive Groups

Land capability classification: IVe

138—Shiloh silty clay loam

Composition

Shiloh and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Depressions on till plains
Landform position: Toeslopes
Slope range: 0 to 2 percent
Size of areas: 3 to 35 acres
Major use: Cropland

Soil Properties and Qualities

Drainage class: Poorly drained
Permeability: Moderately slow
Parent material: Loess
Runoff: Very slow
Available water capacity: High
Seasonal high water table: 1 foot above to 1 foot below the surface
Ponding duration: Brief
Organic matter content: High
Erosion hazard: Slight
Shrink-swell potential: High
Potential for frost action: High

Typical Profile

Surface layer:
0 to 9 inches—very dark gray, mottled, firm silty clay loam

Subsurface layer:
9 to 16 inches—very dark gray, mottled, very firm silty clay

Subsoil:
16 to 46 inches—very dark gray, mottled, very firm silty clay
46 to 60 inches—gray, mottled, very firm silty clay

Inclusions

Contrasting inclusions:
• Cisne soils, which are not subject to ponding; in the slightly higher positions
• Huey soils, which have a natric horizon; in the slightly higher positions

Similar soils:
• Soils that have a thinner surface layer and subsurface layer
• Soils that have a lighter colored surface layer and subsurface layer
• Soils that have less clay in the subsoil

Use and Management

Cropland

Suitability: Well suited
Management considerations:
• Measures that maintain the drainage system are needed. Surface ditches help to overcome the wetness.
• Land grading helps to control ponding.
• Tilling when the soil is wet causes surface cloddiness and compaction and reduces the rate of water infiltration.
• Returning crop residue to the soil, regularly adding other organic material, and minimizing tillage increase the rate of water infiltration and help to maintain tilth and the content of organic matter.
• Winter wheat is subject to frost heave in some years.

Dwellings

Suitability: Generally unsuited because of ponding

Septic tank absorption fields

Suitability: Generally unsuited because of ponding

Interpretive Groups

Land capability classification: IIw

337B—Creal silt loam, 2 to 5 percent slopes

Composition

Creal and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Till plains
Landform position: Footslopes
Size of areas: 3 to 50 acres
Major uses: Cropland, pasture and hay, woodland

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Permeability: Moderately slow
Parent material: Mix of loess and local alluvium
Runoff: Medium
Available water capacity: High
Depth to the seasonal high water table: 0.5 foot to 2.0 feet
Organic matter content: Moderately low
Erosion hazard: Moderate
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 6 inches—dark grayish brown, friable silt loam

Subsurface layer:
6 to 25 inches—brown and pale brown, mottled, friable silt loam

Subsoil:
25 to 45 inches—light brownish gray, mottled, firm silty clay loam
45 to 60 inches—grayish brown, mottled, very firm and firm clay loam

Inclusions

Contrasting inclusions:
• The poorly drained Racoon soils on treads of stream terraces below the Creal soil
• The moderately well drained Ava soils in the slightly higher positions

Similar soils:
• Soils that have more clay in the subsoil
• Soils that have a thinner subsurface layer
• Soils that have slopes of less than 2 percent

Use and Management

Cropland

Suitability: Well suited
Management considerations:
• Surface ditches help to overcome the wetness.
• A system of conservation tillage that leaves crop residue on the surface after planting, terraces, and contour farming help to control erosion.
• Tilling when the soil is wet causes surface cloddiness and compaction, reduces the rate of water infiltration, and causes excessive runoff and erosion.
• Returning crop residue to the soil, regularly adding other organic material, and minimizing tillage increase the rate of water infiltration and help to maintain tilth and the content of organic matter.

Pasture and hay

Suitability: Well suited
Management considerations:
• A cover of grasses and legumes helps to control erosion and maintains good tilth.
• Surface ditches help to overcome the wetness.
• Proper stocking rates, rotation grazing, deferred grazing when the soil is wet, and proper applications of lime and fertilizer help to keep the pasture in good condition.
• Alsike clover, reed canarygrass, ladino clover, tall fescue, red clover, and bromegrass are suited to this soil. Suitable warm-season grasses include big bluestem, indiangrass, and switchgrass.
• The plants should not be grazed or clipped until they are sufficiently established.

Woodland

Suitability: Moderately suited
Management considerations:
• The use of equipment is limited to periods when the soil is firm enough for adequate support.
• Using a harvesting method that does not leave the remaining trees isolated or widely spaced and removing only high-value trees from a strip 50 feet wide along the western and southern edges of the woodland reduce the windthrow hazard.
• 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.
• Protection from fire minimizes injury to trees and maintains the leaf mulch.

Dwellings

Suitability: Poorly suited
Management considerations:
• Onsite investigation is needed.
• Installing subsurface tile drains near the foundation can lower the water table.

Septic tank absorption fields

Suitability: Poorly suited
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Interpretive Groups

Land capability classification: IIe
Woodland ordination symbol: 4A

434C2—Ridgway silt loam, 5 to 10 percent slopes, eroded

Composition

Ridgway and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Stream terraces
Landform position: Backslopes
Size of areas: 5 to 18 acres
Major uses: Cropland; pasture and hay

Soil Properties and Qualities

Drainage class: Well drained
Permeability: Moderate
Parent material: Loess and the underlying glacial outwash
Runoff: Medium
Available water capacity: High
Depth to the seasonal high water table: More than 6 feet
Organic matter content: Moderately low
Erosion hazard: Severe
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 5 inches—brown, friable silt loam

Subsoil:
5 to 10 inches—yellowish brown, friable silty clay loam
10 to 33 inches—yellowish brown, firm silty clay loam
33 to 60 inches—brown, firm clay loam

Inclusions

Contrasting inclusions:
• Soils that have a fragipan in the lower part of the subsoil; in landform positions similar to those of the Ridgway soil

Similar soils:
• Soils that have less sand in the lower part of the subsoil
• Soils that are not eroded, have a thicker surface layer, and have a subsurface layer
• Soils that have slopes of less than 5 percent
• Soils that have more sand in the surface layer and subsoil
• Soils that have a seasonal high water table within a depth of 6 feet

Use and Management

Cropland

Suitability: Moderately suited
Management considerations:
• A system of conservation tillage that leaves crop residue on the surface after planting, terraces, contour farming, and a crop rotation that includes 1 or more years of forage crops help to control erosion.
• Tilling when the soil is wet causes surface cloddiness and compaction, reduces the rate of water infiltration, and causes excessive runoff and erosion.
• Returning crop residue to the soil, regularly adding other organic material, and minimizing tillage increase the rate of water infiltration and help to maintain tilth and the content of organic matter.

Pasture and hay

Suitability: Well suited
Management considerations:
• A cover of grasses and legumes helps to control erosion and maintains good tilth.
• Proper stocking rates, rotation grazing, deferred grazing when the soil is wet, and proper applications of lime and fertilizer help to keep the pasture in good condition.
• Alfalfa, orchardgrass, tall fescue, red clover, and bromegrass are suited to this soil. Suitable warm-season grasses include big bluestem, indiangrass, and switchgrass.
• The plants should not be grazed or clipped until they are sufficiently established.

Dwellings

Suitability: Moderately suited
Management considerations:
• Onsite investigation is needed.
• Extending the footings below the subsoil or reinforcing the foundation helps to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Suitability: Moderately suited
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Interpretive Groups

Land capability classification: IIIe

786D2—Frondorf silt loam, 10 to 18 percent slopes, eroded

Composition

Frondorf and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Landform position: Backslopes
Size of areas: 3 to 40 acres
Major uses: Cropland, pasture and hay, woodland

Soil Properties and Qualities

Drainage class: Well drained
Permeability: Moderate
Parent material: Loess and the underlying residuum derived from sandstone and siltstone
Runoff: Rapid
Available water capacity: Low
Depth to the seasonal high water table: More than 6 feet
Depth to bedrock: 20 to 40 inches
Organic matter content: Moderately low
Erosion hazard: Severe
Shrink-swell potential: Low
Potential for frost action: Moderate

Typical Profile

Surface layer:
0 to 7 inches—brown, friable silt loam

Subsoil:
7 to 11 inches—yellowish brown, friable silty clay loam
11 to 29 inches—light yellowish brown and yellowish brown, firm silty clay loam
29 to 35 inches—yellowish brown, firm channery silty clay loam

Substratum:
35 to 60 inches—weathered sandstone and siltstone

Inclusions

Contrasting inclusions:
• The moderately well drained and well drained Hickory soils, which formed in glacial till; in landform positions similar to those of the Frondorf soil or in the more sloping positions
• The somewhat poorly drained Holton soils on flood plains

Similar soils:
• Soils that have more sand in the surface layer
• Soils that have bedrock within a depth of 20 inches

- Soils that have less clay in the subsoil
- Soils that formed mainly in residuum derived from shale

Use and Management

Cropland

Suitability: Poorly suited
Management considerations:
- Contour farming, a system of conservation tillage that leaves crop residue on the surface after planting, and a crop rotation that is dominated by forage crops help to control erosion.
- Tilling when the soil is wet causes surface cloddiness and compaction, reduces the rate of water infiltration, and causes excessive runoff and erosion.
- Returning crop residue to the soil, regularly adding other organic material, and minimizing tillage increase the rate of water infiltration and help to maintain tilth and the content of organic matter.

Pasture and hay

Suitability: Moderately suited
Management considerations:
- A cover of grasses and legumes helps to control erosion and maintains good tilth.
- Proper stocking rates, rotation grazing, deferred grazing when the soil is wet, and proper applications of lime and fertilizer help to keep the pasture in good condition.
- Using a no-till method of seeding or pasture renovation and seeding on the contour help in establishing forage species and in controlling erosion.
- Alfalfa, orchardgrass, tall fescue, red clover, and bromegrass are suited to this soil. Suitable warm-season grasses include big bluestem, indiangrass, and switchgrass.
- The plants should not be grazed or clipped until they are sufficiently established.

Woodland

Suitability: Well suited
Management considerations:
- 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.
- Protection from fire minimizes injury to trees and maintains the leaf mulch.

Dwellings

Suitability: Moderately suited
Management considerations:
- Onsite investigation is needed.
- Land shaping by cutting and filling helps to overcome the slope.

Septic tank absorption fields

Suitability: Generally unsuited because of the depth to bedrock

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: 8A

786F—Frondorf silt loam, 18 to 35 percent slopes

Composition

Frondorf and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Landform position: Backslopes
Size of areas: 4 to 125 acres
Major uses: Pasture and hay, woodland

Soil Properties and Qualities

Drainage class: Well drained
Permeability: Moderate
Parent material: Loess and the underlying residuum derived from sandstone and siltstone
Runoff: Rapid
Available water capacity: Low
Depth to the seasonal high water table: More than 6 feet
Depth to bedrock: 20 to 40 inches
Organic matter content: Moderately low
Erosion hazard: Severe
Shrink-swell potential: Low
Potential for frost action: Moderate

Typical Profile

Surface layer:
0 to 2 inches—very dark grayish brown, friable silt loam

Subsurface layer:
2 to 8 inches—brown, friable silt loam

Subsoil:
8 to 24 inches—yellowish brown, friable loam
24 to 30 inches—yellowish brown, friable channery loam

Substratum:
30 to 60 inches—weathered sandstone and siltstone

Inclusions

Contrasting inclusions:
- Hickory soils, which formed in glacial till; in landform positions similar to those of the Frondorf soil
- The moderately well drained Ava soils on gently sloping interfluves above the Frondorf soil
- The somewhat poorly drained Holton soils on flood plains

Similar soils:
- Soils that have more sand in the surface layer
- Soils that have bedrock within a depth of 20 inches
- Soils that have less clay in the subsoil
- Soils that formed mainly in residuum derived from shale

Use and Management

Cropland

Suitability: Generally unsuited because of the slope

Pasture and hay

Suitability: Moderately suited
Management considerations:
- A cover of grasses and legumes helps to control erosion and maintains good tilth.
- Proper stocking rates, rotation grazing, deferred grazing when the soil is wet, and proper applications of lime and fertilizer help to keep the pasture in good condition.
- A no-till method of seeding or pasture renovation helps in establishing forage species and in controlling erosion.
- Alfalfa, orchardgrass, tall fescue, red clover, and bromegrass are suited to this soil. Suitable warm-season grasses include big bluestem, indiangrass, and switchgrass.
- The plants should not be grazed or clipped until they are sufficiently established.

Woodland

Suitability: Moderately suited
Management considerations:
- The slope increases the hazard of erosion and limits the use of equipment.
- The use of machinery is limited to periods when the soil is firm enough for adequate support.
- Placing logging roads and skid trails on or nearly on the contour, skidding logs or trees uphill with a cable and winch, using grass firebreaks, and seeding bare areas to grass or to a grass-legume mixture after logging has been completed help to control erosion.
- 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.
- Protection from fire minimizes injury to trees and maintains the leaf mulch.

Dwellings

Suitability: Generally unsuited because of the slope

Septic tank absorption fields

Suitability: Generally unsuited because of the slope and the depth to bedrock

Interpretive Groups

Land capability classification: VIe
Woodland ordination symbol: 8R

801B—Orthents, silty, undulating

Composition

Orthents and similar soils: 85 to 95 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Landform position: Summits and backslopes
Slope range: 1 to 7 percent
Size of areas: 3 to 65 acres
Major uses: Industrial or residential development, fill areas, idle land

Soil Properties and Qualities

Drainage class: Somewhat poorly drained and moderately well drained
Permeability: Variable, depending largely on the degree of compaction by construction equipment
Parent material: Soil material modified by cutting, filling, and leveling
Runoff: Medium
Available water capacity: Variable, but generally moderate
Depth to the seasonal high water table: 1 to 4 feet
Organic matter content: Low
Erosion hazard: Moderate
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 10 inches—mixed yellowish brown and light brownish gray, firm silty clay loam

Substratum:
10 to 40 inches—mixed dark yellowish brown and light brownish gray, very firm, stratified silty clay loam and silt loam
40 to 60 inches—mixed dark brown and light brownish gray, very firm clay loam

Inclusions

Contrasting inclusions:
• Areas used as sanitary landfills
• Areas covered by concrete, asphalt, gravel, and buildings
• Soils that have not been altered by cutting, filling, and leveling; in landform positions similar to those of the Orthents

Similar soils:
• Soils that have more sand and gravel in the substratum
• Soils that have a seasonal high water table below a depth of 4 feet

Use and Management

Dwellings

Suitability: Variable
Management considerations:
• Onsite investigation is needed to determine limitations or hazards.

Septic tank absorption fields

Suitability: Variable
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Interpretive Groups

Land capability classification: None assigned

810—Oil-waste land, brine damaged

Composition

Oil-waste land and similar areas: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Till plains and flood plains
Flooding frequency: Frequent in areas that are subject to flooding
Flooding duration: Brief in areas that are subject to flooding
Size of areas: 3 to 8 acres
Major uses: Brine storage, oil production, idle land

Soil Properties and Qualities

Permeability: Variable because of the wide range of properties of the soil material and degree of disturbance
Available water capacity: Variable
Erosion hazard: Severe

Inclusions

Contrasting inclusions:
• Border areas that support a minimal amount of vegetation
• Soils that have not been damaged by oil brine; in landform positions similar to those of the major areas

Similar areas:
• Areas damaged by oil residue

Use and Management

Reclamation

Suitability: Variable
Management considerations:
• When a vegetative cover is established, plant species that are tolerant of high concentrations of salt or sodium should be selected. Tall wheatgrass (Jose), switchgrass, tall fescue, and barley are some of the grasses commonly used. Onsite investigation and soil tests are necessary for the selection of seed mixtures and to identify site preparation needs.

Interpretive Groups

Land capability classification: None assigned

871E—Lenzburg clay loam, 15 to 25 percent slopes, stony

Composition

Lenzburg and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Till plains
Landform position: Backslopes and summits
Size of areas: 16 to 285 acres
Major uses: Pasture and hay, woodland

Soil Properties and Qualities

Drainage class: Well drained
Permeability: Moderately slow
Parent material: Mix of glacial till and residuum derived from shale and limestone; from surface mining activities

Runoff: Rapid
Available water capacity: Low
Depth to the seasonal high water table: More than 6 feet
Organic matter content: Low
Erosion hazard: Severe
Shrink-swell potential: Moderate
Potential for frost action: Moderate

Typical Profile

Surface layer:
0 to 4 inches—mixed light gray and grayish brown, firm clay loam

Substratum:
4 to 60 inches—mixed light gray, very dark gray, and yellowish brown, firm channery clay loam

Inclusions

Contrasting inclusions:
• Hickory soils, which formed in glacial till; on backslopes not affected by mining
• Water in deeply excavated areas

Similar soils:
• Soils that have more rock fragments in the substratum
• Soils that have slopes of less than 15 percent

Use and Management

Cropland

Suitability: Generally unsuited because of the slope

Pasture and hay

Suitability: Moderately unsuited
Management considerations:
• A cover of grasses and legumes helps to control erosion and maintains good tilth (fig. 5).
• Proper stocking rates, rotation grazing, deferred grazing when the soil is wet, and proper applications of lime and fertilizer help to keep the pasture in good condition.
• Seedbed preparation is difficult because of the stoniness.
• A no-till method of seeding or pasture renovation helps in establishing forage species and in controlling erosion.
• Alfalfa, orchardgrass, tall fescue, red clover, and bromegrass are suited to this soil. Suitable warm-season grasses include big bluestem, indiangrass, and switchgrass.
• The plants should not be grazed or clipped until they are sufficiently established.

Woodland

Suitability: Moderately suited
Management considerations:
• The slope increases the hazard of erosion and limits the use of equipment.
• The use of machinery is limited to periods when the soil is firm enough for adequate support.
• Placing logging roads and skid trails on or nearly on the contour, skidding logs or trees uphill with a cable and winch, using grass firebreaks, and seeding bare areas to grass or to a grass-legume mixture after logging has been completed help to control erosion.
• 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.
• Protection from fire minimizes injury to trees and maintains the leaf mulch.

Dwellings

Suitability: Poorly suited
Management considerations:
• Onsite investigation is needed.
• Land shaping by cutting and filling helps to overcome the slope.

Septic tank absorption fields

Suitability: Poorly suited
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: 5R

889B2—Darmstadt-Bluford complex, 2 to 5 percent slopes, eroded

Composition

Darmstadt and similar soils: 70 to 80 percent
Bluford and similar soils: 15 to 20 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Till plains
Landform position: Backslopes
Size of areas: 3 to 110 acres
Major use: Cropland

Figure 5.—A grassed area of Lenzburg clay loam, 15 to 25 percent slopes, stony.

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Permeability: Darmstadt—very slow; Bluford—slow
Parent material: Loess and the underlying mix of loess and glacial till
Runoff: Medium
Available water capacity: Darmstadt—moderate; Bluford—high
Depth to the seasonal high water table: 0.5 foot to 2.0 feet
Organic matter content: Moderately low
Erosion hazard: Darmstadt—severe; Bluford—moderate
Shrink-swell potential: Darmstadt—moderate; Bluford—high
Potential for frost action: High

Typical Profile

Darmstadt

Surface layer:
0 to 5 inches—brown, friable silt loam

Subsurface layer:
5 to 8 inches—light brownish gray, mottled, friable silt loam

Subsoil:
8 to 12 inches—brown, mottled, very firm silty clay loam
12 to 37 inches—light brownish gray, mottled, firm and very firm silty clay loam

37 to 60 inches—light brownish gray and gray, mottled, very firm clay loam

Bluford

Surface layer:
0 to 7 inches—brown, friable silt loam

Subsoil:
7 to 15 inches—pale brown, mottled, firm silty clay loam
15 to 33 inches—light brownish gray, mottled, firm and very firm silty clay loam
33 to 53 inches—grayish brown, mottled, very firm silty clay loam

Substratum:
53 to 60 inches—grayish brown, mottled, very firm clay loam

Inclusions

Contrasting inclusions:
• Soils that formed in alluvium; on narrow flood plains

Similar soils:
• Soils that have 10 to 15 percent saturation with exchangeable sodium in the subsoil
• Soils that have a thicker and darker surface layer
• Soils that have more sand in the upper part of the subsoil
• Soils that are severely eroded and have a surface layer of silty clay loam

Use and Management

Cropland

Suitability: Darmstadt—moderately suited; Bluford—well suited
Management considerations:
• Contour farming, a system of conservation tillage that leaves crop residue on the surface after planting, and a crop rotation that includes 1 or more years of forage crops help to control erosion.
• Tilling when the soil is wet causes surface cloddiness and compaction, reduces the rate of water infiltration, and causes excessive runoff and erosion.
• The high content of exchangeable sodium in the subsoil of the Darmstadt soil reduces the availability and uptake of some plant nutrients. It also results in moisture stress during dry periods and excess water during wet periods.
• Returning crop residue to the soil, regularly adding other organic material, and minimizing tillage increase the rate of water infiltration and help to maintain tilth and the content of organic matter.

Dwellings

Suitability: Poorly suited
Management considerations:
• Onsite investigation is needed.
• Installing either tile drains near the foundation or interceptor drains higher on the slopes than the building can lower the water table and intercept seepage water.
• Extending the footings below the subsoil or reinforcing the foundation helps to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Suitability: Poorly suited
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Interpretive Groups

Land capability classification: IIIe

912A—Darmstadt-Hoyleton complex, 0 to 2 percent slopes

Composition

Darmstadt and similar soils: 45 to 55 percent
Hoyleton and similar soils: 40 to 45 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Till plains
Landform position: Summits and interfluves
Size of areas: 3 to 130 acres
Major use: Cropland

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Permeability: Darmstadt—very slow; Hoyleton—slow
Parent material: Loess and the underlying mix of loess and glacial till
Runoff: Darmstadt—medium; Hoyleton—slow
Available water capacity: Darmstadt—moderate; Hoyleton—high
Depth to the seasonal high water table: Darmstadt—0.5 foot to 2.0 feet; Hoyleton—1.0 to 3.0 feet
Organic matter content: Darmstadt—moderately low; Hoyleton—moderate
Erosion hazard: Slight
Shrink-swell potential: Darmstadt—moderate; Hoyleton—high

Potential for frost action: High

Typical Profile

Darmstadt

Surface layer:
0 to 8 inches—dark grayish brown, friable silt loam

Subsurface layer:
8 to 13 inches—light brownish gray, mottled, friable silt loam

Subsoil:
13 to 20 inches—brown, mottled, very firm silty clay
20 to 40 inches—light brownish gray, mottled, firm silty clay loam
40 to 60 inches—light gray, mottled, firm silty clay loam

Hoyleton

Surface layer:
0 to 8 inches—dark brown, friable silt loam

Subsurface layer:
8 to 11 inches—yellowish brown, friable silt loam

Subsoil:
11 to 19 inches—brown, very firm silty clay
19 to 34 inches—grayish brown, mottled, very firm and firm silty clay loam
34 to 60 inches—grayish brown, mottled, firm clay loam

Inclusions

Contrasting inclusions:
• The poorly drained Cisne and Huey soils in the lower positions

Similar soils:
• Soils that have 10 to 15 percent saturation with exchangeable sodium in the subsoil

Use and Management

Cropland

Suitability: Darmstadt—moderately suited; Hoyleton—well suited
Management considerations:
• Measures that maintain the drainage system are needed. Surface ditches help to overcome the wetness. The high content of exchangeable sodium in the subsoil of the Darmstadt soil may cause silting in drain lines.
• Tilling when the soil is wet causes surface cloddiness and compaction and reduces the rate of water infiltration.
• The high content of exchangeable sodium in the subsoil of the Darmstadt soil reduces the availability and uptake of some plant nutrients. It also results in moisture stress during dry periods and excess water during wet periods.
• Returning crop residue to the soil, regularly adding other organic material, and minimizing tillage increase the rate of water infiltration and help to maintain tilth and the content of organic matter.
• Winter wheat is subject to frost heave in some years.

Dwellings

Suitability: Poorly suited
Management considerations:
• Onsite investigation is needed.
• Installing subsurface tile drains near the foundation can lower the water table.
• Extending the footings below the subsoil or reinforcing the foundation helps to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Suitability: Poorly suited
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Interpretive Groups

Land capability classification: IIIw

912B2—Darmstadt-Hoyleton complex, 2 to 5 percent slopes, eroded

Composition

Darmstadt and similar soils: 45 to 55 percent
Hoyleton and similar soils: 40 to 45 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Knolls
Landform position: Backslopes
Size of areas: 3 to 30 acres
Major use: Cropland

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Permeability: Darmstadt—very slow; Hoyleton—slow
Parent material: Loess and the underlying mix of loess and glacial till
Runoff: Medium
Available water capacity: Darmstadt—moderate; Hoyleton—high
Depth to the seasonal high water table: Darmstadt—

0.5 foot to 2.0 feet; Hoyleton—1.0 to 3.0 feet
Organic matter content: Darmstadt—moderately low; Hoyleton—moderate
Erosion hazard: Darmstadt—severe; Hoyleton—moderate
Shrink-swell potential: Darmstadt—moderate; Hoyleton—high
Potential for frost action: High

Typical Profile

Darmstadt

Surface layer:
0 to 7 inches—dark brown, friable silt loam

Subsoil:
7 to 21 inches—brown and grayish brown, mottled, firm silty clay loam and very firm silty clay
21 to 34 inches—light brownish gray and grayish brown, mottled, firm silty clay loam
34 to 55 inches—grayish brown, mottled, firm clay loam

Substratum:
55 to 60 inches—yellowish brown, mottled, firm loam

Hoyleton

Surface layer:
0 to 7 inches—dark brown, friable silt loam

Subsoil:
7 to 11 inches—yellowish brown, friable silty clay loam
11 to 27 inches—brown and light brownish gray, mottled, very firm silty clay and firm silty clay loam
27 to 60 inches—grayish brown and yellowish brown, mottled, firm clay loam and loam

Inclusions

Contrasting inclusions:
• Moderately well drained soils on narrow summits above the Darmstadt and Hoyleton soils

Similar soils:
• Soils that have 10 to 15 percent saturation with exchangeable sodium in the subsoil
• Soils that are not eroded, have a thicker surface layer, and have a subsurface layer
• Soils that have more sand in the upper part of the subsoil
• Soils that are severely eroded and have a surface layer of silty clay loam

Use and Management

Cropland

Suitability: Darmstadt—moderately suited; Hoyleton—well suited
Management considerations:
• Contour farming, a system of conservation tillage that leaves crop residue on the surface after planting, and a crop rotation that includes 1 or more years of forage crops help to control erosion.
• Tilling when the soil is wet causes surface cloddiness and compaction, reduces the rate of water infiltration, and causes excessive runoff and erosion.
• The high content of exchangeable sodium in the subsoil of the Darmstadt soil reduces the availability and uptake of some plant nutrients. It also results in moisture stress during dry periods and excess water during wet periods.
• Returning crop residue to the soil, regularly adding other organic material, and minimizing tillage increase the rate of water infiltration and help to maintain tilth and the content of organic matter.

Dwellings

Suitability: Poorly suited
Management considerations:
• Onsite investigation is needed.
• Installing either tile drains near the foundation or interceptor drains higher on the slopes than the building can lower the water table and intercept seepage water.
• Extending the footings below the subsoil or reinforcing the foundation helps to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Suitability: Poorly suited
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Interpretive Groups

Land capability classification: IIIe

934C2—Blair-Grantfork complex, 5 to 10 percent slopes, eroded

Composition

Blair and similar soils: 50 to 60 percent
Grantfork and similar soils: 35 to 40 percent

Contrasting inclusions: 5 to 10 percent

Setting

Landform: Till plains
Landform position: Backslopes
Size of areas: 3 to 150 acres
Major uses: Cropland, pasture and hay, woodland

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Permeability: Blair—moderately slow; Grantfork—slow
Parent material: Mix of loess and glacial till and the underlying glacial till
Runoff: Blair—medium; Grantfork—rapid
Available water capacity: Blair—high; Grantfork—moderate
Depth to the seasonal high water table: Blair—1.5 to 3.5 feet; Grantfork—0.5 foot to 2.0 feet
Organic matter content: Blair—moderately low; Grantfork—low
Erosion hazard: Severe
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Blair

Surface layer:
0 to 7 inches—dark grayish brown, friable silt loam

Subsoil:
7 to 12 inches—brown, firm clay loam
12 to 36 inches—light brownish gray, mottled, firm and very firm clay loam
36 to 60 inches—light gray, mottled, very firm and firm clay loam

Grantfork

Surface layer:
0 to 8 inches—dark grayish brown, firm silty clay loam

Subsoil:
8 to 26 inches—brown and grayish brown, mottled, firm silty clay loam
26 to 47 inches—grayish brown, mottled, firm loam and silt loam
47 to 60 inches—grayish brown, mottled, firm clay loam

Inclusions

Contrasting inclusions:
• Darmstadt soils, which have a natric horizon; in landform positions similar to or less sloping than the major soils
• Holton and Wakeland soils on flood plains

Similar soils:
• Soils that are not eroded, have a thicker surface layer, and have a subsurface layer
• Soils that have more clay in the upper part of the subsoil
• Soils that have more than 10 percent slopes
• Soils that have less sand in the upper part of the subsoil
• Soils that are severely eroded and have more clay in the surface layer

Use and Management

Cropland

Suitability: Blair—moderately suited; Grantfork—poorly suited
Management considerations:
• Contour farming, a system of conservation tillage that leaves crop residue on the surface after planting, and a crop rotation that is dominated by forage crops help to control erosion.
• Preparing a good seedbed is difficult because of surface crusting and cloddiness.
• Using a no-till method of seeding and seeding on the contour help in establishing seedlings and in controlling erosion.
• Tilling when the soil is wet causes surface cloddiness and compaction, reduces the rate of water infiltration, and causes excessive runoff and erosion.
• The high content of exchangeable sodium in the subsoil of the Grantfork soil reduces the availability and uptake of some plant nutrients. It also results in moisture stress during dry periods and excess water during wet periods.
• Returning crop residue to the soil, regularly adding other organic material, and minimizing tillage increase the rate of water infiltration and help to maintain tilth and the content of organic matter.

Pasture and hay

Suitability: Blair—well suited; Grantfork—moderately suited
Management considerations:
• A cover of grasses and legumes helps to control erosion and improves tilth.
• Proper stocking rates, rotation grazing, deferred grazing when the soil is wet, and proper applications of lime and fertilizer help to keep the pasture in good condition.
• Preparing a good seedbed is difficult because of surface crusting and cloddiness.
• Using a no-till method of seeding or pasture

renovation and seeding on the contour help in establishing forage species and in controlling erosion.
• Alsike clover, reed canarygrass, ladino clover, tall fescue, red clover, and bromegrass are suited to this soil. Suitable warm-season grasses include big bluestem, indiangrass, and switchgrass.
• The plants should not be grazed or clipped until they are sufficiently established.

Woodland

Suitability: Blair—well suited; Grantfork—moderately suited
Management considerations:
• The use of equipment is limited to periods when the soil is firm enough for adequate support.
• Using a harvesting method that does not leave the remaining trees isolated or widely spaced and removing only high-value trees from a strip 50 feet wide along the western and southern edges of the woodland reduce the windthrow hazard.
• 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.
• Protection from fire minimizes injury to trees and maintains the leaf mulch.

Dwellings

Suitability: Blair—moderately suited; Grantfork—poorly suited
Management considerations:
• Onsite investigation is needed.
• Installing either tile drains near the foundation or interceptor drains higher on the slopes than the building can lower the water table and intercept seepage water.
• Extending the footings below the subsoil or reinforcing the foundation helps to prevent the structural damage caused by shrinking and swelling.

Septic tank absorption fields

Suitability: Poorly suited
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Interpretive Groups

Land capability classification: IVe
Woodland ordination symbol: Blair—4A; Grantfork—4T

967F—Hickory-Gosport complex, 18 to 35 percent slopes

Composition

Hickory and similar soils: 50 to 55 percent
Gosport and similar soils: 30 to 45 percent
Contrasting inclusions: 5 to 15 percent

Setting

Landform: Till plains
Landform position: Backslopes
Size of areas: 4 to 225 acres
Major uses: Pasture and hay, woodland

Soil Properties and Qualities

Drainage class: Hickory—well drained; Gosport—moderately well drained
Permeability: Hickory—moderate; Gosport—very slow
Parent material: Hickory—glacial till; Gosport—glacial till and the underlying residuum derived from shale
Runoff: Rapid
Available water capacity: Hickory—high; Gosport—low
Depth to the seasonal high water table: Hickory—more than 6 feet; Gosport—1.5 to 3.0 feet
Depth to bedrock: Hickory—more than 60 inches; Gosport—20 to 40 inches
Organic matter content: Moderately low
Erosion hazard: Severe
Shrink-swell potential: Hickory—moderate; Gosport—high
Potential for frost action: Moderate

Typical Profile

Hickory

Surface layer:
0 to 2 inches—dark brown, friable loam

Subsurface layer:
2 to 6 inches—yellowish brown, friable loam

Subsoil:
6 to 46 inches—yellowish brown, friable and firm clay loam
46 to 60 inches—brown, very firm clay loam

Gosport

Surface layer:
0 to 3 inches—dark grayish brown, friable loam

Subsurface layer:
3 to 6 inches—brown, friable loam

Subsoil:
6 to 13 inches—light olive brown, very firm clay
13 to 38 inches—light olive brown, mottled, firm silty clay

Substratum:
38 to 60 inches—weathered shale

Inclusions

Contrasting inclusions:
- The somewhat poorly drained Atlas soils in the less sloping positions
- The moderately well drained Ava soils on gently sloping interfluves above the major soils
- Outcrops of bedrock on the lower parts of the slope
- The somewhat poorly drained Holton and Wakeland soils on flood plains

Similar soils:
- Soils that formed in calcareous shale residuum
- Soils that have bedrock at a depth of 40 to 60 inches
- Soils that are eroded and have a thinner surface layer
- Soils that have slopes of less than 35 percent
- Soils that formed mainly in residuum derived from sandstone and siltstone

Use and Management

Cropland

Suitability: Generally unsuited because of the slope

Pasture and hay

Suitability: Hickory—moderately suited; Gosport—poorly suited
Management considerations:
- A cover of grasses and legumes helps to control erosion and maintains good tilth.
- Proper stocking rates, rotation grazing, deferred grazing when the soil is wet, and proper applications of lime and fertilizer help to keep the pasture in good condition.
- A no-till method of seeding or pasture renovation helps in establishing forage species and in controlling erosion.
- Alfalfa, orchardgrass, tall fescue, red clover, and bromegrass are suited to this soil. Suitable warm-season grasses include big bluestem, indiangrass, and switchgrass.
- The plants should not be grazed or clipped until they are sufficiently established.

Woodland

Suitability: Hickory—moderately suited; Gosport—poorly suited
Management considerations:
- The slope increases the hazard of erosion and limits the use of equipment.
- The use of machinery is limited to periods when the soil is firm enough for adequate support.
- Placing logging roads and skid trails on or nearly on the contour, skidding logs or trees uphill with a cable and winch, using grass firebreaks, and seeding bare areas to grass or to a grass-legume mixture after logging has been completed help to control erosion.
- Planting mature stock and clearing all vegetation within 2 feet of the planted seedlings reduce the seedling mortality rate. Some replanting may be necessary.
- Using a harvesting method that does not leave the remaining trees isolated or widely spaced and removing only high-value trees from a strip 50 feet wide along the western and southern edges of the woodland reduce the windthrow hazard.
- 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.
- Protection from fire minimizes injury to trees and maintains the leaf mulch.

Dwellings

Suitability: Generally unsuited because of the slope

Septic tank absorption fields

Suitability: Generally unsuited because of the slope and the depth to bedrock in the Gosport soil

Interpretive Groups

Land capability classification: VIIe
Woodland ordination symbol: Hickory—5R; Gosport—2R

991—Cisne-Huey complex

Composition

Cisne and similar soils: 50 to 55 percent
Huey and similar soils: 35 to 45 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Till plains
Landform position: Interfluves
Slope range: 0 to 2 percent
Size of areas: 3 to more than 1,000 acres
Major use: Cropland

Soil Properties and Qualities

Drainage class: Poorly drained
Permeability: Very slow
Parent material: Loess and the underlying mix of loess and glacial till
Runoff: Cisne—slow; Huey—very slow
Available water capacity: Moderate
Seasonal high water table: Cisne—at a depth of less than 1 foot; Huey—0.5 foot above to 1.0 foot below the surface
Ponding duration: Huey—brief
Organic matter content: Cisne—moderate; Huey—moderately low
Erosion hazard: Slight
Shrink-swell potential: Cisne—high; Huey—moderate
Potential for frost action: High

Typical Profile

Cisne

Surface layer:
0 to 7 inches—very dark grayish brown, friable silt loam

Subsurface layer:
7 to 14 inches—grayish brown, mottled, friable silt loam

Subsoil:
14 to 36 inches—grayish brown, mottled, very firm silty clay
36 to 60 inches—light brownish gray, mottled, firm silty clay loam

Huey

Surface layer:
0 to 8 inches—dark grayish brown, friable silt loam

Subsoil:
8 to 23 inches—light gray and light brownish gray, mottled, friable and firm silt loam
23 to 52 inches—light brownish gray and light gray, mottled, firm silty clay loam
52 to 60 inches—light gray, mottled, very firm clay loam

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Darmstadt and Hoyleton soils in the higher positions
• Newberry and Shiloh soils, which are subject to ponding; in depressions below the Cisne and Huey soils

Similar soils:
• Soils that have a lighter colored surface layer
• Soils that have 10 to 15 percent saturation with exchangeable sodium in the subsoil
• Soils that have a natric horizon in the lower part of the subsoil

Use and Management

Cropland

Suitability: Cisne—moderately suited; Huey—poorly suited
Management considerations:
• Measures that maintain the drainage system are needed. Surface ditches help to overcome the wetness. The high content of exchangeable sodium in the subsoil of the Huey soil may cause silting in drain lines.
• Land grading helps to control ponding.
• Tilling when the soil is wet causes surface cloddiness and compaction and reduces the rate of water infiltration.
• The high content of exchangeable sodium in the subsoil of the Huey soil reduces the availability and uptake of some plant nutrients. It also results in moisture stress during dry periods and excess water during wet periods (fig. 6).
• Returning crop residue to the soil, regularly adding other organic material, and minimizing tillage increase the rate of water infiltration and help to maintain tilth and the content of organic matter.
• Winter wheat is subject to frost heave in some years.

Dwellings

Suitability: Cisne—poorly suited; Huey—generally unsuited because of ponding
Management considerations:
• Onsite investigation is needed.

Septic tank absorption fields

Suitability: Cisne—poorly suited; Huey—generally unsuited because of ponding
Management considerations:
• Onsite investigation is needed. The design of absorption fields should meet local and State guidelines.

Interpretive Groups

Land capability classification: IVw

1288—Petrolia silty clay loam, undrained

Composition

Petrolia and similar soils: 90 to 95 percent

Figure 6.—Crop growth in this area of Cisne-Huey complex has been affected by the high content of exchangeable sodium in the Huey soil (foreground).

Contrasting inclusions: 5 to 10 percent

Setting

Landform: Backswamps and channels
Slope range: 0 to 2 percent
Flooding frequency: Frequent
Flooding duration: Long
Size of areas: 3 to 145 acres
Major use: Woodland

Soil Properties and Qualities

Drainage class: Very poorly drained
Permeability: Moderately slow
Parent material: Alluvium
Runoff: Ponded
Available water capacity: High
Seasonal high water table: 2.0 feet above to 0.5 foot below the surface
Ponding duration: Very long
Organic matter content: Moderate
Erosion hazard: Slight
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 3 inches—dark grayish brown, mottled, friable silty clay loam

Subsurface layer:
3 to 10 inches—dark grayish brown, mottled, firm silty clay loam

Substratum:
10 to 60 inches—gray, mottled, firm silty clay loam

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Wakeland soils in the higher positions on the flood plains
• The poorly drained Birds soils, which are not subject to ponding; in the slightly higher positions on the flood plains

Similar soils:
• Soils that have more clay in the substratum

Use and Management

Cropland

Suitability: Generally unsuited because of flooding and ponding

Woodland

Suitability: Poorly suited
Management considerations:
• The use of equipment is limited to periods when the soil is firm enough for adequate support.
• Planting mature stock and planting on ridges reduce the seedling mortality rate. Some replanting may be necessary.
• Using a harvesting method that does not leave the remaining trees isolated or widely spaced and removing only high-value trees from a strip 50 feet wide along the western and southern edges of the woodland can reduce the windthrow hazard.
• 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.
• Protection from fire minimizes injury to trees and maintains the leaf mulch.

Dwellings

Suitability: Generally unsuited because of flooding and ponding

Septic tank absorption fields

Suitability: Generally unsuited because of flooding and ponding

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: 5W

1420—Piopolis silty clay loam, undrained

Composition

Piopolis and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Backswamps and channels
Slope range: 0 to 2 percent
Flooding frequency: Frequent
Flooding duration: Long
Size of areas: 3 to 100 acres
Major use: Woodland

Soil Properties and Qualities

Drainage class: Very poorly drained
Permeability: Slow
Parent material: Alluvium
Runoff: Ponded
Available water capacity: High
Seasonal high water table: 2.0 feet above to 0.5 foot below the surface
Ponding duration: Very long
Organic matter content: Moderately low
Erosion hazard: Slight
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 7 inches—grayish brown, mottled, friable silty clay loam

Substratum:
7 to 19 inches—dark gray, mottled, firm silty clay loam
19 to 60 inches—light gray, mottled, firm and friable silty clay loam

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Belknap soils in the higher positions on the flood plains
• The poorly drained Bonnie soils, which are not subject to ponding; in the higher positions on the flood plains

Similar soils:
• Soils that have more clay in the substratum

Use and Management

Cropland

Suitability: Generally unsuited because of flooding and ponding

Woodland

Suitability: Poorly suited
Management considerations:
• The use of equipment is limited to periods when the soil is firm enough for adequate support.
• Planting mature stock and planting on ridges reduce the seedling mortality rate. Some replanting may be necessary.
• Using a harvesting method that does not leave the remaining trees isolated or widely spaced and removing only high-value trees from a strip 50 feet wide along the western and southern edges of the woodland reduce the windthrow hazard.
• 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.
• Protection from fire minimizes injury to trees and maintains the leaf mulch.

Dwellings

Suitability: Generally unsuited because of flooding and ponding

Septic tank absorption fields

Suitability: Generally unsuited because of flooding and ponding

Interpretive Groups

Land capability classification: Vw
Woodland ordination symbol: 5W

3108—Bonnie silt loam, frequently flooded

Composition

Bonnie and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Flood plains
Slope range: 0 to 2 percent
Flooding frequency: Frequent
Flooding duration: Brief
Size of areas: 3 to more than 1,000 acres
Major uses: Cropland, woodland

Soil Properties and Qualities

Drainage class: Poorly drained
Permeability: Moderately slow
Parent material: Alluvium
Runoff: Slow
Available water capacity: High
Depth to the seasonal high water table: Less than 1 foot
Organic matter content: Moderately low
Erosion hazard: Slight
Shrink-swell potential: Low
Potential for frost action: High

Typical Profile

Surface layer:
0 to 9 inches—dark grayish brown, mottled, friable silt loam

Subsurface layer:
9 to 13 inches—light brownish gray, mottled, firm silt loam

Substratum:
13 to 26 inches—light brownish gray, mottled, firm silt loam
26 to 45 inches—stratified light brownish gray and light gray, mottled, firm silt loam
45 to 60 inches—grayish brown, mottled, firm silty clay loam stratified with thin bands of light gray silt loam

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Belknap soils in the higher positions
• The very poorly drained Piopolis soils, which are subject to ponding for very long periods; in backswamps and channels

Similar soils:
• Soils that have more clay in the surface layer and substratum

Use and Management

Cropland

Suitability: Moderately suited
Management considerations:
• Measures that maintain the drainage system are needed. Surface ditches help to overcome the wetness. Surface inlet tile functions satisfactorily if suitable outlets are available.
• Dikes or diversions can reduce the extent of crop damage caused by floodwater.
• Tilling when the soil is wet causes surface cloddiness and compaction and reduces the rate of water infiltration.
• Returning crop residue to the soil, regularly adding other organic material, and minimizing tillage increase the rate of water infiltration and help to maintain tilth and the content of organic matter.

Woodland

Suitability: Poorly suited
Management considerations:
• The use of equipment is limited to periods when the soil is firm enough for adequate support.
• Planting mature stock and planting on ridges reduce the seedling mortality rate. Some replanting may be necessary.
• Using a harvesting method that does not leave the remaining trees isolated or widely spaced and removing only high-value trees from a strip 50 feet wide along the western and southern edges of the woodland reduce the windthrow hazard.
• 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.
• Protection from fire minimizes injury to trees and maintains the leaf mulch.

Dwellings

Suitability: Generally unsuited because of flooding

Septic tank absorption fields

Suitability: Generally unsuited because of flooding

Interpretive Groups

Land capability classification: IIIw
Woodland ordination symbol: 5W

3225—Holton silt loam, frequently flooded

Composition

Holton and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Flood plains
Slope range: 0 to 2 percent
Flooding frequency: Frequent
Flooding duration: Brief
Size of areas: 3 to 245 acres
Major uses: Cropland, pasture and hay, woodland

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Permeability: Moderate
Parent material: Alluvium
Runoff: Slow
Available water capacity: Moderate
Depth to the seasonal high water table: 0.5 foot to 2.0 feet
Organic matter content: Moderately low
Erosion hazard: Slight
Shrink-swell potential: Low
Potential for frost action: High

Typical Profile

Surface layer:
0 to 3 inches—dark grayish brown, friable silt loam

Subsurface layer:
3 to 8 inches—grayish brown, mottled, friable silt loam

Subsoil:
8 to 24 inches—brown, mottled, friable silt loam
24 to 31 inches—grayish brown, mottled, friable loam

Substratum:
31 to 47 inches—grayish brown, mottled, friable loam
47 to 60 inches—stratified grayish brown and light gray, mottled, friable sandy loam and loamy sand

Inclusions

Contrasting inclusions:
• The poorly drained Birds soils in the lower positions
• The well drained Wirt soils on natural levees

Similar soils:
• Soils that have less sand in the subsoil and substratum
• Soils that do not have a subsoil
• Soils that do not have gray mottles in the upper part of the subsoil

Use and Management

Cropland

Suitability: Moderately suited
Management considerations:
• Surface ditches help to overcome the wetness. Surface inlet tile functions satisfactorily if suitable outlets are available.
• Dikes or diversions can reduce the extent of crop damage caused by floodwater.
• Tilling when the soil is wet causes surface cloddiness and compaction and reduces the rate of water infiltration.
• Returning crop residue to the soil, regularly adding other organic material, and minimizing tillage increase the rate of water infiltration and help to maintain tilth and the content of organic matter.

Pasture and hay

Suitability: Well suited

Management considerations:
• A cover of grasses and legumes helps to maintain good tilth.
• Surface ditches help to overcome the wetness.
• Flooding delays harvesting of hay in some years.
• Proper stocking rates, rotation grazing, deferred grazing when the soil is wet, and proper applications of lime and fertilizer help to keep the pasture in good condition.
• Alsike clover, reed canarygrass, ladino clover, tall fescue, red clover, and bromegrass are suited to this soil. Suitable warm-season grasses include big bluestem, indiangrass, and switchgrass.
• The plants should not be grazed or clipped until they are sufficiently established.

Woodland

Suitability: Moderately suited
Management considerations:
• The use of equipment is limited to periods when the soil is firm enough for adequate support.
• Using a harvesting method that does not leave the remaining trees isolated or widely spaced and removing only high-value trees from a strip 50 feet wide along the western and southern edges of the woodland reduce the windthrow hazard.
• 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.
• Protection from fire minimizes injury to trees and maintains the leaf mulch.

Dwellings

Suitability: Generally unsuited because of flooding

Septic tank absorption fields

Suitability: Generally unsuited because of flooding

Interpretive Groups

Land capability classification: IIIw
Woodland ordination symbol: 5A

3226—Wirt loam, sandy substratum, frequently flooded

Composition

Wirt and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Natural levees
Slope range: 0 to 2 percent
Flooding frequency: Frequent
Flooding duration: Very brief
Size of areas: 3 to 345 acres
Major uses: Cropland, pasture and hay, woodland

Soil Properties and Qualities

Drainage class: Well drained
Permeability: Moderate in the upper part; moderately rapid or rapid in the lower part
Parent material: Alluvium
Runoff: Very slow
Available water capacity: Moderate
Depth to the seasonal high water table: More than 6 feet
Organic matter content: Moderately low
Erosion hazard: Slight
Shrink-swell potential: Low
Potential for frost action: Moderate

Typical Profile

Surface layer:
0 to 8 inches—dark yellowish brown, very friable loam

Subsurface layer:
8 to 12 inches—dark yellowish brown, very friable fine sandy loam

Subsoil:
12 to 24 inches—stratified dark brown, very friable fine sandy loam and yellowish brown, very friable loamy fine sand

Substratum:
24 to 45 inches—stratified dark brown, very friable fine sandy loam and yellowish brown, loose loamy fine sand
45 to 60 inches—stratified yellowish brown, loose loamy fine sand and fine sand and dark brown, very friable fine sandy loam

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Belknap, Holton, and Wakeland soils in the lower positions on the flood plain

Similar soils:
• Soils that have less sand in the subsoil and substratum
• Soils that do not have a subsoil

Use and Management

Cropland

Suitability: Well suited

Management considerations:
• Dikes or diversions can reduce the extent of crop damage caused by floodwater.
• Tilling when the soil is wet causes surface cloddiness and compaction and reduces the rate of water infiltration.
• Returning crop residue to the soil, regularly adding other organic material, and minimizing tillage increase the rate of water infiltration and help to maintain tilth and the content of organic matter.

Pasture and hay

Suitability: Well suited
Management considerations:
• A cover of grasses and legumes helps to maintain good tilth.
• Flooding delays harvesting of hay in some years.
• Proper stocking rates, rotation grazing, deferred grazing when the soil is wet, and proper applications of lime and fertilizer help to keep the pasture in good condition.
• Alfalfa, orchardgrass, tall fescue, red clover, and bromegrass are suited to this soil. Suitable warm-season grasses include big bluestem, indiangrass, and switchgrass.
• The plants should not be grazed or clipped until they are sufficiently established.

Woodland

Suitability: Well suited
Management considerations:
• 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.
• Protection from fire minimizes injury to trees and maintains the leaf mulch.

Dwellings

Suitability: Generally unsuited because of flooding

Septic tank absorption fields

Suitability: Generally unsuited because of flooding

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: 4A

3288—Petrolia silty clay loam, frequently flooded

Composition

Petrolia and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Flood plains
Slope range: 0 to 2 percent
Flooding frequency: Frequent
Flooding duration: Brief
Size of areas: 4 to 170 acres
Major uses: Cropland, woodland

Soil Properties and Qualities

Drainage class: Poorly drained
Permeability: Moderately slow
Parent material: Alluvium
Runoff: Very slow
Available water capacity: High
Seasonal high water table: 1 foot above to 1 foot below the surface
Ponding duration: Brief
Organic matter content: Moderate
Erosion hazard: Slight
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 6 inches—dark grayish brown, friable silty clay loam

Subsurface layer:
6 to 14 inches—dark gray, mottled, firm silty clay loam

Substratum:
14 to 43 inches—gray, mottled, firm silty clay loam
43 to 60 inches—light brownish gray, mottled, firm silty clay loam

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Wakeland soils in the higher positions
• Very poorly drained soils that are subject to ponding for very long periods; in backswamps and channels

Similar soils:
• Soils that have more clay in the substratum
• Soils that have less clay in the surface layer and substratum

Use and Management

Cropland

Suitability: Moderately suited

Management considerations:
• Measures that maintain the drainage system are needed. Surface ditches help to overcome the wetness. Surface inlet tile functions satisfactorily if suitable outlets are available.
• Dikes or diversions can reduce the extent of crop damage caused by floodwater.
• Land grading helps to control ponding.
• Tilling when the soil is wet causes surface cloddiness and compaction and reduces the rate of water infiltration.
• Returning crop residue to the soil, regularly adding other organic material, and minimizing tillage increase the rate of water infiltration and help to maintain tilth and the content of organic matter.

Woodland

Suitability: Poorly suited
Management considerations:
• The use of equipment is limited to periods when the soil is firm enough for adequate support.
• Planting mature stock and planting on ridges reduce the seedling mortality rate. Some replanting may be necessary.
• Using a harvesting method that does not leave the remaining trees isolated or widely spaced and removing only high-value trees from a strip 50 feet wide along the western and southern edges of the woodland reduce the windthrow hazard.
• 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.
• Protection from fire minimizes injury to trees and maintains the leaf mulch.

Dwellings

Suitability: Generally unsuited because of flooding and ponding

Septic tank absorption fields

Suitability: Generally unsuited because of flooding and ponding

Interpretive Groups

Land capability classification: IIIw
Woodland ordination symbol: 5W

3333—Wakeland silt loam, frequently flooded

Composition

Wakeland and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Flood plains
Slope range: 0 to 2 percent
Flooding frequency: Frequent
Flooding duration: Brief
Size of areas: 3 to 510 acres
Major uses: Cropland, pasture and hay, woodland

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Permeability: Moderate
Parent material: Alluvium
Runoff: Very slow
Available water capacity: Very high
Depth to the seasonal high water table: 0.5 foot to 2.0 feet
Organic matter content: Moderately low
Erosion hazard: Slight
Shrink-swell potential: Low
Potential for frost action: High

Typical Profile

Surface layer:
0 to 6 inches—dark grayish brown, friable silt loam

Substratum:
6 to 45 inches—grayish brown, mottled, friable silt loam stratified with thin bands of light gray silt loam
45 to 60 inches—light brownish gray, mottled, friable silt loam

Inclusions

Contrasting inclusions:
• The poorly drained Birds soils in the lower positions
• The well drained Wirt soils on natural levees

Similar soils:
• Soils that have more sand in the substratum
• Soils that do not have gray mottles in the upper part of the substratum

Use and Management

Cropland

Suitability: Moderately suited
Management considerations:
• Surface ditches help to overcome the wetness. Surface inlet tile functions satisfactorily if suitable outlets are available.
• Dikes or diversions can reduce the extent of the crop damage caused by floodwater.
• Tilling when the soil is wet causes surface

cloddiness and compaction and reduces the rate of water infiltration.
• Returning crop residue to the soil, regularly adding other organic material, and minimizing tillage increase the rate of water infiltration and help to maintain tilth and the content of organic matter.

Pasture and hay

Suitability: Well suited
Management considerations:
• A cover of grasses and legumes helps to maintain good tilth.
• Surface ditches help to overcome the wetness.
• Flooding delays harvesting of hay in some years.
• Proper stocking rates, rotation grazing, deferred grazing when the soil is wet, and proper applications of lime and fertilizer help to keep the pasture in good condition.
• Alsike clover, reed canarygrass, ladino clover, tall fescue, red clover, and bromegrass are suited to this soil. Suitable warm-season grasses include big bluestem, indiangrass, and switchgrass.
• The plants should not be grazed or clipped until they are sufficiently established.

Woodland

Suitability: Moderately suited
Management considerations:
• The use of equipment is limited to periods when the soil is firm enough for adequate support.
• Using a harvesting method that does not leave the remaining trees isolated or widely spaced and removing only high-value trees from a strip 50 feet wide along the western and southern edges of the woodland reduce the windthrow hazard.
• 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.
• Protection from fire minimizes injury to trees and maintains the leaf mulch.

Dwellings

Suitability: Generally unsuited because of flooding

Septic tank absorption fields

Suitability: Generally unsuited because of flooding

Interpretive Groups

Land capability classification: IIIw
Woodland ordination symbol: 5A

3334—Birds silt loam, frequently flooded

Composition

Birds and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Flood plains
Slope range: 0 to 2 percent
Flooding frequency: Frequent
Flooding duration: Brief
Size of areas: 3 to 345 acres
Major uses: Cropland, pasture and hay, woodland

Soil Properties and Qualities

Drainage class: Poorly drained
Permeability: Moderately slow
Parent material: Alluvium
Runoff: Slow
Available water capacity: Very high
Depth to the seasonal high water table: Less than 1 foot
Organic matter content: Moderately low
Erosion hazard: Slight
Shrink-swell potential: Low
Potential for frost action: High

Typical Profile

Surface layer:
0 to 6 inches—dark grayish brown, friable silt loam

Subsurface layer:
6 to 10 inches—dark grayish brown, mottled, friable silt loam

Substratum:
10 to 51 inches—light brownish gray, mottled, friable silt loam
51 to 60 inches—light gray, mottled, firm silty clay loam

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Holton and Wakeland soils in the higher positions
• The very poorly drained Petrolia soils, which are subject to ponding for very long periods; in backswamps and channels

Similar soils:
• Soils that have more clay in the surface layer and substratum
• Soils that have more sand in the substratum

Use and Management

Cropland

Suitability: Moderately suited
Management considerations:
• Measures that maintain the drainage system are needed. Surface ditches help to overcome the wetness. Surface inlet tile functions satisfactorily if suitable outlets are available.
• Dikes or diversions can reduce the extent of crop damage caused by floodwater.
• Tilling when the soil is wet causes surface cloddiness and compaction and reduces the rate of water infiltration.
• Returning crop residue to the soil, regularly adding other organic material, and minimizing tillage increase the rate of water infiltration and help to maintain tilth and the content of organic matter.

Pasture and hay

Suitability: Well suited
Management considerations:
• A cover of grasses and legumes helps to maintain good tilth.
• The wetness limits the choice of plants and the period of grazing or cutting.
• Surface ditches help to overcome the wetness.
• Flooding delays harvesting of hay in some years.
• Proper stocking rates, rotation grazing, deferred grazing when the soil is wet, and proper applications of lime and fertilizer help to keep the pasture in good condition.
• Alsike clover, reed canarygrass, ladino clover, tall fescue, red clover, and bromegrass are suited to this soil. Suitable warm-season grasses include big bluestem, indiangrass, and switchgrass.
• The plants should not be grazed or clipped until they are sufficiently established.

Woodland

Suitability: Poorly suited
Management considerations:
• The use of equipment is limited to periods when the soil is firm enough for adequate support.
• Planting mature stock and planting on ridges reduce the seedling mortality rate. Some replanting may be necessary.
• Using a harvesting method that does not leave the remaining trees isolated or widely spaced and removing only high-value trees from a strip 50 feet wide along the western and southern edges of the woodland reduce the windthrow hazard.
• 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.
• Protection from fire minimizes injury to trees and maintains the leaf mulch.

Dwellings

Suitability: Generally unsuited because of flooding

Septic tank absorption fields

Suitability: Generally unsuited because of flooding

Interpretive Groups

Land capability classification: IIIw
Woodland ordination symbol: 5W

3382—Belknap silt loam, frequently flooded

Composition

Belknap and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Flood plains
Slope range: 0 to 2 percent
Flooding frequency: Frequent
Flooding duration: Brief
Size of areas: 3 to 440 acres
Major uses: Cropland, woodland

Soil Properties and Qualities

Drainage class: Somewhat poorly drained
Permeability: Moderate
Parent material: Alluvium
Runoff: Very slow
Available water capacity: Very high
Depth to the seasonal high water table: 0.5 foot to 2.0 feet
Organic matter content: Moderately low
Erosion hazard: Slight
Shrink-swell potential: Low
Potential for frost action: High

Typical Profile

Surface layer:
0 to 7 inches—dark grayish brown, friable silt loam

Substratum:
7 to 15 inches—brown, mottled, friable silt loam
15 to 29 inches—light brownish gray, mottled, friable silt loam
29 to 60 inches—light brownish gray, mottled, friable silt loam stratified with thin bands of light gray silt loam

Inclusions

Contrasting inclusions:
• The poorly drained Bonnie soils in the lower positions
• The well drained Wirt soils on natural levees

Similar soils:
• Soils that have more clay in the substratum
• Soils that do not have gray mottles in the upper part of the substratum

Use and Management

Cropland

Suitability: Moderately suited
Management considerations:
• Surface ditches help to overcome the wetness. Surface inlet tile functions satisfactorily if suitable outlets are available.
• Dikes or diversions can reduce the extent of crop damage caused by floodwater.
• Tilling when the soil is wet causes surface cloddiness and compaction and reduces the rate of water infiltration.
• Returning crop residue to the soil, regularly adding other organic material, and minimizing tillage increase the rate of water infiltration and help to maintain tilth and the content of organic matter.

Woodland

Suitability: Moderately suited
Management considerations:
• The use of equipment is limited to periods when the soil is firm enough for adequate support.
• Using a harvesting method that does not leave the remaining trees isolated or widely spaced and removing only high-value trees from a strip 50 feet wide along the western and southern edges of the woodland reduce the windthrow hazard.
• 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.
• Protection from fire minimizes injury to trees and maintains the leaf mulch.

Dwellings

Suitability: Generally unsuited because of flooding

Septic tank absorption fields

Suitability: Generally unsuited because of flooding

Interpretive Groups

Land capability classification: IIIw
Woodland ordination symbol: 6A

3420—Piopolis silty clay loam, frequently flooded

Composition

Piopolis and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Flood plains
Slope range: 0 to 2 percent
Flooding frequency: Frequent
Flooding duration: Brief
Size of areas: 3 to 875 acres
Major uses: Cropland, woodland

Soil Properties and Qualities

Drainage class: Poorly drained
Permeability: Slow
Parent material: Alluvium
Runoff: Very slow
Available water capacity: High
Seasonal high water table: 1 foot above to 1 foot below the surface
Ponding duration: Brief
Organic matter content: Moderately low
Erosion hazard: Slight
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 6 inches—dark grayish brown, mottled, firm silty clay loam

Subsurface layer:
6 to 12 inches—gray, mottled, firm silty clay loam

Substratum:
12 to 44 inches—light brownish gray and light gray, mottled, firm silty clay loam
44 to 60 inches—grayish brown, mottled, firm silty clay loam

Inclusions

Contrasting inclusions:
• The somewhat poorly drained Belknap soils in the higher positions
• Very poorly drained soils that are subject to ponding for very long periods; in backswamps and channels

Similar soils:
• Soils that have less clay in the surface layer and substratum
• Soils that have more clay in the substratum

Use and Management

Cropland

Suitability: Moderately suited
• Measures that maintain the drainage system are needed. Surface ditches help to overcome the wetness. Surface inlet tile functions satisfactorily if suitable outlets are available.
• Dikes or diversions can reduce the extent of crop damage caused by floodwater.
• Land grading helps to control ponding.
• Tilling when the soil is wet causes surface cloddiness and compaction and reduces the rate of water infiltration.
• Returning crop residue to the soil, regularly adding other organic material, and minimizing tillage increase the rate of water infiltration and help to maintain tilth and the content of organic matter.

Woodland

Suitability: Poorly suited
Management considerations:
• The use of equipment is limited to periods when the soil is firm enough for adequate support.
• Planting mature stock and planting on ridges reduce the seedling mortality rate. Some replanting may be necessary.
• Using a harvesting method that does not leave the remaining trees isolated or widely spaced and removing only high-value trees from a strip 50 feet wide along the western and southern edges of the woodland reduce the windthrow hazard.
• 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.
• Protection from fire minimizes injury to trees and maintains the leaf mulch.

Dwellings

Suitability: Generally unsuited because of flooding and ponding

Septic tank absorption fields

Suitability: Generally unsuited because of flooding and ponding

Interpretive Groups

Land capability classification: IIIw
Woodland ordination symbol: 5W

4218—Newberry silt loam, ponded

Composition

Newberry and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Depressions on till plains
Landform position: Toeslopes
Slope range: 0 to 2 percent
Size of areas: 3 to 300 acres
Major use: Cropland

Soil Properties and Qualities

Drainage class: Poorly drained
Permeability: Slow
Parent materials: Loess and the underlying mix of loess and glacial till
Runoff: Very slow
Available water capacity: High
Seasonal high water table: 0.5 foot above to 1.0 foot below the surface
Ponding duration: Brief
Organic matter content: Moderate
Erosion hazard: Slight
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 7 inches—very dark grayish brown, friable silt loam

Subsurface layer:
7 to 13 inches—gray, mottled, friable silt loam

Subsoil:
13 to 19 inches—gray, mottled, friable silty clay loam
19 to 52 inches—grayish brown, mottled, firm silty clay loam
52 to 60 inches—gray, mottled, firm silty clay loam

Inclusions

Contrasting inclusions:
• Huey soils, which have a natric horizon; in the slightly higher positions
• Cisne soils, which are not subject to ponding; in the slightly higher positions

Similar soils:
• Soils that have more clay in the surface layer
• Soils that have a lighter colored surface layer
• Soils that have a thicker surface layer
• Soils that have more clay in the subsoil

Use and Management

Cropland

Suitability: Moderately suited
Management considerations:
- Measures that maintain the drainage system are needed. Surface ditches help to overcome the wetness.
- Land grading helps to control ponding.
- Tilling when the soil is wet causes surface cloddiness and compaction and reduces the rate of water infiltration.
- Returning crop residue to the soil, regularly adding other organic material, and minimizing tillage increase the rate of water infiltration and help to maintain tilth and the content of organic matter.
- Winter wheat is subject to frost heave in some years.

Dwellings

Suitability: Generally unsuited because of ponding

Septic tank absorption fields

Suitability: Generally unsuited because of ponding

Interpretive Groups

Land capability classification: IIIw

7109—Racoon silt loam, rarely flooded

Composition

Racoon and similar soils: 90 to 95 percent
Contrasting inclusions: 5 to 10 percent

Setting

Landform: Stream terraces
Landform position: Treads
Slope range: 0 to 2 percent
Flooding frequency: Rare
Size of areas: 3 to 90 acres
Major uses: Cropland, pasture and hay, woodland

Soil Properties and Qualities

Drainage class: Poorly drained
Permeability: Slow
Parent material: Mix of loess and local alluvium
Runoff: Very slow
Available water capacity: High
Seasonal high water table: 0.5 foot above to 1.0 foot below the surface
Ponding duration: Brief
Organic matter content: Moderately low
Erosion hazard: Slight
Shrink-swell potential: Moderate
Potential for frost action: High

Typical Profile

Surface layer:
0 to 7 inches—dark grayish brown, friable silt loam

Subsurface layer:
7 to 11 inches—grayish brown, mottled, friable silt loam
11 to 36 inches—light brownish gray, mottled, friable silt loam

Subsoil:
36 to 50 inches—light brownish gray, mottled, firm silty clay loam

Substratum:
50 to 60 inches—grayish brown, mottled, firm, stratified loam and silty clay loam

Inclusions

Contrasting inclusions:
- Bonnie soils, which are subject to frequent flooding; on flood plains
- The somewhat poorly drained Creal soils on footslopes above the Racoon soil

Similar soils:
- Soils that have more clay in the subsoil
- Soils that have a thinner subsurface layer

Use and Management

Cropland

Suitability: Well suited
Management considerations:
- Measures that maintain the drainage system are needed. Surface ditches help to overcome the wetness.
- Land grading helps to control ponding.
- Dikes or diversions can reduce the extent of crop damage caused by floodwater.
- Tilling when the soil is wet causes surface cloddiness and compaction and reduces the rate of water infiltration.
- Returning crop residue to the soil, regularly adding other organic material, and minimizing tillage increase the rate of water infiltration and help to maintain tilth and the content of organic matter.
- Winter wheat and hay crops are subject to frost heave in some years.

Pasture and hay

Suitability: Well suited
Management considerations:
• A cover of grasses and legumes helps to maintain good tilth.
• The wetness limits the choice of plants and the period of grazing and clipping.
• Surface ditches help to overcome the wetness.
• Land grading helps to control ponding.
• Proper stocking rates, rotation grazing, deferred grazing when the soil is wet, and proper applications of lime and fertilizer help to keep the pasture in good condition.
• Alsike clover, reed canarygrass, ladino clover, tall fescue, red clover, and bromegrass are suited to this soil. Suitable warm-season grasses include big bluestem, indiangrass, and switchgrass.
• The plants should not be grazed or clipped until they are sufficiently established.

Woodland

Suitability: Poorly suited
Management considerations:
• The use of equipment is limited to periods when the soil is firm enough for adequate support.
• Planting mature stock and planting on ridges reduce the seedling mortality rate. Some replanting may be necessary.
• Using a harvesting method that does not leave the remaining trees isolated or widely spaced and removing only high-value trees from a strip 50 feet wide along the western and southern edges of the woodland reduce the windthrow hazard.
• 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.
• Protection from fire minimizes injury to trees and maintains the leaf mulch.

Dwellings

Suitability: Generally unsuited because of flooding and ponding

Septic tank absorption fields

Suitability: Generally unsuited because of ponding

Interpretive Groups

Land capability classification: IIw
Woodland ordination symbol: 4W

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 or 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 expenditure 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 Natural Resources Conservation Service.

About 189,700 acres in Clay County, or approximately 63 percent of the total acreage, meets the soil requirements for prime farmland. The prime farmland is throughout the county. It generally is used for crops, mainly corn, soybeans, and winter wheat. These crops account for most of the local agricultural income each year.

The map units in the survey area that are considered prime farmland are listed in table 5. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps. 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 as 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. Most of the naturally wet soils in Clay County have been adequately drained for the production of the commonly grown crops.

Use and Management

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 to prevent 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 behavioral 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 recreational 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 unstable cutbanks 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 Natural Resources 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 the heading "Detailed Soil Map Units." Specific information can be obtained from the local office of the Natural Resources Conservation Service or the Cooperative Extension Service.

The soils in Clay County have fair or good potential for increased production of crops and forage plants, particularly if the latest management techniques are applied. This soil survey can greatly facilitate the application of such techniques. The main management concerns on the cropland and pastureland in the county are erosion, drainage, droughtiness, fertility, and tilth.

Erosion is a hazard on cropland and pastureland if the slopes are more than 2 percent. It is also a hazard in areas where the slopes are less than 2 percent if the slope lengths are long.

Loss of the surface layer by sheet and rill erosion is damaging for three reasons. First, the organic matter content and natural fertility levels are lowered as the surface layer is lost and part of the subsoil is incorporated into the plow layer. As a result, soil productivity is reduced. Second, severe erosion on sloping soils results in the deterioration of tilth in the surface layer and thus reduces the rate of water infiltration. In areas where the surface layer has become mixed with the subsoil, the surface tends to become cloddy if the soil is tilled when wet. Because of the cloddiness, preparing a good seedbed is difficult. Also, the surface tends to crust after hard rains. This crusting increases the runoff rate. Third, sediment from erosion enters drainage ditches, streams, ponds, rivers, and road ditches. Deposition of sediment reduces the water storage capacity and reduces the ability of these water systems to accommodate floodwaters. Removing this sediment

is expensive. Water quality is also impaired when herbicides, pesticides, and fertilizers are washed into the water along with the soil particles.

A good management system maintains or improves natural fertility, helps to control erosion and soil blowing, removes excess water, maintains good tilth, and increases the rate of water infiltration. A cropping system that provides a protective plant cover and leaves crop residue on the surface during critical rainfall periods helps to control erosion and maintains the productive capacity of the soil (fig. 7). Including grasses and legumes in the cropping system helps to prevent crusting, improves tilth, and provides nitrogen for the following crop. Planting annual winter cover crops, such as rye, wheat, oats, and vetch, helps to control erosion on sloping soils, adds organic matter to the soil, and, if legumes are used, adds nitrogen to the soil.

Conservation tillage systems, such as chisel plowing, no-till, and ridge planting, help to control excessive soil loss, reduce the runoff rate, and increase the rate of water infiltration.

Chisel plowing is suitable on most of the tillable soils in the county. No-till is most suited to moderately well drained or well drained soils, such as Ava, Richview, and Ridgway soils. Ridge planting is a suitable tillage system on most of the nearly level soils. The use of conservation tillage systems that leave crop residue on the surface after planting is becoming more common in Clay County.

Crop rotations that include oats, wheat, other small grain, and hay are needed to control erosion in moderately sloping to moderately steep areas, such as areas of Atlas and Hickory soils. In addition to minimizing soil losses, such rotations generally increase the content of organic matter, nitrogen levels, and the ability of the soils to retain water. They can also improve soil tilth. Crop-damaging weeds and insects are generally controlled naturally because of the annually changing soil environment resulting from crop rotations.

Terraces, diversions, and contour farming also help to control erosion. By reducing the length of slopes, these systems reduce the runoff rate and increase the rate of water infiltration. They are most effective on soils that have smooth, uniform slopes, such as Ava, Bluford, Hoyleton, and Richview soils. In areas of soils that have short slopes with irregular topography, such as Atlas, Blair, Grantfork, and Hickory soils, erosion can be controlled by using conservation tillage systems or crop rotations that provide adequate plant cover.

Grassed waterways help to carry excess rainwater safely downslope to the nearest creek, stream, or other watercourse. They generally are used in conjunction with other conservation practices, such as terraces, diversions, conservation tillage systems, and contour farming. These conservation practices help to manage excess rainfall effectively, increase water retention, and minimize soil losses on cropland and in other areas. Grassed waterways are most effective on slopes of 2 percent or more.

Soil blowing is a hazard in some areas where the surface is bare. Establishing field windbreaks, using a conservation tillage system that leaves crop residue on the surface after planting, and maintaining an adequate plant cover help to control soil blowing and prevent the damage caused by windblown soil particles.

Further information about the measures that control erosion and soil blowing on each kind of soil is provided in the Technical Guide, which is available in the local office of the Natural Resources Conservation Service.

In Clay County, drainage systems have been installed in most areas of poorly drained and somewhat poorly drained soils. Poorly drained soils, such as Bonnie, Cisne, and Newberry soils, are naturally so wet that production of the common crops would not be possible unless drainage systems and ditches were installed. In some years even the somewhat poorly drained soils, such as Bluford, Hoyleton, and Wakeland soils, are so wet that planting is delayed.

The design of surface and subsurface drainage systems varies depending upon the kind of soil. Tile drains are generally not effective in slowly permeable or very slowly permeable soils, such as Bluford, Cisne, Piopolis, and Wynoose soils. Moderately permeable and moderately slowly permeable soils, such as Birds, Bonnie, and Wakeland soils, can be adequately drained by tile drains if suitable outlets are available. A surface drainage system, including deep and shallow ditches and land grading, is commonly used in combination with tile drains to drain excess water from most of the wet soils in the county. The ditches should be protected from silt deposition and ditchbank erosion caused by runoff.

Further information about drainage systems suitable for each kind of soil is provided in the Technical Guide, which is available in the local office of the Natural Resources Conservation Service.

Soil droughtiness limits the productivity of some of the soils used for crops and pasture in the county. Darmstadt, Frondorf, Gosport, Grantfork, and Huey soils, for example, have layers or zones that restrict root penetration or that inhibit the uptake of water and plant nutrients. Plant stress can result quickly during

Figure 7.—Crop residue has been left on the surface in this area of Atlas silt loam, 5 to 10 percent slopes, eroded. Leaving crop residue on the surface helps to prevent further erosion.

hot, windy days. The effects of droughtiness can be minimized by using a no-till system, planting cover crops, and leaving crop residue on the surface. These practices increase the rate of water infiltration, reduce the runoff rate, and reduce the amount of surface moisture lost through evaporation. In addition, planting drought-tolerant crops or crop varieties can minimize the effects of droughtiness. Soybeans and grain sorghum are more drought-tolerant than corn. Winter wheat can be grown on droughty soils because it matures in the spring, before the water stored in the soil is depleted.

Natural fertility is low or medium in most of the soils in Clay County. Soils that formed under forest vegetation, such as Bluford soils, have a lower level of natural fertility than soils that formed under prairie vegetation, such as Hoyleton soils. Cultural practices can be used to maintain or improve soil fertility. Planting legumes in rotation or as a cover crop adds nitrogen and organic matter to the soil. Returning crop residue, manure, and other organic material to the soil also increases the organic matter content. Commercial fertilizers can also be used. On most of the soils in the county, crops respond well to additions of nitrogen, phosphorus, and potassium fertilizer and to applications of certain micronutrients. On acid soils, applications of ground limestone are needed to raise the pH level sufficiently for optimum plant growth.

Applications of lime, fertilizer, and manure should be based on the results of soil tests, the needs of the crop, and the expected level of yields. The local office of the Cooperative Extension Service can help in determining the kinds and amounts of nutrients needed.

Sodium-affected soils, such as Darmstadt, Grantfork, and Huey soils, have a high content of exchangeable sodium in the subsoil. The reaction in

the subsoil commonly ranges from neutral to strongly alkaline. The subsoil of these soils has poor physical condition, which restricts rooting depth and the uptake of water and nutrients. As a result, crop yields are reduced. Incorporating large amounts of gypsum into the soil in conjunction with closely spaced subsurface tile drainage has been shown to improve corn yields by lowering the sodium content in the subsoil and replacing the sodium with calcium (Sharma and others, 1974). Returning crop residue to the soil and regularly adding manure or other organic material improve fertility and tilth in the surface layer. Using a no-till system, planting cover crops, leaving crop residue on the surface, and planting drought-tolerant crops or crop varieties help to minimize the effects of droughtiness. Sodium-affected soils commonly are in small areas and are closely intermingled with areas of more productive soils. About 10 percent of the county has areas of sodium-affected soils.

Soil tilth is an important factor affecting the germination of seeds, the amount of runoff, and the infiltration of water into the soil. Soils that have good tilth are granular and porous. Poor tilth is a problem on most soils that have a low content of organic matter in the surface layer. Generally, the structure of the surface layer in these soils is weak and a surface crust forms after periods of intensive rainfall. The crust is hard when dry and is nearly impervious to water. Once the crust forms, the rate of water infiltration is reduced and the runoff rate is increased. Including grasses and legumes in the cropping sequence and regularly incorporating crop residue, manure, or other organic material into the surface layer improve soil structure. Leaving crop residue on the surface helps to prevent crusting by absorbing the impact of falling raindrops.

Poor tilth is also a problem in poorly drained soils that have a surface layer of silty clay loam, such as Petrolia, Piopolis, and Shiloh soils. The opportunity for primary tillage commonly is limited because these soils often stay wet until late in spring. If the soils are tilled when wet, the surface layer tends to become cloddy. The cloddiness makes preparing a good seedbed difficult. Chisel tillage in the fall on these soils generally results in good tilth in the spring. If the soils are tilled in the fall, enough crop residue should be left on the surface to prevent excessive erosion or soil blowing.

Corn and soybeans are the major crops grown in the county. Wheat is the main small grain crop. Grain sorghum, oats, rye, barley, sunflowers, canola, berries, fruit trees, and vegetables are grown in some areas (fig. 8).

Grasses and legumes are grown for both pasture and hay. Suitable pasture and hay plants include several legumes, cool-season grasses, and warm-season native grasses. Alfalfa and red clover are the most common legumes grown for hay. They are also used in mixtures with bromegrass, orchardgrass, and tall fescue for hay and pasture.

Warm-season native grasses commonly grown in the area are big bluestem, indiangrass, and switchgrass. These grasses grow well in the summer. They require different management techniques for establishment and grazing than cool-season grasses.

Alfalfa is best suited to moderately well drained and well drained soils, such as Ava and Hickory soils. In areas of poorly drained or somewhat poorly drained soils, moisture-tolerant plants, such as alsike clover, ladino clover, and reed canarygrass, should be selected.

Well managed forage stands are effective in controlling erosion. Overgrazing and the need for adequate lime and fertilizer are common management concerns. Additions of lime and fertilizer should be based on the results of soil tests, the needs of the plants, and the expected level of production.

Overgrazing reduces the vigor of pasture plants and hinders forage production. It also allows weedy and brushy species to spread. Timely deferment of grazing, rotation grazing, and proper stocking rates help to prevent overgrazing. Deferred grazing and rotation grazing among several areas of pasture provide a rest period for the forage plants and allow them to build up reserves of carbohydrates.

Many soils in the county have a high water table in the spring. Deferred grazing during wet periods minimizes surface compaction. Pasture renovation may be needed in compacted areas. Frost heave of alfalfa and red clover is also a hazard on soils that have a high water table. Leaving stubble that is 4 to 6 inches high helps to minimize the effects of frost heave in winter. Using grass-legume mixtures can also help to prevent frost heave.

The latest information and recommendations for row crops and forage production can be obtained from the local office of the Cooperative Extension Service or the Natural Resources Conservation Service.

Yields per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in

Figure 8.—An apple orchard in an area of Hoyleton silt loam, 2 to 5 percent slopes.

the table because of variations in rainfall and other climatic factors. The land capability classification also is shown in the table.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents (Fehrenbacher and others, 1978). 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 Natural Resources 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 (USDA, 1961). 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 or for engineering purposes.

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

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

Class I soils have few limitations that restrict their use.

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

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

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

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

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

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

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

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

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

The capability classification of the map units in this survey area is given in the section "Detailed Soil Map Units" and in the yields table.

Woodland Management and Productivity

When Clay County was first settled in the early 1800's, the area had approximately 112,000 acres of hardwood forests. In 1985, forests covered about 48,300 acres, or 16 percent of the county (Iverson, 1990). Much of the remaining woodland is in areas of soils that are unsuitable for cultivation, commonly because they are too steep or too wet or are in isolated areas. The largest areas of woodland are in associations 2, 3, and 4, which are described under the heading "General Soil Map Units." The soils in these areas have fair to very good potential for the production of high-quality trees, especially if the best species are selected for planting and the woodland is properly managed. The main species in the uplands include white oak, red oak, shagbark hickory, sugar maple, black walnut, elm, and yellow-poplar. The main species on the flood plains are cottonwood, silver maple, pin oak, sycamore, and sweetgum.

Many woodland stands can be improved by harvesting mature trees and removing nonmerchantable trees that retard the growth of desirable species. Measures that protect the woodland from fire and from grazing by livestock are essential. Tree planting is needed unless stocking is adequate. Control of competing vegetation is needed if seedlings are planted. Maintaining a cover of grass between rows of seedlings that are planted in bare, sloping areas helps to control erosion. Machinery can be used only if the soil is firm enough for adequate support. If excessive erosion occurs or the slope is more than 15 percent, runoff should be diverted away from haul roads and skid trails. A surface drainage system is beneficial on wet soils.

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*, excess water in or on the soil; *T*, toxic substances in the soil; *D*, restricted rooting depth; *C*, clay in the upper part of the soil; *S*, sandy texture; *F*, a high content of rock fragments in the soil; and *L*, low strength. The letter *A* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: R, X, W, T, D, C, S, F, and L.

In table 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, and fire lanes and in 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 and season of use are not significantly restricted by soil factors. Soil wetness can restrict equipment use, but the wet period does not exceed 1 month. A rating of *moderate* indicates that equipment use is moderately restricted because of one or more soil factors. If the soil is wet, the wetness restricts equipment use for a period of 1 to 3 months. A rating of *severe* indicates that equipment use is severely restricted either as to the kind of equipment that can be used or the season of use. If the soil is wet, the wetness restricts equipment use for more than 3 months.

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

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

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

The *volume*, a number, is the yield likely to be produced by the most important trees. This number, expressed as cubic feet per acre per year, indicates the amount of fiber produced in 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 generally is the most common species on the soil and is 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 Natural Resources Conservation Service or the Cooperative Extension Service or from a commercial nursery.

Recreation

The demand for land and facilities for boating, swimming, picnicking, fishing, hunting, hiking, camping, and other forms of outdoor recreation is increasing throughout the county. Facilities for these activities are available in city parks and a few privately owned tracts.

The potential for further recreational development is good throughout the county. The soils having the best potential are on uplands along the major streams and tributaries. These soils are in areas where a hilly terrain, wooded slopes, and numerous streams provide a variety of opportunities for recreation.

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 sewer lines. 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 recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational 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 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 gentle 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 nearly 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 should be considered.

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

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

Wildlife Habitat

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

In table 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 flooding. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, sorghum, and sunflowers.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flooding, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, bromegrass, orchardgrass, timothy, clover, alfalfa, lespedeza, and partridge pea.

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 flooding. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, butterfly weed, 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, hackberry, hawthorn, walnut, maple, hickory, sumac, and pecan. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are crabapple, gray dogwood, and black chokecherry.

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 cattails, 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. Wildlife attracted to these areas include bobwhite quail, meadowlark, prairie chicken, field sparrow, rabbit, 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, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and deer.

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

In the following paragraphs, the soil associations in the survey area, which are described under the heading "General Soil Map Units," are grouped into three wildlife areas.

Wildlife area 1 consists of the Cisne-Hoyleton-Huey association. The major soils in this association are nearly level and gently sloping and are poorly drained and somewhat poorly drained. This area is mainly used as cropland.

Wildlife habitat can be improved by leaving grassy cover along roadsides, ditchbanks, and waterways unmowed until after the nesting season (August 1); protecting existing woody cover; leaving crop residue on the surface after harvest; maintaining brushy fencerows and hedges; and planting winter food plots near sources of water and areas of existing grassy or woody cover.

Wildlife area 2 consists of the Bluford-Hickory-Ava association. The major soils in this association are nearly level to very steep and are somewhat poorly drained to well drained. This area borders the major streams and creeks in the county. It is used as woodland, as cropland, or for pasture and hay. Because of the diversity of habitat in this area, a variety of management measures can be used to improve the habitat for wildlife.

Measures that can improve the habitat in areas of woodland include protecting the existing woodland from fire and from grazing by livestock; encouraging nut- and fruit-bearing trees and shrubs by selective cutting; and establishing shrubs or grassy borders around wooded areas for cover and travel lanes.

In areas used as cropland, wildlife habitat can be improved by leaving grassy cover along roadsides, ditchbanks, and waterways unmowed until after the nesting season (August 1); protecting existing woody cover; leaving crop residue on the surface after harvest; maintaining brushy fencerows and hedges; and planting winter food plots near sources of water and areas of existing grassy or woody cover. Establishing field border strips of trees, shrubs, grasses, and legumes around at least half of the perimeter of pastures can also improve wildlife habitat in these areas.

Wildlife area 3 consists of the Wakeland-Birds-Wirt and the Bonnie-Belknap-Piopolis associations. The major soils in these associations are very poorly drained, poorly drained, somewhat poorly drained, and well drained. They are subject to flooding. This area is mainly used as cropland or woodland.

In cultivated areas, wildlife habitat can be improved by leaving grassy cover along roadsides, ditchbanks, and waterways unmowed until after the nesting season (August 1); protecting existing woody cover; leaving crop residue on the surface after harvest; maintaining brushy fencerows and hedges; and planting winter food plots near sources of water and areas of existing grassy or woody cover.

In areas of woodland, habitat can be improved by protecting the existing woodland from fire and from grazing by livestock; encouraging nut- and fruit-bearing trees and shrubs by selective cutting; and establishing shrubs or grassy borders around wooded areas for cover and travel lanes.

Areas of very poorly drained and poorly drained soils in wildlife area 3 provide good habitat for wetland wildlife (fig. 9). These areas can be improved for wetland wildlife by establishing or preserving areas of open water; managing water levels through a system of ditches, dikes, and levees; planting water-tolerant plants for cover; planting food plots of millet, buckwheat, grain sorghum, and corn; and constructing nesting boxes for wood ducks.

Additional information regarding wildlife habitat is available at the district office of the Department of

Figure 9.—This area of Piopolis silty clay loam, undrained, provides good habitat for wetland wildlife.

Conservation, Division of Wildlife Resources, or at the local office of the Natural Resources Conservation Service.

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. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

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

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

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should 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 or 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. 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 evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and 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; 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 depth to the water table.

Dwellings and *small commercial buildings* are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrinking and swelling, and organic layers can cause the movement of footings. A high water table, depth to bedrock, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 or 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, 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, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

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

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

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

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

Table 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, flooding, large stones, and content of organic matter.

Excessive seepage resulting from rapid permeability in 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 and bedrock 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. In an area sanitary 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. The landfill must be able to bear heavy vehicular traffic. Ground-water pollution is a potential concern. Ease of excavation and revegetation should be considered.

The ratings in table 12 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock, a high water table, slope, and flooding affect landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. Onsite investigation may be needed.

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

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

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock or the water table to permit revegetation. The soil material used as the 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 to 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, a 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 a 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 have a water table at a depth of 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. They 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, reaction, 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 high 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 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, and the potential for frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock, 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 and sodium. 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. 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 control erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock 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 affect the construction of grassed waterways. A hazard of soil blowing, low available water capacity, restricted rooting depth, toxic substances such as salts and 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 to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classification, 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 the heading "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 (ASTM, 1993) and the system adopted by the American Association of State Highway and Transportation Officials (AASHTO, 1986).

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

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

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

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates

determined mainly by converting volume percentage in the field to weight percentage.

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

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

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

Physical and Chemical Properties

Table 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, 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 and septic tank absorption fields.

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 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. Coarse sands, 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 coarse sands, loamy sands, loamy fine sands, loamy very fine sands, and sapric soil material. These soils are very highly erodible. Crops can be grown if intensive measures to control soil blowing are used.
3. Coarse sandy loams, 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 loams, silt loams, clay loams, and silty clay loams. These soils are erodible. Crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, noncalcareous 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. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material. These soils are slightly erodible. Crops can be grown if measures to control soil blowing are used.
6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay. These soils are very slightly erodible. Crops can be grown if ordinary measures to control soil blowing are used.
7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material. These soils are very slightly erodible. Crops can be grown if ordinary measures to control soil blowing are used.
8. Soils that are not subject to soil blowing because of coarse fragments on the surface or because of surface wetness.

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 in 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 infiltration 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 or by runoff from adjacent slopes. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 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 (the chance of flooding is nearly 0 percent to 5 percent in any year); *occasional* that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); and *frequent* that it occurs often under normal weather conditions (the chance of flooding is more than 50 percent in any year). Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, *long* if 7 days to 1 month, and *very long* if more than 1 month. Probable dates are expressed in months. About two-thirds to three-fourths of all flooding occurs during the stated period.

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 little or no horizon development.

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 estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 17 are 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 results in a severe hazard of corrosion. 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 422 (ASTM), D 2217 (ASTM); Liquid limit—T 89 (AASHTO), D 4318 (ASTM); Plasticity index—T 90 (AASHTO), D 4318 (ASTM); and Moisture density—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 (USDA, 1975). 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. Eleven 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 Entisol.

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 Aquent (*Aqu*, meaning water, plus *ent*, from Entisol).

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 Fluvaquents (*Fluv*, meaning flood plain, plus *aquent*, the suborder of the Entisols that has an aquic 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 Fluvaquents.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, 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, acid, mesic Typic Fluvaquents.

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. 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" (USDA, 1993). Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" (USDA, 1975). 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."

Atlas Series

Drainage class: Somewhat poorly drained
Permeability: Very slow

Landform: Till plains
Landform position: Backslopes
Parent material: Mix of loess and glacial till and the underlying glacial till or entirely glacial till
Slope range: 5 to 18 percent
Taxonomic classification: Fine, montmorillonitic, mesic, sloping Aeric Ochraqualfs

Typical Pedon

Atlas silt loam, 5 to 10 percent slopes, eroded, about 185 feet north and 680 feet west of the southeast corner of sec. 20, T. 4 N., R. 5 E.

Ap—0 to 5 inches; brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; mixed with grayish brown (10YR 5/2) material from the subsurface layer; moderate fine granular structure; friable; common fine roots; common medium rounded nodules of iron and manganese oxide; neutral; abrupt smooth boundary.

E—5 to 9 inches; grayish brown (10YR 5/2) silt loam; few fine distinct yellowish brown (10YR 5/6) mottles; moderate thin platy structure; friable; common fine roots; common medium rounded nodules of iron and manganese oxide; about 1 percent fine gravel; neutral; clear wavy boundary.

Bt—9 to 14 inches; brown (10YR 5/3) silty clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate fine angular blocky; firm; common fine roots; few distinct light gray (10YR 7/2 dry) silt coatings and few distinct grayish brown (10YR 5/2) clay films on faces of peds; common medium rounded nodules of iron and manganese oxide; about 1 percent fine gravel; very strongly acid; clear wavy boundary.

2Btg1—14 to 28 inches; light brownish gray (10YR 6/2) silty clay; common medium prominent strong brown (7.5YR 4/6) mottles; moderate medium prismatic structure; very firm; common very fine roots; very few distinct light gray (10YR 7/2 dry) silt coatings and common distinct dark gray (10YR 4/1) clay films on faces of peds; few medium rounded nodules of iron and manganese oxide; about 1 percent fine gravel; very strongly acid; clear wavy boundary.

2Btg2—28 to 40 inches; light gray (10YR 6/1) silty clay; common medium prominent strong brown (7.5YR 4/6) mottles; moderate medium prismatic structure; very firm; common very fine roots; few distinct dark gray (10YR 4/1) clay films on faces of peds; common medium rounded nodules of iron and manganese oxide; about 2 percent medium gravel; very strongly acid; clear wavy boundary.

2Btg3—40 to 60 inches; gray (10YR 5/1) clay; common medium prominent strong brown (7.5YR 4/6) mottles; moderate medium prismatic structure; very firm; common distinct dark gray (10YR 4/1) clay films on faces of peds; common medium irregular accumulations of iron and manganese oxide; about 3 percent medium gravel; very strongly acid.

Range in Characteristics

Depth to glacial till: Less than 20 inches

Ap horizon:
Hue—10YR
Value—3 to 5
Chroma—2 to 4
Texture—silt loam, silty clay loam, or clay loam

E horizon (if it occurs):
Hue—10YR
Value—4 or 5
Chroma—2 or 3
Texture—silt loam

Bt or 2Bt horizon:
Hue—10YR
Value—4 or 5
Chroma—3 or 4
Texture—silty clay loam, clay loam, or silty clay

Btg or 2Btg horizon:
Hue—10YR or 2.5Y
Value—5 or 6
Chroma—1 or 2
Texture—clay loam, silty clay loam, silty clay, or clay

Ava Series

Drainage class: Moderately well drained
Permeability: Moderate in the upper part; very slow in the lower part
Landform: Till plains and knolls
Landform position: Interfluves, summits, and backslopes
Parent material: Loess and the underlying mix of loess and glacial till
Slope range: 2 to 10 percent
Taxonomic classification: Fine-silty, mixed, mesic Typic Fragiudalfs
Taxadjunct features: The Ava soils in this county have secondary soil structure in the 2Btx horizon, which allows rooting. These soils are classified as fine-silty, mixed, mesic Typic Hapludalfs.

Typical Pedon

Ava silt loam, 5 to 10 percent slopes, eroded, about 1,220 feet north and 2,310 feet west of the southeast corner of sec. 15, T. 4 N., R. 7 E.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; common very fine roots; common fine rounded nodules of iron and manganese oxide; neutral; abrupt smooth boundary.

Bt1—5 to 10 inches; yellowish brown (10YR 5/6) silt loam; weak fine prismatic structure parting to weak fine subangular blocky; friable; common very fine roots; few distinct dark brown (10YR 4/3) clay films on faces of peds; few fine rounded nodules of iron and manganese oxide; strongly acid; clear wavy boundary.

Bt2—10 to 16 inches; yellowish brown (10YR 5/4) silty clay loam; common fine prominent strong brown (7.5YR 4/6) mottles; moderate medium prismatic structure parting to moderate fine angular blocky; firm; common very fine roots; very few distinct pale brown (10YR 6/3) silt coatings and few distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; few fine rounded nodules of iron and manganese oxide; very strongly acid; clear wavy boundary.

Bt/E—16 to 19 inches; yellowish brown (10YR 5/4) silty clay loam (Bt); pale brown (10YR 6/3) silt loam (E); the E material occurs as prominent coatings on faces of peds (10 to 15 percent by volume); common fine prominent strong brown (7.5YR 4/6) mottles; moderate medium prismatic structure parting to moderate fine angular blocky; firm; common very fine roots; few distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; few fine rounded nodules of iron and manganese oxide; very strongly acid; abrupt wavy boundary.

B′t—19 to 30 inches; brown (10YR 5/3) silty clay loam; common fine distinct light gray (10YR 6/1) and common medium prominent strong brown (7.5YR 4/6) mottles; strong medium prismatic structure parting to moderate medium angular blocky; firm; few very fine roots; common distinct dark brown (10YR 4/3) clay films on faces of peds; few fine rounded nodules of iron and manganese oxide; very strongly acid; abrupt wavy boundary.

2Btx—30 to 52 inches; pale brown (10YR 6/3) loam; common medium prominent strong brown (7.5YR 4/6) mottles and common coarse faint grayish brown (10YR 5/2) mottles in vertical cracks between polygons; moderate very coarse prismatic structure parting to moderate medium angular blocky; very firm and brittle; few very fine roots between peds; common distinct dark brown (10YR 4/3) and dark yellowish brown (10YR 4/4) clay films on faces of peds; common medium irregular accumulations of iron and manganese oxide; about 1 percent fine gravel; very strongly acid; clear wavy boundary.

2BC—52 to 60 inches; pale brown (10YR 6/3) loam; few fine faint grayish brown (10YR 5/2) and common medium prominent strong brown (7.5YR 5/6) mottles; weak medium prismatic structure; firm; very few distinct dark gray (10YR 4/1) clay films in pores; common medium irregular accumulations of iron and manganese oxide; about 2 percent fine gravel; strongly acid.

Range in Characteristics

Depth to Bt/E horizon: 16 to 30 inches
Depth to horizon with fragipan characteristics: 25 to 40 inches
Thickness of the loess: 30 to 45 inches

Ap horizon:
Hue—10YR
Value—4 or 5
Chroma—2 or 3
Texture—silt loam or silty clay loam

E horizon (if it occurs):
Hue—10YR
Value—4 or 5
Chroma—3 or 4
Texture—silt loam

Bt, Bt/E, or B′t horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—3 to 6
Texture—silty clay loam or silt loam

2Btx horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—2 to 6
Texture—clay loam, silty clay loam, loam, or silt loam

2BC horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—2 to 6
Texture—clay loam, silty clay loam, loam, or silt loam

Belknap Series

Drainage class: Somewhat poorly drained
Permeability: Moderate
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Taxonomic classification: Coarse-silty, mixed, acid, mesic Aeric Fluvaquents

Typical Pedon

Belknap silt loam, frequently flooded, about 125 feet north and 1,650 feet west of the center of sec. 9, T. 3 N., R. 8 E.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; few fine prominent strong brown (7.5YR 5/6) mottles; weak fine granular structure; friable; few very fine roots; few distinct very pale brown (10YR 7/3) silt coatings on faces of peds; few medium rounded nodules of iron and manganese oxide; slightly acid; abrupt smooth boundary.

Cg1—7 to 15 inches; brown (10YR 5/3) silt loam; many medium faint light brownish gray (10YR 6/2) mottles; massive; friable; few very fine roots; few medium rounded nodules of iron and manganese oxide; strongly acid; clear wavy boundary.

Cg2—15 to 29 inches; light brownish gray (10YR 6/2) silt loam; common fine prominent yellowish brown (10YR 5/8) and many fine faint brown (10YR 5/3) mottles; massive; friable; few very fine roots; few medium rounded nodules of iron and manganese oxide; strongly acid; clear wavy boundary.

Cg3—29 to 60 inches; light brownish gray (10YR 6/2) silt loam stratified with thin bands of light gray (10YR 7/2) silt loam; many medium faint brown (10YR 5/3) and common fine prominent strong brown (7.5YR 5/6) mottles; massive; friable; few medium rounded nodules of iron and manganese oxide; strongly acid.

Range in Characteristics

Ap horizon:
Hue—10YR
Value—4 or 5
Chroma—2 or 3
Texture—silt loam

Cg horizon:
Hue—10YR
Value—5 or 6
Chroma—1 to 3
Texture—silt loam

Birds Series

Drainage class: Poorly drained
Permeability: Moderately slow
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Taxonomic classification: Fine-silty, mixed, nonacid, mesic Typic Fluvaquents

Typical Pedon

Birds silt loam, frequently flooded, about 700 feet south and 1,530 feet west of the center of sec. 14, T. 4 N., R. 6 E.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; few fine roots; few medium rounded nodules of iron and manganese oxide; neutral; abrupt smooth boundary.

Ag—6 to 10 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; common fine faint gray (10YR 5/1) mottles; weak thin platy structure; friable; few fine roots; few medium rounded nodules of iron and manganese oxide; neutral; abrupt wavy boundary.

Cg1—10 to 22 inches; light brownish gray (10YR 6/2) silt loam; common fine prominent dark brown (7.5YR 4/4) mottles; weak medium prismatic structure; friable; few fine roots; common medium rounded nodules of iron and manganese oxide; slightly acid; clear wavy boundary.

Cg2—22 to 51 inches; light brownish gray (10YR 6/2) silt loam; common fine distinct yellowish brown (10YR 5/6) and common fine prominent dark brown (7.5YR 4/4) mottles; weak medium prismatic structure; friable; common medium rounded nodules of iron and manganese oxide; slightly acid; clear wavy boundary.

Cg3—51 to 60 inches; light gray (10YR 6/1) silty clay loam; common fine prominent dark brown (7.5YR 4/4) mottles; weak medium prismatic structure; firm; common medium irregular accumulations of iron and manganese oxide; moderately acid.

Range in Characteristics

Ap or Ag horizon:
Hue—10YR
Value—3 or 4
Chroma—2
Texture—silt loam

Cg horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—1 or 2
Texture—silt loam or silty clay loam

Blair Series

Drainage class: Somewhat poorly drained
Permeability: Moderately slow
Landform: Till plains
Landform position: Backslopes
Parent material Mix of loess and glacial till and the underlying glacial till or entirely mix of loess and glacial till
Slope range: 5 to 10 percent
Taxonomic classification: Fine-silty, mixed, mesic Aquic Hapludalfs
Taxadjunct features: The Blair soils in this county have more sand in the control section than is defined as the range for the series. These soils are classified as fine-loamy, mixed, mesic Aquic Hapludalfs.

Typical Pedon

Blair silt loam, 5 to 10 percent slopes, eroded, about 1,775 feet north and 130 feet east of the southwest corner of sec. 24, T. 4 N., R. 8 E.

Ap—0 to 5 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; weak medium granular structure; friable; common very fine roots; slightly acid; abrupt smooth boundary.
Bt1—5 to 8 inches; yellowish brown (10YR 5/4) clay loam; few medium distinct yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; firm; common very fine roots; few distinct dark brown (10YR 4/3) clay films on faces of peds; strongly acid; clear wavy boundary.
Bt2—8 to 12 inches; brown (10YR 5/3) silty clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure; firm; common very fine roots; few distinct grayish brown (10YR 5/2) and common distinct dark brown (10YR 4/3) clay films on faces of peds; very strongly acid; gradual wavy boundary.
Bt3—12 to 23 inches; brown (10YR 5/3) clay loam; common fine faint grayish brown (10YR 5/2) and many medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; firm; few very fine roots; few distinct grayish brown (10YR 5/2) and few distinct dark brown (10YR 4/3) clay films on faces of peds; few fine irregular accumulations of iron and manganese oxide; about 2 percent fine gravel; very strongly acid; clear wavy boundary.
Btg1—23 to 34 inches; grayish brown (10YR 5/2) clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to weak medium subangular blocky; firm; few very fine roots; few distinct gray (10YR 5/1) clay films on faces of peds; few medium irregular accumulations of iron and manganese oxide; about 2 percent fine gravel; very strongly acid; gradual wavy boundary.
2Btg2—34 to 42 inches; light gray (10YR 6/1) clay loam; common medium prominent yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure; very firm; few very fine roots; few distinct gray (10YR 5/1) clay films on faces of peds; common medium irregular accumulations of iron and manganese oxide; about 2 percent fine gravel; moderately acid; clear wavy boundary.
2Btg3—42 to 60 inches; gray (10YR 5/1) clay loam; common medium prominent yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure; very firm; very few distinct dark grayish brown (10YR 4/2) clay films on faces of peds; common medium irregular accumulations of iron and manganese oxide; about 5 percent medium gravel; neutral.

Range in Characteristics

Depth to glacial till: 20 inches or more

Ap horizon:
Hue—10YR
Value—4 or 5
Chroma—2 to 4
Texture—silt loam or silty clay loam

Bt horizon:
Hue—10YR
Value—4 to 6
Chroma—3 or 4
Texture—silty clay loam, clay loam, loam, or silt loam

Btg or 2Btg horizon:
Hue—10YR
Value—4 to 6
Chroma—1 or 2
Texture—silty clay loam, clay loam, or loam

Bluford Series

Drainage class: Somewhat poorly drained
Permeability: Slow
Landform: Till plains and knolls
Landform position: Summits, interfluves, and backslopes
Parent material: Loess and the underlying mix of loess and glacial till
Slope range: 0 to 5 percent
Taxonomic classification: Fine, montmorillonitic, mesic Aeric Ochraqualfs

Typical Pedon

Bluford silt loam, 0 to 2 percent slopes, about 1,495 feet south and 1,185 feet west of the northeast corner of sec. 16, T. 5 N., R. 5 E.

Ap—0 to 7 inches; brown (10YR 5/3) silt loam, very pale brown (10YR 7/3) dry; moderate fine granular structure in the upper part and moderate thin platy structure in the lower part; friable; many fine roots; common medium rounded nodules of iron and manganese oxide; neutral; abrupt smooth boundary.

E—7 to 12 inches; yellowish brown (10YR 5/4) silt loam; few fine distinct yellowish brown (10YR 5/6) and common fine distinct light brownish gray (10YR 6/2) mottles; weak thick platy structure; friable; common fine roots; very few distinct white (10YR 8/1 dry) silt coatings on horizontal faces of peds; common medium rounded nodules of iron and manganese oxide; very strongly acid; clear wavy boundary.

Bt/E—12 to 18 inches; brown (10YR 5/3) silty clay loam (Bt); pale brown (10YR 6/3) silt loam (E); the E material occurs as prominent coatings on faces of peds (10 to 15 percent by volume); common fine distinct yellowish brown (10YR 5/6) mottles; weak fine prismatic structure parting to moderate fine angular blocky; firm; common fine roots; few distinct grayish brown (10YR 5/2) clay films on faces of peds; few medium rounded nodules of iron and manganese oxide; very strongly acid; clear wavy boundary.

Btg1—18 to 32 inches; grayish brown (10YR 5/2) silty clay; common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; very firm; few very fine roots; few distinct gray (10YR 5/1) clay films and few distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; few fine rounded nodules of iron and manganese oxide; very strongly acid; gradual wavy boundary.

Btg2—32 to 38 inches; grayish brown (10YR 5/2) silty clay loam; common medium prominent strong brown (7.5YR 4/6) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; very firm; few very fine roots; few distinct gray (10YR 5/1) and few distinct dark grayish brown (10YR 4/2) clay films on faces of peds; common fine rounded nodules of iron and manganese oxide; very strongly acid; clear wavy boundary.

2Btx—38 to 45 inches; light brownish gray (10YR 6/2) silty clay loam; common medium prominent strong brown (7.5YR 4/6) mottles; weak medium prismatic structure; firm and slightly brittle; very few distinct gray (10YR 5/1) clay films on faces of peds; common fine rounded nodules of iron and manganese oxide; about 12 percent fine sand; very strongly acid; abrupt wavy boundary.

2BCg—45 to 60 inches; mottled grayish brown (10YR 5/2) and dark gray (10YR 4/1) clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure; firm; very few distinct gray (10YR 5/1) clay films in pores; few medium irregular accumulations of iron and manganese oxide; about 1 percent fine gravel; very strongly acid.

Range in Characteristics

Thickness of the loess: 30 to 45 inches

Ap horizon:
Hue—10YR
Value—4 or 5
Chroma—2 or 3
Texture—silt loam

E horizon (if it occurs):
Hue—10YR
Value—4 to 6
Chroma—2 to 4
Texture—silt loam

Bt or Btg horizon:
Hue—10YR
Value—4 to 6
Chroma—2 to 4
Texture—silty clay or silty clay loam

2Btx horizon:
Hue—10YR
Value—5 or 6
Chroma—2
Texture—silty clay loam, clay loam, loam, or silt loam

2BCg horizon (if it occurs):
Hue—10YR

Value—4 to 6
Chroma—1 to 4
Texture—silty clay loam, clay loam, loam, or silt loam

Bonnie Series

Drainage class: Poorly drained
Permeability: Moderately slow
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Taxonomic classification: Fine-silty, mixed, acid, mesic Typic Fluvaquents

Typical Pedon

Bonnie silt loam, frequently flooded, about 1,690 feet north and 1,110 feet west of the southeast corner of sec. 3, T. 3 N., R. 7 E.

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; few fine faint gray (10YR 5/1) mottles; weak fine granular structure; friable; common very fine roots; few medium rounded nodules of iron and manganese oxide; slightly acid; abrupt smooth boundary.

ACg—9 to 13 inches; light brownish gray (10YR 6/2) silt loam, pale brown (10YR 6/3) dry; common medium distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure; firm; few very fine roots; few distinct dark grayish brown (10YR 4/2) organic coatings on faces of peds; common medium rounded nodules of iron and manganese oxide; strongly acid; clear wavy boundary.

Cg1—13 to 26 inches; light brownish gray (10YR 6/2) silt loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure; firm; few very fine roots; common medium rounded nodules of iron and manganese oxide; very strongly acid; clear wavy boundary.

Cg2—26 to 45 inches; stratified light brownish gray (10YR 6/2) and light gray (10YR 7/2) silt loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure; firm; few very fine roots; common medium rounded nodules of iron and manganese oxide; very strongly acid; abrupt wavy boundary.

Cg3—45 to 60 inches; grayish brown (10YR 5/2) silty clay loam stratified with thin bands of light gray (10YR 7/2) silt loam; common medium distinct dark yellowish brown (10YR 4/4) mottles; weak medium prismatic structure; firm; many medium irregular accumulations of iron and manganese oxide; very strongly acid.

Range in Characteristics

Ap horizon:
Hue—10YR
Value—4 or 5
Chroma—2
Texture—silt loam

Cg horizon:
Hue—10YR or 2.5Y
Value—5 to 7
Chroma—1 or 2
Texture—silt loam or silty clay loam

Cisne Series

Drainage class: Poorly drained
Permeability: Very slow
Landform: Till plains
Landform position: Interfluves
Parent material: Loess and the underlying mix of loess and glacial till
Slope range: 0 to 2 percent
Taxonomic classification: Fine, montmorillonitic, mesic Mollic Albaqualfs

Typical Pedon

Cisne silt loam, about 330 feet south and 200 feet east of the northwest corner of sec. 26, T. 4 N., R. 5 E.

Ap—0 to 7 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; weak medium granular structure; friable; common medium rounded nodules of iron and manganese oxide; moderately acid; abrupt smooth boundary.

Eg1—7 to 12 inches; grayish brown (10YR 5/2) silt loam; moderate medium platy structure; friable; common distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds; common medium rounded nodules of iron and manganese oxide; strongly acid; clear wavy boundary.

Eg2—12 to 19 inches; light brownish gray (10YR 6/2) silt loam; common fine distinct yellowish brown (10YR 5/6) mottles; weak thick platy structure; friable; few distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds; common medium rounded nodules of iron and manganese oxide; strongly acid; abrupt wavy boundary.

Btg1—19 to 32 inches; light brownish gray (10YR 6/2) silty clay; common fine prominent strong brown

(7.5YR 4/6) and common fine prominent yellowish red (5YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; very firm; common distinct dark gray (10YR 4/1) clay films on faces of peds; few medium rounded nodules of iron and manganese oxide; strongly acid; abrupt wavy boundary.

Btg2—32 to 48 inches; light brownish gray (2.5Y 6/2) silty clay loam; common medium prominent yellowish brown (10YR 5/6) mottles; weak medium prismatic structure; firm; few distinct dark gray (10YR 4/1) clay films on faces of peds; common medium irregular accumulations of iron and manganese oxide; moderately acid; clear wavy boundary.

2Btg3—48 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam; common coarse prominent yellowish brown (10YR 5/6) mottles; weak medium prismatic structure; firm; very few distinct dark gray (10YR 4/1) clay films on faces of peds; common medium irregular accumulations of iron and manganese oxide; about 1 percent fine gravel; slightly acid.

Range in Characteristics

Thickness of the loess: 30 to 55 inches

Ap horizon:
Hue—10YR
Value—3
Chroma—2 or 3
Texture—silt loam

Eg horizon:
Hue—10YR
Value—4 to 7
Chroma—1 or 2
Texture—silt loam

Btg horizon:
Hue—10YR or 2.5Y
Value—5 to 7
Chroma—1 or 2
Texture—silty clay or silty clay loam

2Btg horizon:
Hue—10YR or 2.5Y
Value—5 or 6
Chroma—1 or 2
Texture—silty clay loam, clay loam, or silt loam

Creal Series

Drainage class: Somewhat poorly drained
Permeability: Moderately slow
Landform: Till plains
Landform position: Footslopes
Parent material: Mix of loess and local alluvium
Slope range: 2 to 5 percent
Taxonomic classification: Fine-silty, mixed, mesic Aeric Ochraqualfs

Typical Pedon

Creal silt loam, 2 to 5 percent slopes, about 1,755 feet south and 235 feet west of the northeast corner of sec. 6, T. 4 N., R. 6 E.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; common very fine roots; common medium rounded nodules of iron and manganese oxide; neutral; abrupt smooth boundary.

E1—6 to 16 inches; brown (10YR 5/3) silt loam; common fine faint light brownish gray (10YR 6/2) and few fine distinct yellowish brown (10YR 5/6) mottles; weak thick platy structure; friable; few very fine roots; few distinct dark grayish brown (10YR 4/2) organic coatings on faces of peds; common medium rounded nodules of iron and manganese oxide; strongly acid; clear wavy boundary.

E2—16 to 25 inches; pale brown (10YR 6/3) silt loam; common medium faint light brownish gray (10YR 6/2) and common fine distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure; friable; few very fine roots; common medium rounded nodules of iron and manganese oxide; very strongly acid; clear wavy boundary.

Btg1—25 to 45 inches; light brownish gray (10YR 6/2) silty clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to weak coarse angular blocky; firm; few very fine roots; few distinct light gray (10YR 7/2 dry) silt coatings and few distinct grayish brown (10YR 5/2) clay films on faces of peds; few medium rounded nodules of iron and manganese oxide; very strongly acid; abrupt wavy boundary.

Btg2—45 to 57 inches; grayish brown (10YR 5/2) clay loam; common medium distinct dark yellowish brown (10YR 4/6) mottles; weak medium prismatic structure; very firm; few very fine roots; few distinct gray (10YR 5/1) clay films on faces of peds; few medium rounded nodules of iron and manganese oxide; moderately acid; clear wavy boundary.

Btg3—57 to 60 inches; grayish brown (10YR 5/2) clay loam; common medium distinct dark yellowish brown (10YR 4/6) mottles; weak medium

prismatic structure; firm; few distinct dark gray (10YR 4/1) clay films on faces of peds; common medium irregular accumulations of iron and manganese oxide; slightly acid.

Range in Characteristics

Ap horizon:
Hue—10YR
Value—4 or 5
Chroma—2 or 3
Texture—silt loam

E horizon:
Hue—10YR
Value—5 or 6
Chroma—2 to 4
Texture—silt loam

Bt or Btg horizon:
Hue—10YR or 2.5Y
Value—5 or 6
Chroma—2 to 4
Texture—silty clay loam or clay loam in the lower part

Darmstadt Series

Drainage class: Somewhat poorly drained
Permeability: Very slow
Landform: Till plains and knolls
Landform position: Summits, interfluves, and backslopes
Parent material: Loess and the underlying mix of loess and glacial till
Slope range: 0 to 5 percent
Taxonomic classification: Fine-silty, mixed, mesic Albic Natraqualfs

Typical Pedon

Darmstadt silt loam, in an area of Darmstadt-Hoyleton complex, 0 to 2 percent slopes, about 915 feet south and 660 feet west of the center of sec. 16, T. 3 N., R. 7 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; moderate very fine granular structure; friable; many very fine roots; few medium rounded nodules of iron and manganese oxide; 1 percent exchangeable sodium; slightly alkaline; abrupt smooth boundary.

E—8 to 13 inches; light brownish gray (10YR 6/2) silt loam; few fine distinct dark yellowish brown (10YR 4/6) mottles; weak thick platy structure; friable; many very fine roots; few distinct dark grayish brown (10YR 4/2) organic coatings on faces of peds; common medium rounded nodules of iron and manganese oxide; 1 percent exchangeable sodium; slightly alkaline; abrupt wavy boundary.

Btn—13 to 20 inches; brown (10YR 5/3) silty clay; common medium faint grayish brown (10YR 5/2) and common medium prominent strong brown (7.5YR 4/6) mottles; strong medium prismatic structure parting to strong medium angular blocky; very firm; common very fine roots; very few distinct white (10YR 8/1 dry) silt coatings and many distinct dark gray (10YR 4/1) clay films on faces of peds; few fine rounded nodules of iron and manganese oxide; 14 percent exchangeable sodium; moderately acid; clear wavy boundary.

Btng1—20 to 28 inches; light brownish gray (10YR 6/2) silty clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure parting to weak coarse angular blocky; firm; few very fine roots; very few distinct white (10YR 8/1 dry) silt coatings and few distinct dark gray (10YR 4/1) clay films on faces of peds; few fine rounded nodules of iron and manganese oxide and few fine irregular accumulations of calcium carbonate; 23 percent exchangeable sodium; slight effervescence; moderately alkaline; clear wavy boundary.

Btng2—28 to 40 inches; light brownish gray (2.5Y 6/2) silty clay loam; common medium prominent strong brown (7.5YR 4/6) mottles; moderate coarse prismatic structure parting to moderate coarse angular blocky; firm; few very fine roots; few distinct white (10YR 8/1 dry) silt coatings and few distinct gray (10YR 5/1) clay films on faces of peds; common medium irregular accumulations of iron and manganese oxide and few fine irregular accumulations of calcium carbonate; 25 percent exchangeable sodium; strong effervescence; strongly alkaline; gradual wavy boundary.

2Btng3—40 to 60 inches; light gray (10YR 6/1) silty clay loam; common medium prominent strong brown (7.5YR 4/6) mottles; weak coarse angular blocky structure; firm; few very fine roots; few distinct white (10YR 8/1 dry) silt coatings and few distinct gray (10YR 5/1) clay films on faces of peds; common medium irregular accumulations of iron and manganese oxide and few fine irregular accumulations of calcium carbonate; about 1 percent fine gravel; 17 percent exchangeable sodium; slight effervescence; moderately alkaline.

Range in Characteristics

Depth to horizon with 15 percent or more exchangeable sodium: Between 6 and 16 inches below the top of the argillic horizon
Thickness of the loess: 30 to 50 inches

Ap horizon:
Hue—10YR
Value—3 or 4
Chroma—2 or 3
Texture—silt loam

E horizon (if it occurs):
Hue—10YR
Value—5 or 6
Chroma—2
Texture—silt loam

Btn or Btng horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—2 to 4
Texture—silty clay loam or silty clay

2Btng or 2BCg horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—1 to 6
Texture—silty clay loam, clay loam, or loam

Frondorf Series

Drainage class: Well drained
Permeability: Moderate
Landform: Till plains
Landform position: Backslopes
Parent material: Loess and the underlying residuum derived from sandstone and siltstone
Slope range: 10 to 35 percent
Taxonomic classification: Fine-loamy, mixed, mesic Ultic Hapludalfs
Taxadjunct features: Frondorf silt loam, 18 to 35 percent slopes, has a lower base saturation immediately above the paralithic contact than is defined as the range for the series. It is classified as fine-loamy, mixed, mesic Typic Hapludults.

Typical Pedon

Frondorf silt loam, 10 to 18 percent slopes, eroded, about 845 feet north and 1,900 feet west of the southeast corner of sec. 30, T. 3 N., R. 8 E.

Ap—0 to 7 inches; brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; mixed with yellowish brown (10YR 5/4) material from the subsoil; weak fine granular structure; friable; common very fine roots; few fine rounded nodules of iron and manganese oxide; neutral; abrupt smooth boundary.
Bt1—7 to 11 inches; yellowish brown (10YR 5/4) silty clay loam; common fine prominent strong brown (7.5YR 5/6) mottles; moderate medium subangular blocky structure; friable; common very fine roots; common distinct brown (10YR 4/3) clay films on faces of peds; few fine rounded nodules of iron and manganese oxide; neutral; clear wavy boundary.
Bt2—11 to 18 inches; light yellowish brown (10YR 6/4) silty clay loam; common fine prominent red (2.5YR 4/6) and common medium prominent strong brown (7.5YR 5/6) mottles; moderate fine prismatic structure parting to moderate fine angular blocky; firm; common very fine roots; common distinct brown (10YR 4/3) clay films on faces of peds; common fine rounded nodules of iron and manganese oxide; strongly acid; clear wavy boundary.
2Bt3—18 to 29 inches; yellowish brown (10YR 5/4) silty clay loam; common fine prominent red (2.5YR 4/6) and common medium prominent strong brown (7.5YR 5/6) mottles; strong medium prismatic structure parting to strong fine angular blocky; firm; common very fine roots; common distinct brown (10YR 5/3) clay films on faces of peds; many medium irregular accumulations of iron and manganese oxide; about 5 percent sandstone and siltstone channers; very strongly acid; abrupt wavy boundary.
2BC—29 to 35 inches; yellowish brown (10YR 5/6) channery silty clay loam; common fine prominent light gray (10YR 6/1) and common fine prominent red (2.5YR 4/6) mottles; massive; firm; few distinct brown (10YR 5/3) clay films on faces of channers; about 34 percent sandstone and siltstone channers; strongly acid; clear wavy boundary.
2Cr—35 to 60 inches; weathered sandstone and siltstone.

Range in Characteristics

Depth to bedrock: 20 to 40 inches

Ap or A horizon:
Hue—10YR
Value—3 or 4
Chroma—2 to 4
Texture—silt loam

E horizon (if it occurs):
Hue—10YR
Value—4

Chroma—3 or 4
Texture—silt loam

Bt horizon:
Hue—10YR
Value—4 to 6
Chroma—4 to 6
Texture—silty clay loam

2Bt or 2BC horizon:
Hue—10YR
Value—5 or 6
Chroma—3 to 6
Texture—silty clay loam, clay loam, or loam or the channery analogs of these textures

Gosport Series

Drainage class: Moderately well drained
Permeability: Very slow
Landform: Till plains
Landform position: Backslopes
Parent material: Glacial till and the underlying residuum derived from shale
Slope range: 18 to 35 percent
Taxonomic classification: Fine, illitic, mesic Typic Dystrochrepts

Typical Pedon

Gosport loam, in an area of Hickory-Gosport complex, 18 to 35 percent slopes, about 1,625 feet south and 740 feet east of the northwest corner of sec. 11, T. 4 N., R. 5 E.

A—0 to 3 inches; dark grayish brown (10YR 4/2) loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; common very fine roots; common distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds; few fine rounded nodules of iron and manganese oxide; about 1 percent fine gravel; slightly acid; clear smooth boundary.

E—3 to 6 inches; brown (10YR 4/3) loam; weak thin platy structure; friable; common very fine roots; common distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds; few fine rounded nodules of iron and manganese oxide; about 1 percent fine gravel; moderately acid; abrupt wavy boundary.

2Bw1—6 to 13 inches; light olive brown (2.5Y 5/4) clay; many fine prominent yellowish brown (10YR 5/6) mottles; weak fine prismatic structure; very firm; few very fine roots; very few distinct brown (10YR 5/3) clay films on vertical faces of peds; very strongly acid; clear wavy boundary.

2Bw2—13 to 27 inches; light olive brown (2.5Y 5/4) silty clay; common fine prominent yellowish brown (10YR 5/6) and common fine distinct light brownish gray (2.5Y 6/2) mottles; weak medium prismatic structure; firm; few very fine roots; very few distinct brown (10YR 5/3) clay films on vertical faces of peds; very strongly acid; clear wavy boundary.

2Bw3—27 to 38 inches; light olive brown (2.5Y 5/4) silty clay; common fine prominent yellowish brown (10YR 5/6) and common fine prominent light gray (10YR 6/1) mottles; weak medium prismatic structure; firm; few very fine roots; very few distinct gray (10YR 5/1) clay films on vertical faces of peds; very strongly acid; abrupt wavy boundary.

2Cr—38 to 60 inches; weathered shale.

Range in Characteristics

Depth to bedrock: 20 to 40 inches
Thickness of the glacial till: Less than 15 inches

A horizon:
Hue—10YR
Value—3 or 4
Chroma—2 or 3
Texture—loam, silt loam, or silty clay loam

E horizon:
Hue—10YR
Value—4 or 5
Chroma—3 or 4
Texture—loam or silt loam

2Bw horizon:
Hue—10YR, 2.5Y, or 5Y
Value—5 or 6
Chroma—2 to 4
Texture—silty clay loam, silty clay, or clay

Grantfork Series

Drainage class: Somewhat poorly drained
Permeability: Slow
Landform: Till plains
Landform position: Backslopes
Parent material: Mix of loess and glacial till and the underlying glacial till
Slope range: 5 to 10 percent
Taxonomic classification: Fine-loamy, mixed, mesic, sloping Aeric Ochraqualfs

Typical Pedon

Grantfork silty clay loam, in an area of Blair-Grantfork complex, 5 to 10 percent slopes, eroded, about 205

feet north and 290 feet east of the southwest corner of sec. 15, T. 3 N., R. 7 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silty clay loam, pale brown (10YR 6/3) dry; mixed with brown (10YR 5/3) material from the subsoil; moderate fine subangular blocky structure; firm; many fine roots; few fine rounded nodules of iron and manganese oxide; about 1 percent fine gravel; neutral; abrupt smooth boundary.

Bt—8 to 13 inches; brown (10YR 5/3) silty clay loam; common medium distinct dark yellowish brown (10YR 4/6) and common medium faint light brownish gray (10YR 6/2) mottles; moderate fine subangular blocky structure; firm; common fine roots; common distinct grayish brown (10YR 5/2) clay films on faces of peds; few fine rounded nodules of iron and manganese oxide; about 1 percent fine gravel; 3 percent exchangeable sodium; moderately acid; abrupt wavy boundary.

Btng1—13 to 17 inches; grayish brown (10YR 5/2) silty clay loam; common medium distinct dark yellowish brown (10YR 4/6) mottles; moderate medium prismatic structure parting to moderate medium subangular blocky; firm; few fine roots; common distinct gray (10YR 5/1) clay films on faces of peds; common fine rounded nodules of iron and manganese oxide; about 2 percent fine gravel; 5 percent exchangeable sodium; neutral; clear wavy boundary.

Btng2—17 to 26 inches; grayish brown (10YR 5/2) silty clay loam; common medium distinct dark yellowish brown (10YR 4/6) and few coarse faint light brownish gray (10YR 6/2) mottles; moderate medium prismatic structure parting to weak medium subangular blocky; firm; few fine roots; many distinct gray (10YR 5/1) clay films on faces of peds; few fine rounded nodules of iron and manganese oxide and few fine irregular accumulations of calcium carbonate; about 2 percent fine gravel; 7 percent exchangeable sodium; slight effervescence; moderately alkaline; clear wavy boundary.

2Btng3—26 to 36 inches; grayish brown (10YR 5/2) loam; few fine distinct dark yellowish brown (10YR 4/6) and few coarse faint light brownish gray (10YR 6/2) mottles; moderate medium prismatic structure; firm; common distinct gray (10YR 5/1) clay films on faces of peds; few fine rounded nodules of iron and manganese oxide and common medium irregular accumulations of calcium carbonate; about 3 percent fine gravel; 10 percent exchangeable sodium; violent effervescence; moderately alkaline; clear wavy boundary.

2Btng4—36 to 47 inches; grayish brown (10YR 5/2) silt loam; few fine distinct dark yellowish brown (10YR 4/6) mottles; moderate medium prismatic structure; firm; common distinct gray (10YR 5/1) clay films on faces of peds; few fine rounded nodules of iron and manganese oxide and common medium irregular accumulations of calcium carbonate; about 3 percent fine gravel; 9 percent exchangeable sodium; strong effervescence; moderately alkaline; clear wavy boundary.

2Btng5—47 to 60 inches; grayish brown (2.5Y 5/2) clay loam; common medium prominent dark yellowish brown (10YR 4/6) mottles; weak coarse prismatic structure; firm; few distinct gray (10YR 5/1) clay films on faces of peds; few fine rounded nodules of iron and manganese oxide and many medium irregular accumulations of calcium carbonate; about 5 percent fine gravel; 7 percent exchangeable sodium; strong effervescence; moderately alkaline.

Range in Characteristics

Depth to horizon with 10 to 15 percent exchangeable sodium: 10 to 40 inches
Depth to glacial till: 45 inches or less

Ap horizon:
Hue—10YR
Value—3 or 4
Chroma—2 to 4
Texture—silty clay loam or clay loam

Bt, Btng, or 2Btng horizon:
Hue—10YR, 2.5Y, or 7.5YR
Value—4 to 6
Chroma—1 to 4
Texture—silty clay loam, clay loam, loam, or silt loam

Hickory Series

Drainage class: Moderately well drained and well drained
Permeability: Moderate
Landform: Till plains
Landform position: Backslopes
Parent material: Glacial till
Slope range: 10 to 60 percent
Taxonomic classification: Fine-loamy, mixed, mesic Typic Hapludalfs

Typical Pedon

Hickory loam, 18 to 35 percent slopes, about 2,340

feet south and 1,980 feet east of the northwest corner of sec. 31, T. 3 N., R. 5 E.

A—0 to 2 inches; very dark grayish brown (10YR 3/2) loam, light brownish gray (10YR 6/2) dry; moderate fine granular structure; friable; common fine roots; about 1 percent fine gravel; moderately acid; clear smooth boundary.

E—2 to 9 inches; dark yellowish brown (10YR 4/4) loam; weak medium platy structure; friable; common fine roots; few distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds; few medium rounded nodules of iron and manganese oxide; about 1 percent fine gravel; very strongly acid; clear wavy boundary.

Bt1—9 to 16 inches; yellowish brown (10YR 5/4) clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; weak fine prismatic structure parting to weak medium angular blocky; friable; few fine roots; very few distinct dark brown (10YR 4/3) clay films on faces of peds; few medium rounded nodules of iron and manganese oxide; about 2 percent fine gravel; very strongly acid; clear wavy boundary.

Bt2—16 to 31 inches; yellowish brown (10YR 5/6) clay loam; moderate medium prismatic structure parting to moderate medium angular blocky; firm; few fine roots; few distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; few medium rounded nodules of iron and manganese oxide; about 3 percent medium gravel and coarse sandstone channers; very strongly acid; clear wavy boundary.

Bt3—31 to 44 inches; yellowish brown (10YR 5/6) clay loam; common fine distinct light brownish gray (10YR 6/2) mottles; moderate medium prismatic structure; firm; few fine roots; common distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; common medium irregular accumulations of iron and manganese oxide; about 5 percent medium gravel and coarse sandstone channers; strongly acid; clear wavy boundary.

C—44 to 60 inches; brown (10YR 5/3) clay loam; common coarse distinct yellowish brown (10YR 5/6) and common medium faint light brownish gray (10YR 6/2) mottles; massive; very firm; few distinct dark yellowish brown (10YR 4/4) clay films on vertical faces of soil fragments; common medium irregular accumulations of iron and manganese oxide and common medium irregular accumulations of calcium carbonate; about 10 percent medium gravel and coarse sandstone channers; violent effervescence; neutral.

Range in Characteristics

Depth to carbonates: 40 to 60 inches

A or Ap horizon:
Hue—10YR
Value—3 to 5
Chroma—2 to 4
Texture—loam, silt loam, or clay loam

E horizon (if it occurs):
Hue—10YR
Value—4 or 5
Chroma—3 or 4
Texture—loam or silt loam

Bt or BC horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—3 to 6
Texture—clay loam or loam

C horizon:
Hue—10YR
Value—5
Chroma—2 to 6
Texture—clay loam, loam, or gravelly clay loam

Holton Series

Drainage class: Somewhat poorly drained
Permeability: Moderate
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Taxonomic classification: Coarse-loamy, mixed, nonacid, mesic Aeric Fluvaquents

Typical Pedon

Holton silt loam, frequently flooded, about 245 feet south and 535 feet west of the center of sec. 9, T. 2 N., R. 5 E.

A1—0 to 3 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; many fine roots; common distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds; few fine rounded nodules of iron and manganese oxide; neutral; abrupt smooth boundary.

A2—3 to 8 inches; grayish brown (10YR 5/2) silt loam; common fine prominent strong brown (7.5YR 4/6) mottles; weak medium angular blocky structure; friable; common fine roots; few medium rounded nodules of iron and manganese

oxide; about 1 percent fine gravel; slightly acid; clear wavy boundary.

Bw1—8 to 24 inches; brown (10YR 5/3) silt loam; common medium faint grayish brown (10YR 5/2) and common medium distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure; friable; common very fine roots; few distinct dark grayish brown (10YR 4/2) clay films on faces of peds and in pores; common medium rounded nodules of iron and manganese oxide; about 1 percent fine gravel; slightly acid; clear wavy boundary.

Bw2—24 to 31 inches; grayish brown (10YR 5/2) loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak coarse subangular blocky structure; friable; few very fine roots; very few distinct gray (10YR 5/1) clay films on faces of peds and in pores; common medium rounded nodules of iron and manganese oxide; about 2 percent fine gravel; slightly acid; abrupt wavy boundary.

C1—31 to 47 inches; grayish brown (10YR 5/2) loam; common medium distinct yellowish brown (10YR 5/6) and common medium faint light gray (10YR 6/1) mottles; massive; friable; few very fine roots; few distinct white (10YR 8/1 dry) silt coatings and very few distinct dark gray (10YR 4/1) clay films in pores; common medium rounded nodules of iron and manganese oxide; about 2 percent fine gravel; slightly acid; clear wavy boundary.

C2—47 to 60 inches; stratified grayish brown (10YR 5/2) sandy loam and light gray (10YR 6/1) loamy sand; common medium distinct yellowish brown (10YR 5/6) and common medium faint light gray (10YR 6/1) mottles; massive; friable; very few distinct dark gray (10YR 4/1) clay films in pores; common medium rounded nodules of iron and manganese oxide; about 3 percent fine gravel; slightly acid.

Range in Characteristics

A horizon:
Hue—10YR
Value—4 or 5
Chroma—2 or 3
Texture—silt loam

Bw horizon:
Hue—10YR
Value—4 or 5
Chroma—2 or 3
Texture—silt loam or loam

C horizon:
Hue—10YR
Value—4 or 5
Chroma—1 to 3
Texture—loam, sandy loam, or loamy sand

Hoyleton Series

Drainage class: Somewhat poorly drained
Permeability: Slow
Landform: Till plains and knolls
Landform position: Summits, interfluves, and backslopes
Parent material: Loess and the underlying mix of loess and glacial till
Slope range: 0 to 5 percent
Taxonomic classification: Fine, montmorillonitic, mesic Aquollic Hapludalfs

Typical Pedon

Hoyleton silt loam, 0 to 2 percent slopes, about 1,855 feet south and 495 feet east of the northwest corner of sec. 10, T. 3 N., R. 5 E.

Ap—0 to 8 inches; dark brown (10YR 3/3) silt loam, brown (10YR 5/3) dry; moderate fine granular structure; friable; few very fine roots; few fine rounded nodules of iron and manganese oxide; neutral; abrupt smooth boundary.

E—8 to 12 inches; brown (10YR 5/3) silt loam; few fine distinct yellowish brown (10YR 5/6) mottles; weak medium platy structure; friable; few very fine roots; few distinct very dark gray (10YR 3/1) organic coatings on faces of peds; common fine rounded nodules of iron and manganese oxide; strongly acid; clear wavy boundary.

Bt1—12 to 17 inches; yellowish brown (10YR 5/4) silty clay loam; common medium prominent yellowish red (5YR 5/6) mottles; moderate fine prismatic structure parting to moderate fine angular blocky; friable; few very fine roots; few distinct light gray (10YR 7/2 dry) silt coatings and few distinct dark grayish brown (10YR 4/2) clay films on faces of peds; few fine rounded nodules of iron and manganese oxide; very strongly acid; clear wavy boundary.

Bt2—17 to 25 inches; brown (10YR 5/3) silty clay; common fine distinct gray (10YR 5/1) and common medium prominent yellowish red (5YR 5/6) mottles; moderate medium prismatic structure parting to moderate fine angular blocky; firm; few very fine roots; common distinct light gray (10YR 7/2 dry) silt coatings and common distinct dark gray (10YR 4/1) clay films on faces of peds; few fine rounded nodules of iron and

manganese oxide; very strongly acid; clear wavy boundary.

Btg—25 to 33 inches; light brownish gray (10YR 6/2) silty clay; common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; firm; few very fine roots; common distinct dark gray (10YR 4/1) and very dark gray (10YR 3/1) clay films on faces of peds; few fine rounded nodules of iron and manganese oxide; strongly acid; abrupt wavy boundary.

2BCg—33 to 60 inches; grayish brown (10YR 5/2) silty clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure; firm; very few distinct dark gray (10YR 4/1) clay films on vertical faces of peds; common medium rounded nodules of iron and manganese oxide; about 1 percent fine gravel; moderately acid.

Range in Characteristics

Thickness of the loess: 30 to 50 inches

Ap horizon:
Hue—10YR
Value—3
Chroma—2 or 3
Texture—silt loam

E horizon (if it occurs):
Hue—10YR
Value—4 or 5
Chroma—3 or 4
Texture—silt loam

Bt or Btg horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—2 to 4
Texture—silty clay loam or silty clay

2Btg or 2BCg horizon:
Hue—10YR
Value—4 to 6
Chroma—1 to 4
Texture—silty clay loam, clay loam, silt loam, or loam

Huey Series

Drainage class: Poorly drained
Permeability: Very slow
Landform: Till plains
Landform position: Interfluves
Parent material: Loess and the underlying mix of loess and glacial till
Slope range: 0 to 2 percent
Taxonomic classification: Fine-silty, mixed, mesic Typic Natraqualfs

Typical Pedon

Huey silt loam, in an area of Cisne-Huey complex, about 1,070 feet north and 245 feet east of the southwest corner of sec. 18, T. 4 N., R. 8 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure in the upper part and moderate very thin platy structure in the lower part; friable; few medium rounded nodules of iron and manganese oxide; 2 percent exchangeable sodium; neutral; abrupt smooth boundary.

Bt/Eg—8 to 12 inches; light gray (10YR 6/1) (Bt) and light brownish gray (10YR 6/2) (Eg) silt loam; the E material occurs as prominent coatings on faces of peds (20 to 25 percent by volume); few fine prominent yellowish brown (10YR 5/6) mottles; weak medium angular blocky structure; friable; few distinct dark gray (10YR 4/1) clay films on faces of peds; few medium rounded nodules of iron and manganese oxide; 14 percent exchangeable sodium; strongly alkaline; clear wavy boundary.

Btng1—12 to 23 inches; light brownish gray (2.5Y 6/2) silt loam; common medium prominent yellowish brown (10YR 5/6) mottles; weak medium prismatic structure; firm; few prominent white (10YR 8/1 dry) silt coatings and few distinct dark gray (10YR 4/1) clay films on faces of peds; few medium rounded nodules of iron and manganese oxide and many medium irregular accumulations of calcium carbonate; 39 percent exchangeable sodium; violent effervescence; strongly alkaline; clear wavy boundary.

Btng2—23 to 37 inches; light brownish gray (2.5Y 6/2) silty clay loam; common medium prominent strong brown (7.5YR 4/6) mottles; weak medium prismatic structure; firm; very few distinct white (10YR 8/1 dry) silt coatings and few distinct gray (10YR 5/1) clay films on faces of peds; few medium rounded nodules of iron and manganese oxide and common medium irregular accumulations of calcium carbonate; 61 percent exchangeable sodium; slight effervescence; strongly alkaline; clear wavy boundary.

Btng3—37 to 52 inches; light gray (10YR 6/1) silty clay loam; many medium prominent strong brown (7.5YR 4/6) mottles; weak medium prismatic structure; firm; very few distinct white (10YR 8/1 dry) silt coatings in pores and very few distinct gray (10YR 5/1) clay films on faces of peds;

common medium irregular accumulations of iron and manganese oxide and common medium irregular accumulations of calcium carbonate; 53 percent exchangeable sodium; slight effervescence; strongly alkaline; abrupt wavy boundary.

2BCng—52 to 60 inches; light gray (10YR 6/1) clay loam; common medium prominent strong brown (7.5YR 4/6) mottles; weak medium prismatic structure; very firm; very few distinct gray (10YR 5/1) clay films in pores; few medium rounded nodules of iron and manganese oxide and common medium irregular accumulations of calcium carbonate; 40 percent exchangeable sodium; slight effervescence; strongly alkaline.

Range in Characteristics

Depth to horizon with 15 percent or more exchangeable sodium: Within 6 inches of the top of the argillic horizon

Thickness of the loess: 30 to 55 inches

Ap horizon:
Hue—10YR
Value—3 or 4
Chroma—2
Texture—silt loam

Bt/Eg or Eg horizon:
Hue—10YR
Value—4 to 6
Chroma—1 or 2
Texture—silt loam

Btng horizon:
Hue—10YR or 2.5Y
Value—5 or 6
Chroma—1 or 2
Texture—silty clay loam or silt loam

2Btng or 2BCng horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—1 or 2
Texture—clay loam, silty clay loam, silt loam, or loam

Lenzburg Series

Drainage class: Well drained
Permeability: Moderately slow
Landform: Till plains
Landform position: Backslopes and summits
Parent material: Mix of glacial till and residuum derived from shale and limestone; from surface mining operations
Slope range: 15 to 25 percent
Taxonomic classification: Fine-loamy, mixed (calcareous), mesic Typic Udorthents

Typical Pedon

Lenzburg clay loam, 15 to 25 percent slopes, stony, about 2,600 feet south and 715 feet east of the northwest corner of sec. 2, T. 4 N., R. 5 E.

Ap—0 to 4 inches; mixed light gray (10YR 6/1) and grayish brown (10YR 5/2) clay loam, light gray (10YR 7/1) dry; weak medium granular structure; firm; common very fine roots; about 10 percent shale and limestone channers; slight effervescence; slightly alkaline; clear wavy boundary.

C1—4 to 22 inches; mixed light gray (10YR 6/1), very dark gray (2.5Y 3/0), and yellowish brown (10YR 5/6) channery clay loam; massive; firm; common very fine roots; about 20 percent shale and limestone channers; strong effervescence; slightly alkaline; abrupt wavy boundary.

C2—22 to 60 inches; mixed light gray (10YR 6/1), very dark gray (2.5Y 3/0), and yellowish brown (10YR 5/6) channery clay loam; massive; firm; few medium irregular accumulations of calcium carbonate; about 20 percent shale and limestone channers and limestone gravel; strong effervescence; slightly alkaline.

Range in Characteristics

Content of rock fragments in the control section: 10 to 35 percent

Ap horizon:
Hue—10YR or 2.5Y
Value—3 to 6
Chroma—1 to 6
Texture—clay loam or channery clay loam

C horizon:
Hue—10YR, 2.5Y, 7.5YR, or neutral
Value—3 to 6
Chroma—0 to 8
Texture—clay loam, silty clay loam, or loam or the channery or gravelly analogs of these textures

Newberry Series

Drainage class: Poorly drained
Permeability: Slow
Landform: Depressions on till plains
Landform position: Toeslopes

Parent material: Loess and the underlying mix of loess and glacial till
Slope range: 0 to 2 percent
Taxonomic classification: Fine-silty, mixed, mesic Mollic Ochraqualfs

Typical Pedon

Newberry silt loam, ponded, about 1,775 feet north and 1,855 feet east of the southwest corner of sec. 6, T. 5 N., R. 7 E.

Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) silt loam, brown (10YR 5/3) dry; weak fine granular structure; friable; few fine rounded nodules of iron and manganese oxide; neutral; abrupt smooth boundary.
Eg—7 to 13 inches; gray (10YR 5/1) silt loam; common fine prominent yellowish brown (10YR 5/6) mottles; weak medium platy structure; friable; few fine rounded nodules of iron and manganese oxide; moderately acid; clear wavy boundary.
Btg1—13 to 19 inches; gray (10YR 5/1) silty clay loam; common fine prominent yellowish brown (10YR 5/6) mottles; moderate fine prismatic structure parting to moderate medium subangular blocky; friable; few distinct dark gray (10YR 4/1) clay films on faces of peds; few fine rounded nodules of iron and manganese oxide; very strongly acid; clear wavy boundary.
Btg2—19 to 33 inches; grayish brown (10YR 5/2) silty clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; firm; few distinct light gray (10YR 7/2 dry) silt coatings and few distinct dark gray (10YR 4/1) clay films on faces of peds; few medium rounded nodules of iron and manganese oxide; very strongly acid; clear wavy boundary.
Btg3—33 to 52 inches; grayish brown (10YR 5/2) silty clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate coarse angular blocky; firm; few distinct light gray (10YR 7/2 dry) silt coatings and few distinct dark gray (10YR 4/1) clay films on faces of peds; few medium rounded nodules of iron and manganese oxide; moderately acid; clear wavy boundary.
2Btg4—52 to 60 inches; gray (10YR 5/1) silty clay loam; common medium prominent dark yellowish brown (10YR 4/6) mottles; weak medium prismatic structure parting to weak coarse angular blocky; firm; few distinct light gray (10YR 7/2 dry) silt coatings and few distinct dark gray (10YR 4/1) clay films on faces of peds; few medium rounded nodules of iron and manganese oxide; about 1 percent fine gravel; neutral.

Range in Characteristics

Thickness of the loess: 30 to 55 inches

Ap horizon:
Hue—10YR
Value—3
Chroma—1 or 2
Texture—silt loam

Eg horizon:
Hue—10YR
Value—4 to 6
Chroma—1 or 2
Texture—silt loam

Btg horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—1 or 2
Texture—silty clay loam or silt loam

2Btg horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—1 or 2
Texture—silty clay loam, clay loam, or silt loam

Petrolia Series

Drainage class: Poorly drained and very poorly drained
Permeability: Moderately slow
Landform: Flood plains, backswamps, and channels
Parent material: Alluvium
Slope range: 0 to 2 percent
Taxonomic classification: Fine-silty, mixed, nonacid, mesic Typic Fluvaquents

Typical Pedon

Petrolia silty clay loam, frequently flooded, about 500 feet south and 235 feet east of the northwest corner of sec. 17, T. 5 N., R. 6 E.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silty clay loam, light brownish gray (10YR 6/2) dry; moderate fine granular structure; friable; common very fine roots; few fine rounded nodules of iron and manganese oxide; neutral; abrupt smooth boundary.
Ag—6 to 14 inches; dark gray (10YR 4/1) silty clay loam, light brownish gray (10YR 6/2) dry; common medium faint dark grayish brown (10YR 4/2) and few fine distinct yellowish brown (10YR

5/6) mottles; weak fine prismatic structure parting to weak fine angular blocky; firm; common very fine roots; few fine rounded nodules of iron and manganese oxide; neutral; abrupt wavy boundary.

Cg1—14 to 25 inches; gray (10YR 5/1) silty clay loam; common medium faint dark grayish brown (10YR 4/2) and common fine prominent strong brown (7.5YR 4/6) mottles; weak medium prismatic structure; firm; few very fine roots; few distinct gray (10YR 5/1) pressure faces on faces of peds; few fine rounded nodules of iron and manganese oxide; slightly acid; clear wavy boundary.

Cg2—25 to 43 inches; gray (10YR 5/1) silty clay loam; many medium prominent yellowish brown (10YR 5/6) mottles; weak medium prismatic structure; firm; few very fine roots; very few distinct gray (10YR 5/1) pressure faces on faces of peds; common medium rounded nodules of iron and manganese oxide; slightly acid; abrupt wavy boundary.

Cg3—43 to 60 inches; light brownish gray (10YR 6/2) silty clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure; firm; few very fine roots; very few distinct gray (10YR 5/1) pressure faces on faces of peds; common medium rounded nodules of iron and manganese oxide; slightly acid.

Range in Characteristics

Ap or Ag horizon:
Hue—10YR
Value—3 or 4
Chroma—1 or 2
Texture—silty clay loam

Cg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 to 6
Chroma—1 or 2
Texture—commonly silty clay loam; thin strata of silty clay, silt loam, or loam in some pedons

Piopolis Series

Drainage class: Poorly drained and very poorly drained
Permeability: Slow
Landform: Flood plains, backswamps, and channels
Parent material: Alluvium
Slope range: 0 to 2 percent
Taxonomic classification: Fine-silty, mixed, acid, mesic Typic Fluvaquents

Typical Pedon

Piopolis silty clay loam, frequently flooded, about 2,480 feet south and 1,820 feet east of the northwest corner of sec. 26, T. 3 N., R. 8 E.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silty clay loam, pale brown (10YR 6/3) dry; few fine distinct yellowish brown (10YR 5/6) mottles; weak medium subangular blocky structure parting to moderate fine granular; firm; many fine roots; few fine rounded nodules of iron and manganese oxide; moderately acid; abrupt smooth boundary.

ACg—6 to 12 inches; gray (10YR 5/1) silty clay loam, light brownish gray (10YR 6/2) dry; common fine prominent dark brown (7.5YR 4/4) mottles; moderate fine angular blocky structure; firm; common fine roots; few distinct dark brown (10YR 4/3) organic coatings on faces of peds; common medium rounded nodules of iron and manganese oxide; strongly acid; clear wavy boundary.

Cg1—12 to 35 inches; light brownish gray (2.5Y 6/2) silty clay loam; common medium prominent strong brown (7.5YR 5/6) mottles; weak medium prismatic structure; firm; common fine roots; common medium rounded nodules of iron and manganese oxide; very strongly acid; clear wavy boundary.

Cg2—35 to 44 inches; light gray (10YR 6/1) silty clay loam; common medium prominent yellowish red (5YR 4/6) mottles; weak medium prismatic structure; firm; few fine roots; common medium rounded nodules of iron and manganese oxide; strongly acid; clear wavy boundary.

Cg3—44 to 60 inches; grayish brown (2.5Y 5/2) silty clay loam; common medium prominent dark yellowish brown (10YR 4/6) mottles; weak medium prismatic structure; firm; few fine roots; common medium irregular accumulations of iron and manganese oxide; slightly acid.

Range in Characteristics

Ap or ACg horizon:
Hue—10YR
Value—4 or 5
Chroma—1 or 2
Texture—silty clay loam

Cg horizon:
Hue—10YR, 2.5Y, or 5Y
Value—4 to 6
Chroma—1 or 2
Texture—commonly silty clay loam; thin strata of silt loam or silty clay in some pedons

Racoon Series

Drainage class: Poorly drained
Permeability: Slow
Landform: Stream terraces
Landform position: Treads
Parent material: Mix of loess and local alluvium
Slope range: 0 to 2 percent
Taxonomic classification: Fine-silty, mixed, mesic Typic Ochraqualfs

Typical Pedon

Racoon silt loam, rarely flooded, about 1,940 feet south and 1,075 feet west of the northeast corner of sec. 24, T. 4 N., R. 6 E.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; common medium rounded nodules of iron and manganese oxide; neutral; abrupt smooth boundary.

Eg1—7 to 11 inches; grayish brown (10YR 5/2) silt loam; common fine distinct dark yellowish brown (10YR 4/4) mottles; weak thin platy structure; friable; common medium rounded nodules of iron and manganese oxide; neutral; clear wavy boundary.

Eg2—11 to 32 inches; light brownish gray (10YR 6/2) silt loam; common medium faint brown (10YR 5/3) mottles; weak medium prismatic structure parting to weak thick platy; friable; common medium rounded nodules of iron and manganese oxide; very strongly acid; clear wavy boundary.

EB—32 to 36 inches; light brownish gray (10YR 6/2) silt loam; common medium faint brown (10YR 5/3) mottles; weak medium prismatic structure parting to weak medium angular blocky; friable; few distinct dark gray (10YR 4/1) clay films on faces of peds; common medium rounded nodules of iron and manganese oxide; very strongly acid; clear wavy boundary.

Btg—36 to 50 inches; light brownish gray (10YR 6/2) silty clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; firm; few distinct gray (10YR 5/1) clay films on faces of peds; common medium rounded nodules of iron and manganese oxide; very strongly acid; clear wavy boundary.

Cg—50 to 60 inches; grayish brown (10YR 5/2), stratified loam and silty clay loam; common medium prominent strong brown (7.5YR 4/6) mottles; massive; firm; common coarse irregular accumulations of iron and manganese oxide; moderately acid.

Range in Characteristics

Ap horizon:
Hue—10YR
Value—4 or 5
Chroma—2
Texture—silt loam

Eg or EB horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—1 or 2
Texture—silt loam

Btg horizon:
Hue—10YR or 2.5Y
Value—5 or 6
Chroma—1 or 2
Texture—silty clay loam or silt loam

Cg horizon:
Hue—10YR or 2.5Y
Value—5 or 6
Chroma—1 or 2
Texture—loam, silty clay loam, or silt loam

Richview Series

Drainage class: Moderately well drained
Permeability: Moderate
Landform: Knolls
Landform position: Summits and backslopes
Parent material: Loess and the underlying mix of loess and glacial till
Slope range: 2 to 10 percent
Taxonomic classification: Fine-silty, mixed, mesic Mollic Hapludalfs

Typical Pedon

Richview silt loam, 2 to 5 percent slopes, about 535 feet south and 620 feet east of the northwest corner of sec. 8, T. 4 N., R. 5 E.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, brown (10YR 5/3) dry; moderate fine granular structure; friable; few fine rounded nodules of iron and manganese oxide; neutral; clear smooth boundary.

AB—8 to 12 inches; dark yellowish brown (10YR 4/4) silty clay loam, yellowish brown (10YR 5/4) dry; weak fine subangular blocky structure parting to weak fine granular; friable; common distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds; few fine rounded nodules of iron and manganese oxide; strongly acid; clear wavy boundary.

Bt1—12 to 18 inches; yellowish brown (10YR 5/6)

silty clay loam; moderate fine prismatic structure parting to moderate fine angular blocky; friable; few distinct very dark grayish brown (10YR 3/2) organic coatings and common distinct dark brown (10YR 4/3) clay films on faces of peds; few fine rounded nodules of iron and manganese oxide; very strongly acid; clear wavy boundary.

Bt2—18 to 26 inches; yellowish brown (10YR 5/4) silty clay loam; common fine faint pale brown (10YR 6/3) and common medium prominent reddish brown (5YR 4/4) mottles; moderate fine prismatic structure parting to moderate fine angular blocky; friable; common distinct dark brown (10YR 4/3) clay films on faces of peds; few fine rounded nodules of iron and manganese oxide; very strongly acid; clear wavy boundary.

Bt3—26 to 33 inches; yellowish brown (10YR 5/4) silty clay loam; common medium prominent strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; firm; common distinct dark gray (10YR 4/1) clay films on faces of peds; few fine rounded nodules of iron and manganese oxide; very strongly acid; clear wavy boundary.

2Bt4—33 to 49 inches; dark yellowish brown (10YR 4/4) clay loam; common medium prominent strong brown (7.5YR 5/6) and common medium distinct grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to weak coarse angular blocky; firm; few distinct dark gray (10YR 4/1) clay films on faces of peds; few fine rounded nodules of iron and manganese oxide; very strongly acid; gradual wavy boundary.

2C—49 to 60 inches; yellowish brown (10YR 5/4) sandy loam; many fine distinct yellowish brown (10YR 5/6) mottles; weak thick platy structure on soil fragments; firm; few prominent pale brown (10YR 6/3) sand coatings in pores; few fine irregular accumulations of iron and manganese oxide; slightly acid.

Range in Characteristics

Thickness of the loess: 30 to 45 inches

Ap horizon:
Hue—10YR
Value—3
Chroma—2 or 3
Texture—silt loam

AB, BE, or E horizon (if it occurs):
Hue—10YR
Value—4 or 5
Chroma—3 or 4
Texture—silt loam or silty clay loam

Bt horizon:
Hue—10YR or 7.5YR
Value—4 or 5
Chroma—3 to 6
Texture—silty clay loam or silt loam

2Bt horizon:
Hue—10YR or 7.5YR
Value—4 to 6
Chroma—3 to 6
Texture—clay loam, sandy loam, loam, or silt loam

2C horizon:
Hue—10YR
Value—4 or 5
Chroma—3 or 4
Texture—sandy loam, loam, or clay loam

Ridgway Series

Drainage class: Well drained
Permeability: Moderate
Landform: Stream terraces
Landform position: Backslopes
Parent material: Loess and the underlying glacial outwash
Slope range: 5 to 10 percent
Taxonomic classification: Fine-silty, mixed, mesic Typic Hapludalfs

Typical Pedon

Ridgway silt loam, 5 to 10 percent slopes, eroded, about 2,350 feet north and 1,530 feet east of the southwest corner of sec. 16, T. 3 N., R. 8 E.

Ap—0 to 5 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; common fine roots; few fine rounded nodules of iron and manganese oxide; slightly acid; abrupt smooth boundary.

Bt1—5 to 10 inches; yellowish brown (10YR 5/6) silty clay loam; moderate fine prismatic structure parting to moderate fine subangular blocky; friable; common fine roots; few distinct brown (10YR 4/3) clay films on faces of peds; few fine rounded nodules of iron and manganese oxide; moderately acid; clear wavy boundary.

Bt2—10 to 18 inches; yellowish brown (10YR 5/6) silty clay loam; moderate fine prismatic structure parting to moderate fine angular blocky; firm; common fine roots; common distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; few fine rounded nodules of iron and manganese oxide; very strongly acid; clear wavy boundary.

Bt3—18 to 24 inches; yellowish brown (10YR 5/4) silty clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; firm; common fine roots; very few distinct pale brown (10YR 6/3) silt coatings and few distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; few fine rounded nodules of iron and manganese oxide; very strongly acid; clear wavy boundary.

Bt4—24 to 33 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; firm; common fine roots; common distinct pale brown (10YR 6/3) silt coatings and few distinct brown (10YR 4/3) clay films on faces of peds; common fine rounded nodules of iron and manganese oxide; very strongly acid; abrupt wavy boundary.

2Bt5—33 to 48 inches; brown (10YR 5/3) clay loam; common medium prominent strong brown (7.5YR 4/6) mottles; weak medium prismatic structure; firm; few very fine roots; very few distinct white (10YR 8/1 dry) silt coatings in pores and very few distinct brown (10YR 4/3) clay films on faces of peds; common fine rounded nodules of iron and manganese oxide; very strongly acid; abrupt wavy boundary.

2Bt6—48 to 60 inches; brown (10YR 5/3) clay loam; many medium prominent strong brown (7.5YR 4/6) mottles; weak medium prismatic structure; firm; very few distinct white (10YR 8/1 dry) silt coatings in pores and very few distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; few medium irregular accumulations of iron and manganese oxide; about 2 percent fine gravel; strongly acid.

Range in Characteristics

Thickness of the loess: 24 to 40 inches

Ap horizon:
Hue—10YR
Value—4 or 5
Chroma—3
Texture—silt loam

Bt horizon:
Hue—10YR
Value—5
Chroma—3 to 6
Texture—silty clay loam or silt loam

2Bt horizon:
Hue—10YR or 7.5YR
Value—4 or 5
Chroma—3 to 6
Texture—clay loam or loam

Shiloh Series

Drainage class: Poorly drained
Permeability: Moderately slow
Landform: Depressions on till plains
Landform position: Toeslopes
Parent material: Loess
Slope range: 0 to 2 percent
Taxonomic classification: Fine, montmorillonitic, mesic Cumulic Haplaquolls

Typical Pedon

Shiloh silty clay loam, about 125 feet north and 575 feet west of the center of sec. 21, T. 4 N., R. 7 E.

Ap—0 to 9 inches; very dark gray (N 3/0) silty clay loam, grayish brown (10YR 5/2) dry; common fine prominent dark yellowish brown (10YR 4/6) mottles; moderate very fine angular blocky structure; firm; few fine rounded nodules of iron and manganese oxide; neutral; abrupt smooth boundary.

A—9 to 16 inches; very dark gray (10YR 3/1) silty clay, grayish brown (10YR 5/2) dry; common fine faint dark gray (10YR 4/1) and common fine prominent yellowish brown (10YR 5/6) mottles; weak fine angular blocky structure; very firm; slightly acid; clear wavy boundary.

Bg1—16 to 28 inches; very dark gray (10YR 3/1) silty clay, grayish brown (10YR 5/2) dry; common fine faint dark gray (10YR 4/1) and common fine prominent yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to weak medium angular blocky; very firm; few distinct very dark gray (N 3/0) pressure faces on faces of peds; slightly acid; gradual wavy boundary.

Bg2—28 to 46 inches; very dark gray (10YR 3/1) silty clay, grayish brown (10YR 5/2) dry; common fine prominent dark yellowish brown (10YR 4/6) mottles; weak medium prismatic structure; very firm; very few distinct very dark gray (N 3/0) pressure faces on faces of peds; few medium rounded nodules of iron and manganese oxide; neutral; gradual wavy boundary.

Bg3—46 to 60 inches; gray (5Y 5/1) silty clay; common fine prominent dark yellowish brown (10YR 4/6) mottles; weak medium prismatic structure; very firm; very few distinct white (10YR 8/1 dry) silt coatings and very few distinct very dark gray (N 3/0) pressure faces on faces of

peds; few medium rounded nodules of iron and manganese oxide; neutral.

Range in Characteristics

Thickness of the mollic epipedon: 24 to 48 inches

Ap or A horizon:
Hue—10YR, 2.5Y, or neutral
Value—2 or 3
Chroma—0 to 2
Texture—silty clay loam or silty clay

Bg horizon:
Hue—10YR, 2.5Y, 5Y, or neutral
Value—3 to 6
Chroma—0 to 2
Texture—silty clay or silty clay loam

Wakeland Series

Drainage class: Somewhat poorly drained
Permeability: Moderate
Landform: Flood plains
Parent material: Alluvium
Slope range: 0 to 2 percent
Taxonomic classification: Coarse-silty, mixed, nonacid, mesic Aeric Fluvaquents

Typical Pedon

Wakeland silt loam, frequently flooded, about 2,205 feet south and 830 feet west of the northeast corner of sec. 10, T. 4 N., R. 5 E.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; common fine distinct yellowish brown (10YR 5/6) mottles; moderate fine granular structure; friable; common fine roots; few fine rounded nodules of iron and manganese oxide; neutral; abrupt smooth boundary.

Cg1—6 to 20 inches; grayish brown (10YR 5/2) silt loam stratified with thin bands of light gray (10YR 7/2) silt loam; many medium faint dark brown (10YR 4/3) and common fine distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure; friable; few very fine roots; few medium rounded nodules of iron and manganese oxide; neutral; clear wavy boundary.

Cg2—20 to 45 inches; grayish brown (10YR 5/2) silt loam stratified with thin bands of light gray (10YR 7/2) silt loam; many medium faint dark brown (10YR 4/3) and common fine distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure; friable; few very fine roots; few medium rounded nodules of iron and manganese oxide; slightly acid; clear wavy boundary.

Cg3—45 to 60 inches; light brownish gray (10YR 6/2) silt loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure; friable; few very fine roots; common medium rounded nodules of iron and manganese oxide; moderately acid.

Range in Characteristics

Ap horizon:
Hue—10YR
Value—4 or 5
Chroma—2 or 3
Texture—silt loam

Cg horizon:
Hue—10YR
Value—4 to 6
Chroma—1 to 4
Texture—silt loam

Wirt Series

Drainage class: Well drained
Permeability: Moderate in the upper part; moderately rapid or rapid in the lower part
Landform: Natural levees
Parent material: Alluvium
Slope range: 0 to 2 percent
Taxonomic classification: Coarse-loamy, mixed, nonacid, mesic Typic Udifluvents

Typical Pedon

Wirt loam, sandy substratum, frequently flooded, about 500 feet north and 1,650 feet east of the southwest corner of sec. 14, T. 4 N., R. 6 E.

Ap—0 to 8 inches; dark yellowish brown (10YR 4/4) loam, light yellowish brown (10YR 6/4) dry; moderate fine granular structure in the upper part and weak thin platy structure in the lower part; very friable; few fine roots; common distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds; slightly acid; abrupt smooth boundary.

A—8 to 12 inches; dark yellowish brown (10YR 4/4) fine sandy loam, light yellowish brown (10YR 6/4) dry; weak medium prismatic structure; very friable; few very fine roots; few distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds; moderately acid; clear wavy boundary.

Bw—12 to 24 inches; stratified dark brown (10YR 4/3) fine sandy loam and yellowish brown (10YR

5/4) loamy fine sand; weak medium subangular blocky structure; very friable; few very fine roots; slightly acid; clear wavy boundary.

C1—24 to 45 inches; stratified dark brown (10YR 4/3) fine sandy loam and yellowish brown (10YR 5/4) loamy fine sand; massive and single grain; very friable and loose; few very fine roots; slightly acid; abrupt wavy boundary.

C2—45 to 60 inches; stratified yellowish brown (10YR 5/4) loamy fine sand and fine sand and dark brown (10YR 4/3) fine sandy loam; single grain and massive; loose and very friable; slightly acid.

Range in Characteristics

Ap or A horizon:
Hue—10YR
Value—3 or 4
Chroma—3 or 4
Texture—loam, fine sandy loam, or silt loam

Bw horizon:
Hue—10YR
Value—4 or 5
Chroma—3 or 4
Texture—fine sandy loam, loam, silt loam, or loamy fine sand

C horizon:
Hue—10YR
Value—4 or 5
Chroma—3 to 6
Texture—loamy fine sand, fine sand, or fine sandy loam

Wynoose Series

Drainage class: Poorly drained
Permeability: Very slow
Landform: Till plains
Landform position: Interfluves
Parent material: Loess and the underlying mix of loess and glacial till
Slope range: 0 to 2 percent
Taxonomic classification: Fine, montmorillonitic, mesic Typic Albaqualfs

Typical Pedon

Wynoose silt loam, about 1,050 feet north and 160 feet east of the southwest corner of sec. 2, T. 2 N., R. 6 E.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; few very fine roots; few fine rounded nodules of iron and manganese oxide; neutral; abrupt smooth boundary.

Eg1—6 to 12 inches; light brownish gray (10YR 6/2) silt loam; common fine distinct yellowish brown (10YR 5/4) mottles; weak thin platy structure; friable; few very fine roots; common faint light gray (10YR 7/2 dry) silt coatings on faces of peds; common medium rounded nodules of iron and manganese oxide; strongly acid; clear wavy boundary.

Eg2—12 to 21 inches; light brownish gray (10YR 6/2) silt loam; common fine distinct yellowish brown (10YR 5/4) mottles; weak fine subangular blocky structure; friable; few very fine roots; common faint light gray (10YR 7/2 dry) silt coatings on faces of peds; common medium rounded nodules of iron and manganese oxide; very strongly acid; abrupt wavy boundary.

Btg1—21 to 28 inches; light brownish gray (10YR 6/2) silty clay; common fine distinct yellowish brown (10YR 5/6) mottles; moderate fine prismatic structure parting to moderate fine angular blocky; very firm; few very fine roots; very few distinct white (10YR 8/2 dry) silt coatings and many distinct grayish brown (10YR 5/2) clay films on faces of peds; common medium rounded nodules of iron and manganese oxide; very strongly acid; clear wavy boundary.

Btg2—28 to 41 inches; light brownish gray (10YR 6/2) silty clay; common fine prominent strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure; very firm; few distinct gray (10YR 5/1) and many distinct grayish brown (10YR 5/2) clay films and very few distinct white (10YR 8/2 dry) silt coatings on faces of peds; common medium rounded nodules of iron and manganese oxide; very strongly acid; clear wavy boundary.

2Btg3—41 to 60 inches; light brownish gray (10YR 6/2) clay loam; common medium prominent strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure; firm; common distinct grayish brown (10YR 5/2) clay films and very few distinct white (10YR 8/2 dry) silt coatings on faces of peds; common medium rounded nodules of iron and manganese oxide; strongly acid.

Range in Characteristics

Thickness of the loess: 30 to 55 inches

Ap horizon:
Hue—10YR

Value—4 or 5
Chroma—2
Texture—silt loam

Eg horizon:
Hue—10YR
Value—5 to 7
Chroma—2
Texture—silt loam

Btg horizon:
Hue—10YR or 2.5Y
Value—4 to 6
Chroma—1 or 2
Texture—silty clay or silty clay loam

2Btg horizon:
Hue—10YR or 2.5Y
Value—5 or 6
Chroma—1 or 2
Texture—clay loam, silty clay loam, or silt loam

Formation of the Soils

Soils are natural bodies that formed on the earth's surface, that contain living matter, and that support or are capable of supporting plants. The characteristics of soils at any given point are determined by (1) the physical and mineralogical composition of the parent material; (2) the plant and animal life on and in the soil; (3) the topography; (4) the climate, especially rainfall and temperature; and (5) the length of time that the processes of soil formation have acted on the soil material (Jenny, 1941). The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effects of any one factor unless conditions are specified for the other four.

Soils form a continuum over the landscape. Differences in the properties of adjacent soil bodies primarily reflect changes in topography or slope. Changes in parent material and vegetation can also be locally significant influences. Each of the soil series in Clay County differs in one or more properties, the result of differing conditions under which the soils formed.

Parent Material

Parent material is the unconsolidated geologic material in which a soil forms. It determines the chemical and mineralogical composition of the soil. The soils in Clay County formed in four major parent materials. These are loess; glacial till; alluvium; and residuum derived from sandstone, siltstone, and shale bedrock.

Loess, or wind-deposited silty material, was deposited at various times associated with glacial activity in the Midwest. The principal deposit covering the uplands of Clay County is called Peoria loess. This loess was deposited during the Woodfordian glacial substage of the Wisconsinan Stage, about 22,000 to 12,500 years ago (Willman and others, 1975). The loess is generally 30 to 50 inches thick in nearly level and gently sloping upland areas. Many of the soils in the county formed in loess and in the underlying mix of loess and glacial till. Bluford and Cisne soils are examples. The mix apparently resulted from mixing of the materials by plant and animal life and other mixing processes that occurred as the loess was deposited (Fehrenbacher and others, 1986). The mix typically contains more sand and gravel than the overlying layer of loess.

Glacial till is material laid down directly by glaciers with a limited amount of water action. It is a mixture of different sized soil particles and rock fragments. In Clay County the glacial till was deposited during the Illinoian glacial period more than 125,000 years ago. Glacial till is typically exposed on moderately steep to very steep backslopes. Hickory soils formed in glacial till. In some areas the glacial till contains a paleosol. The paleosol is an ancient soil that developed during the Sangamonian Substage about 125,000 to 75,000 years ago and is commonly called the Sangamon paleosol (Willman and others, 1975). Atlas soils formed in glacial till that contains a paleosol.

Alluvium is material recently deposited by floodwater from streams. Variations in soil texture indicate differences in the speed of the floodwaters. Coarse particles of sand settle out in rapidly moving water, but fine particles of silt and clay can settle out only in very slowly moving or stagnant water. Many soils that formed in alluvium still receive sediments. The largest areas of alluvial soils are on the flood plains along the Little Wabash River and Big Muddy Creek. Bonnie and Wakeland soils are common in these areas.

On a small acreage in the county, the soils formed in residuum derived from sandstone, siltstone, and shale. Most of these soils are on steep backslopes above flood plains. Frondorf soils formed mostly in material derived from sandstone and siltstone. Gosport soils formed mostly in shale residuum.

Some of the soils in the county are affected by sodium. Darmstadt, Grantfork, and Huey soils have a high content of exchangeable sodium in the subsoil. The sodium in these soils originated from weathering of sodium feldspar minerals that occurred in some areas of the loess (Wilding and others, 1963). Soils affected by sodium are generally intermingled on the landform with soils that are not affected by sodium. Cisne-Huey complex and Darmstadt-Hoyleton complex, 0 to 2 percent slopes, are examples.

Plant and Animal Life

Living organisms, such as plants, burrowing animals, bacteria, and fungi, affect soil formation. Human activities, such as farming, also alter the nature of the existing plant community.

Plant and animal life adds and incorporates organic matter and nitrogen into the soil. The remains of plants accumulate in the surface layer, decay, and eventually become soil organic matter. As the roots of the plants die and decay, they add organic matter to the soil and provide channels for the movement of water and air through the soil. Earthworms, some insects, and burrowing animals help to incorporate the organic matter into the soil. Bacteria and fungi help to break down the organic matter into forms that can be used by growing plants. The kind of organic matter on and in the soil depends on the kinds of plants that are present.

The native vegetation in Clay County was deciduous hardwoods and prairie grasses. Trees contribute organic matter to the soil mainly as leaf litter. Their root systems are less fibrous than those of prairie grasses and are not as densely concentrated near the surface. As a result, forest soils typically have a thin, light colored surface layer that is relatively low in organic matter. Some forest soils have an eluvial horizon (E horizon) underlying the surface layer. The eluvial horizon is characterized by a loss of clay and exchangeable bases through eluviation, or leaching. This downward translocation of clay has also contributed to the formation of claypans in the subsoil of some of the poorly drained and somewhat poorly drained soils. In general, soils that formed under forest vegetation in Clay County are in sloping upland areas near major streams and on flood plains. Ava, Belknap, and Hickory soils are examples of soils that formed under forest vegetation. Bluford and Wynoose soils are examples of soils that have an eluvial horizon and a claypan.

Soils that formed under prairie grasses are generally in broad, nearly level and gently sloping upland areas. The many fine, fibrous roots of grasses contribute large amounts of organic matter to the soil when they die and decompose. Shiloh soils formed under prairie grasses and have a very thick, dark surface layer. Cisne, Hoyleton, Newberry, and Richview soils formed under prairie grasses but have been influenced by forest vegetation at some time during their development. They have a dark surface layer and an underlying eluvial horizon. These soils are considered to be intergrades between prairie soils and forest soils.

Topography

Variations in the slope of the land surface greatly affect the natural drainage, the rate of surface runoff, and the susceptibility to erosion. Slopes in the county range from 0 to 60 percent. Natural drainage ranges from very poorly drained in backswamps to well drained on steep backslopes.

Topography influences the depth to the water table and the natural drainage. In nearly level, poorly drained soils, such as Bonnie and Cisne soils, the water table is close to the surface in most years. The soil pores contain water that restricts the circulation of air. Under these conditions, iron and manganese compounds are chemically reduced. As a result, the subsoil is grayish in color and is mottled. In the steeper, well drained soils, such as Frondorf and Hickory soils, the water table is lower and some of the rainfall runs off the surface. The soil pores contain less water and more air. The iron and manganese compounds are well oxidized. As a result, the subsoil is brown and brightly colored.

Topography also affects the rate of surface runoff and the susceptibility to erosion. Runoff is most rapid on the steeper slopes. In some low areas, water is temporarily ponded. As slope gradient and slope length increase, the soil becomes more susceptible to erosion.

Climate

Clay County has a temperate, humid, continental climate. The climate is essentially uniform throughout the county and has not caused any obvious differences among the soils within the survey area. However, climate has differentiated these soils from soils in other broad regions.

Climate affects soil formation through its influence on weathering, plant and animal life, and erosion. Precipitation and temperature influence the rate of weathering and the subsequent breakdown of minerals and the formation of clay. High average temperatures and precipitation in the county have encouraged rapid weathering and clay formation. As water from rains and melting snows seeps downward through the soil, it causes physical and chemical changes. In many of the soils in the county, percolating water has moved clay from the surface and subsurface layers to the subsoil where it has accumulated. The water has also dissolved minerals and salts and moved them downward through the soil. This leaching of minerals has removed naturally occurring free lime from the upper layers of most of

the soils in Clay County. As a result, these layers are acidic.

Climate also affects soil formation by stimulating the growth of living organisms, particularly plants. The climate in Clay County has favored both deciduous hardwoods and prairie grasses. It has also favored the decomposition of plant and animal matter into humus.

Precipitation can affect soil formation by removing soil at the surface. Extensive erosion can result from heavy rainfall on soils that do not have a vegetative cover or are only sparsely covered. Early spring rains can also result in erosion when the soil is partially frozen. The freezing restricts the rate of water infiltration and increases the runoff rate. As the rate of erosion approaches the rate of soil formation, the soil generally exhibits less profile development.

Time

Time is needed for the formation of soil profile characteristics in the parent material. Soil profiles normally become more strongly expressed with increased exposure to weathering processes. The influence of time, however, can be modified by climate and by depositional and erosional processes. In Clay County, soil formation began 125,000 to 75,000 years ago during the Sangamonian Substage (Willman and others, 1975). Soil formation was interrupted, however, when the climate became significantly cooler in association with the advance of the Wisconsinan glacier. The soils that formed during the Sangamonian Substage were later buried by a blanket of loess after the Wisconsinan glacier retreated. Soils then formed in this blanket of loess as the climate warmed about 12,500 years ago.

Depositional processes on flood plains also alter the influence of time. Soils on flood plains, such as Birds and Wakeland soils, receive surface deposits each time they are flooded. The processes of soil formation are interrupted with each flooding event. Consequently, these soils do not have the distinct horizons that typically develop over time.

Erosional processes on sloping land can also alter the influence of time. If the rate of erosion exceeds the rate of soil formation, the soil profile will be thinner and will generally not have distinct horizons.

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Glossary

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly, such soil formed in recent alluvium or on steep, rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

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.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.

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:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Backslope. The landform position that forms the steepest inclined surface and principal element of many hillslopes.

Backswamp. A landform consisting of marshy, depressed areas of flood plains between natural levees and valley sides or terraces.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or "chain," of soils on a landform that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Channel. The hollow bed where a natural body of surface water flows or may flow.

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 2 millimeters to 38 centimeters (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 (7.6 to 25 centimeters) in diameter.

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.

Corrosion. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Depression. Any relatively sunken part of the earth's surface; especially a low-lying area surrounded by higher ground.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils

are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities 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.

Excess sodium (in tables). Excess exchangeable sodium in the soil. The resulting poor physical properties restrict the growth of plants.

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.

Fibric soil material (peat). The least decomposed of all organic soil material. Peat contains a large amount of well preserved fiber that is readily identifiable according to botanical origin. Peat has the lowest bulk density and the highest water content at saturation of all organic soil material.

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, or clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Footslope. 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 outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 35 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 the 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.

Hemic soil material (mucky peat). Organic soil material intermediate in degree of decomposition between the less decomposed fibric and the more decomposed sapric material.

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 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

Interfluve. The relatively undissected upland or ridge between two adjacent valleys containing streams flowing in the same general direction. Any elevated area between two drainageways that sheds water to those drainageways.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:
Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.
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.
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.

Knoll. A small, low, rounded hill rising above adjacent landforms.

Landform. Any physical, recognizable form or feature of the earth's surface, having a characteristic shape and produced by natural causes.

Landscape (soils). A collection of related, natural landforms; typically, the land surface that can be comprehended in a single view.

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 the 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, or fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

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).

Muck. Dark, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Munsell notation. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.

Natric horizon. A special kind of argillic horizon that contains enough exchangeable sodium to have an adverse effect on the physical condition of the subsoil.

Natural levee. A long, broad, low ridge or embankment of sand and coarse silt, built up by a stream as its flood plain and along both sides of its channel. It is made up of wedge-shaped deposits of the coarsest suspended-load material. The deposits slope gently away from the stream.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *fragipan, claypan, plowpan,* and *traffic pan.*

Parent material. The unconsolidated organic and mineral material in which soil forms.

Peat. Unconsolidated material, largely undecomposed organic matter, that has accumulated under excess moisture. (See Fibric soil material.)

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 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, such as slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of

moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly 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 drawbar 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-sized particles.

Sapric soil material (muck). The most highly decomposed of all organic soil material. Muck has the least amount of plant fiber, the highest bulk density, and the lowest water content at saturation of all organic soil material.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the substratum. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer

of soil material from the land surface by the action of rainfall and surface runoff.

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

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.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

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 substratum. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stream terrace. One of a series of platforms in a stream valley, flanking and more or less parallel to the stream channel, originally formed near the level of the stream, and representing the dissected remnants of an abandoned flood plain, streambed, or valley floor produced during a former state of erosion or deposition.

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 principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular. Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from soil blowing and water erosion after harvest, during preparation of a seedbed for the

next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Summit. A general term for the top, or highest level, of a landform, such as a knoll.

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 (geomorphology). A steplike surface that borders a valley floor and represents the former position of a flood plain.

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). A layer of otherwise suitable soil material that is too thin for the specified use.

Till plain. An extensive area of nearly level to undulating soils underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toeslope. The position that forms the gently inclined surface at the base of a hillslope.

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, in soils in extremely small amounts. They are essential to plant growth.

Tread. The flat or gently sloping surface of one of a series of natural steplike landforms, such as successive stream terraces.

Upland (geomorphology). Land at a higher elevation than the flood plain or low stream terrace.

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 a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

Table 1.--Temperature and Precipitation

(Recorded in the period 1961-90 at Flora, Illinois)

Month	Temperature						Precipitation				
				2 years in 10 will have--				2 years in 10 will have--			
	Average daily maximum	Average daily minimum	Average	Maximum temperature higher than--	Minimum temperature lower than--	Average number of growing degree days*	Average	Less than--	More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January-----	38.1	19.5	28.8	67	-13	5	1.95	0.94	2.95	4	3.5
February----	42.7	23.0	32.8	70	-8	9	2.33	1.21	3.32	5	2.4
March-------	55.0	33.9	44.4	81	8	71	4.23	2.37	5.87	7	1.7
April-------	67.2	43.5	55.3	88	23	212	3.91	2.35	5.32	8	.2
May---------	76.8	52.4	64.6	92	31	454	4.34	2.22	6.20	7	.0
June--------	85.5	61.1	73.3	97	37	697	4.31	2.24	6.11	6	.0
July--------	89.0	64.9	76.9	100	48	834	3.74	1.71	5.49	6	.0
August------	87.2	62.4	74.8	100	45	768	3.30	1.59	4.78	4	.0
September---	80.9	55.6	68.3	96	35	548	3.06	1.35	4.52	5	.0
October-----	69.5	44.3	56.9	89	23	251	2.99	1.25	4.47	5	.0
November----	55.6	35.3	45.4	78	12	70	3.70	1.87	5.30	6	.6
December----	42.2	24.8	33.5	68	-5	11	3.68	1.69	5.39	6	2.4
Yearly:											
Average---	65.8	43.4	54.6	---	---	---	---	---	---	---	---
Extreme---	104	-25	---	101	-15	---	---	---	---	---	---
Total-----	---	---	---	---	---	3,930	41.54	20.79	59.72	69	10.8

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).

Table 2.--Freeze Dates in Spring and Fall

(Recorded in the period 1961-90 at Flora, Illinois)

Probability	Temperature		
	24 °F or lower	28 °F or lower	32 °F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	Apr. 9	Apr. 19	May 11
2 years in 10 later than--	Apr. 4	Apr. 14	May 5
5 years in 10 later than--	Mar. 26	Apr. 5	Apr. 23
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 18	Oct. 8	Sept. 27
2 years in 10 earlier than--	Oct. 24	Oct. 13	Oct. 2
5 years in 10 earlier than--	Nov. 4	Oct. 24	Oct. 12

Table 3.--Growing Season

(Recorded in the period 1961-90 at Flora, Illinois)

Probability	Daily minimum temperature during growing season		
	Higher than 24 °F	Higher than 28 °F	Higher than 32 °F
	Days	Days	Days
9 years in 10	200	182	148
8 years in 10	207	188	156
5 years in 10	222	201	171
2 years in 10	237	213	186
1 year in 10	244	220	194

Table 4.--Acreage and Proportionate Extent of the Soils

Map symbol	Soil name	Acres	Percent
2	Cisne silt loam	44,270	14.7
3A	Hoyleton silt loam, 0 to 2 percent slopes	19,560	6.5
3B	Hoyleton silt loam, 2 to 5 percent slopes	5,800	1.9
3B2	Hoyleton silt loam, 2 to 5 percent slopes, eroded	5,240	1.7
4B	Richview silt loam, 2 to 5 percent slopes	360	0.1
4C2	Richview silt loam, 5 to 10 percent slopes, eroded	180	0.1
5C2	Blair silt loam, 5 to 10 percent slopes, eroded	7,660	2.5
5C3	Blair silty clay loam, 5 to 10 percent slopes, severely eroded	3,780	1.3
7C2	Atlas silt loam, 5 to 10 percent slopes, eroded	5,960	2.0
7C3	Atlas silty clay loam, 5 to 10 percent slopes, severely eroded	2,800	0.9
7D2	Atlas silt loam, 10 to 18 percent slopes, eroded	1,000	0.3
7D3	Atlas silty clay loam, 10 to 18 percent slopes, severely eroded	630	0.2
8D2	Hickory silt loam, 10 to 18 percent slopes, eroded	8,570	2.9
8D3	Hickory clay loam, 10 to 18 percent slopes, severely eroded	1,530	0.5
8F	Hickory loam, 18 to 35 percent slopes	8,040	2.7
8F3	Hickory clay loam, 18 to 35 percent slopes, severely eroded	540	0.2
8G	Hickory loam, 35 to 60 percent slopes	1,650	0.5
12	Wynoose silt loam	26,180	8.7
13A	Bluford silt loam, 0 to 2 percent slopes	37,680	12.5
13B	Bluford silt loam, 2 to 5 percent slopes	5,450	1.8
13B2	Bluford silt loam, 2 to 5 percent slopes, eroded	9,740	3.2
14B	Ava silt loam, 2 to 5 percent slopes	12,700	4.2
14C2	Ava silt loam, 5 to 10 percent slopes, eroded	4,360	1.5
14C3	Ava silty clay loam, 5 to 10 percent slopes, severely eroded	1,100	0.4
138	Shiloh silty clay loam	500	0.2
337B	Creal silt loam, 2 to 5 percent slopes	830	0.3
434C2	Ridgway silt loam, 5 to 10 percent slopes, eroded	80	*
786D2	Frondorf silt loam, 10 to 18 percent slopes, eroded	480	0.2
786F	Frondorf silt loam, 18 to 35 percent slopes	590	0.2
801B	Orthents, silty, undulating	330	0.1
810	Oil-waste land, brine damaged	220	0.1
871E	Lenzburg clay loam, 15 to 25 percent slopes, stony	330	0.1
889B2	Darmstadt-Bluford complex, 2 to 5 percent slopes, eroded	2,800	0.9
912A	Darmstadt-Hoyleton complex, 0 to 2 percent slopes	6,200	2.1
912B2	Darmstadt-Hoyleton complex, 2 to 5 percent slopes, eroded	1,500	0.5
934C2	Blair-Grantfork complex, 5 to 10 percent slopes, eroded	1,500	0.5
967F	Hickory-Gosport complex, 18 to 35 percent slopes	1,690	0.6
991	Cisne-Huey complex	18,700	6.2
1288	Petrolia silty clay loam, undrained	860	0.3
1420	Piopolis silty clay loam, undrained	860	0.3
3108	Bonnie silt loam, frequently flooded	8,200	2.7
3225	Holton silt loam, frequently flooded	5,250	1.8
3226	Wirt loam, sandy substratum, frequently flooded	2,080	0.7
3288	Petrolia silty clay loam, frequently flooded	1,160	0.4
3333	Wakeland silt loam, frequently flooded	11,190	3.7
3334	Birds silt loam, frequently flooded	6,040	2.0
3382	Belknap silt loam, frequently flooded	5,220	1.7
3420	Piopolis silty clay loam, frequently flooded	2,670	0.9
4218	Newberry silt loam, ponded	5,250	1.8
7109	Racoon silt loam, rarely flooded	500	0.2
	Water	620	0.2
	Total	300,430	100.0

* Less than 0.1 percent.

Table 5.--Prime Farmland

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name)

Map symbol	Soil name
2	Cisne silt loam (where drained)
3A	Hoyleton silt loam, 0 to 2 percent slopes
3B	Hoyleton silt loam, 2 to 5 percent slopes
3B2	Hoyleton silt loam, 2 to 5 percent slopes, eroded
4B	Richview silt loam, 2 to 5 percent slopes
13A	Bluford silt loam, 0 to 2 percent slopes (where drained)
13B	Bluford silt loam, 2 to 5 percent slopes
13B2	Bluford silt loam, 2 to 5 percent slopes, eroded
14B	Ava silt loam, 2 to 5 percent slopes
138	Shiloh silty clay loam (where drained)
337B	Creal silt loam, 2 to 5 percent slopes
3108	Bonnie silt loam, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
3225	Holton silt loam, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
3226	Wirt loam, sandy substratum, frequently flooded (where protected from flooding or not frequently flooded during the growing season)
3288	Petrolia silty clay loam, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
3333	Wakeland silt loam, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
3334	Birds silt loam, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
3382	Belknap silt loam, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
3420	Piopolis silty clay loam, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
4218	Newberry silt loam, ponded (where drained)
7109	Racoon silt loam, rarely flooded (where drained)

Table 6.--Land Capability and Yields per Acre of Crops and Pasture

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Soil name and map symbol	Land capability	Corn	Soybeans	Winter wheat	Orchardgrass-alfalfa hay	Bromegrass-alfalfa
		Bu	Bu	Bu	Tons	AUM*
2--- Cisne	IIIw	115	35	52	---	---
3A--- Hoyleton	IIw	116	34	53	---	---
3B--- Hoyleton	IIe	115	34	52	---	---
3B2--- Hoyleton	IIe	111	33	51	4.5	7.5
4B--- Richview	IIe	109	33	50	4.6	7.6
4C2--- Richview	IIIe	103	31	47	4.3	7.2
5C2--- Blair	IIIe	89	31	41	3.5	5.8
5C3--- Blair	IVe	83	29	38	3.2	5.4
7C2--- Atlas	IIIe	52	16	19	2.2	3.6
7C3--- Atlas	IVe	43	14	16	1.8	3.0
7D2--- Atlas	IVe	48	15	18	2.0	3.4
7D3--- Atlas	VIe	---	---	---	1.7	2.8
8D2--- Hickory	IIIe	71	23	26	2.7	4.5
8D3--- Hickory	IVe	65	21	23	2.4	4.1
8F--- Hickory	VIe	---	---	---	2.2	3.7
8F3--- Hickory	VIe	---	---	---	1.9	3.1
8G--- Hickory	VIIe	---	---	---	---	2.4
12--- Wynoose	IIIw	96	33	46	3.9	6.5
13A--- Bluford	IIw	103	33	49	4.1	6.8

See footnote at end of table.

Table 6.--Land Capability and Yields per Acre of Crops and Pasture--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Winter wheat	Orchardgrass-alfalfa hay	Bromegrass-alfalfa
		Bu	Bu	Bu	Tons	AUM*
13B Bluford	IIe	102	33	49	4.1	6.7
13B2 Bluford	IIe	99	32	47	3.9	6.5
14B Ava	IIe	97	33	48	4.3	7.1
14C2 Ava	IIIe	89	30	44	3.9	6.6
14C3 Ava	IVe	74	25	36	3.3	5.5
138 Shiloh	IIw	139	46	56	---	---
337B Creal	IIe	108	35	50	4.3	7.1
434C2 Ridgway	IIIe	112	36	46	4.3	7.2
786D2 Frondorf	IVe	58	19	25	2.6	4.3
786F Frondorf	VIe	---	---	---	2.2	3.8
801B. Orthents						
810. Oil-waste land, brine damaged						
871E Lenzburg	VIIe	---	---	---	---	4.6
889B2 Darmstadt-Bluford	IIIe	72	26	37	---	---
912A Darmstadt-Hoyleton	IIIw	90	30	44	---	---
912B2 Darmstadt-Hoyleton	IIIe	86	28	42	---	---
934C2 Blair-Grantfork	IVe	75	26	35	3.0	4.9
967F Hickory-Gosport	VIIe	---	---	---	2.0	3.3
991 Cisne-Huey	IVw	92	30	43	---	---
1288 Petrolia	Vw	---	---	---	---	---

See footnote at end of table.

Table 6.--Land Capability and Yields per Acre of Crops and Pasture--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Winter wheat	Orchardgrass-alfalfa hay	Bromegrass-alfalfa
		Bu	Bu	Bu	Tons	AUM*
1420--- Piopolis	Vw	---	---	---	---	---
3108--- Bonnie	IIIw	102	33	---	---	---
3225--- Holton	IIIw	95	32	---	4.0	7.3
3226--- Wirt	IIw	75	26	---	3.2	6.4
3288--- Petrolia	IIIw	119	39	---	---	---
3333--- Wakeland	IIIw	122	41	---	4.7	7.8
3334--- Birds	IIIw	110	38	---	4.0	6.6
3382--- Belknap	IIIw	112	35	---	---	---
3420--- Piopolis	IIIw	104	35	---	---	---
4218--- Newberry	IIIw	118	37	48	---	---
7109--- Racoon	IIw	108	35	48	4.1	6.8

* Animal unit month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

Table 7.--Woodland Management and Productivity

(Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available)

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
5C2--Blair	4A	Slight	Slight	Slight	Slight	White oak Northern red oak Green ash Bur oak	70 70 --- 70	52 52 --- 52	Shortleaf pine, loblolly pine, eastern white pine.
7C2, 7D2--Atlas	4C	Slight	Moderate	Slight	Moderate	White oak Northern red oak Bur oak Green ash	70 70 70 ---	52 52 52 ---	Green ash, pin oak, red maple, Austrian pine.
8D2--Hickory	5A	Slight	Slight	Slight	Slight	White oak Northern red oak Black oak Yellow-poplar Green ash	85 85 --- 95 ---	67 67 --- 100 ---	White oak, yellow-poplar, black walnut, sugar maple, eastern white pine.
8F--Hickory	5R	Moderate	Moderate	Slight	Slight	White oak Northern red oak Black oak Green ash Bitternut hickory Yellow-poplar	85 85 --- --- --- 95	67 67 --- --- --- 100	White oak, yellow-poplar, eastern white pine, red pine, sugar maple, black walnut.
8G--Hickory	5R	Severe	Severe	Slight	Slight	White oak Northern red oak Black oak Green ash Bitternut hickory Yellow-poplar	85 85 --- --- --- 95	67 67 --- --- --- 100	White oak, yellow-poplar, eastern white pine, red pine, sugar maple, black walnut.
12--Wynoose	4W	Slight	Severe	Moderate	Moderate	Pin oak White oak Black oak	70 --- ---	52 --- ---	Pin oak, red maple.
13A, 13B, 13B2--Bluford	4A	Slight	Moderate	Slight	Moderate	White oak Northern red oak Southern red oak Green ash Bur oak	70 70 70 --- ---	52 52 52 --- ---	Shortleaf pine, loblolly pine, eastern white pine, eastern redcedar.
14B, 14C2--Ava	4A	Slight	Slight	Slight	Slight	White oak Northern red oak Yellow-poplar Black walnut	75 80 90 ---	57 62 86 ---	Black walnut, eastern cottonwood, sweetgum, yellow-poplar, white oak, American sycamore.

See footnote at end of table.

Table 7.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
337B---------- Creal	4A	Slight	Moderate	Slight	Moderate	White oak----------	70	52	White oak, northern red oak, green ash, eastern white pine, pecan, white ash, yellow-poplar.
						Northern red oak----	70	52	
						Green ash----------	---	---	
						Bur oak----------	---	---	
786D2---------- Frondorf	8A	Slight	Slight	Slight	Slight	Virginia pine-------	78	119	Yellow-poplar, shortleaf pine, white oak, eastern white pine, loblolly pine, northern red oak.
						White oak----------	74	56	
						Black oak----------	78	60	
						Yellow-poplar-------	---	---	
						Hickory----------	---	---	
						Sweetgum----------	82	86	
786F---------- Frondorf	8R	Moderate	Moderate	Slight	Slight	Virginia pine-------	78	119	Yellow-poplar, shortleaf pine, white oak, eastern white pine, loblolly pine, northern red oak.
						White oak----------	74	56	
						Black oak----------	78	60	
						Yellow-poplar-------	---	---	
						Hickory----------	---	---	
						Sweetgum----------	82	86	
871E---------- Lenzburg	5R	Moderate	Moderate	Slight	Slight	Sweetgum----------	76	72	Black walnut, eastern cottonwood, green ash, white ash.
						Black walnut--------	73	---	
						Eastern cottonwood--	---	---	
934C2:									
Blair----------	4A	Slight	Slight	Slight	Slight	White oak----------	70	52	Shortleaf pine, loblolly pine, eastern white pine.
						Northern red oak----	70	52	
						Green ash----------	---	---	
						Bur oak----------	70	52	
Grantfork------	4T	Slight	Moderate	Slight	Moderate	Black oak----------	70	52	Eastern redcedar, eastern white pine, green ash, white ash.
						Post oak----------	---	---	
						Shagbark hickory----	---	---	
967F:									
Hickory--------	5R	Moderate	Moderate	Slight	Slight	White oak----------	85	67	White oak, yellow-poplar, eastern white pine, red pine, sugar maple, black walnut.
						Northern red oak----	85	67	
						Black oak----------	---	---	
						Green ash----------	---	---	
						Bitternut hickory---	---	---	
						Yellow-poplar-------	95	100	

See footnote at end of table.

Table 7.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
967F:									
Gosport	2R	Moderate	Moderate	Severe	Severe	White oak	45	30	Eastern white pine, red pine, Norway spruce, Scotch pine, white spruce, cottonwood.
1288 Petrolia	5W	Slight	Severe	Severe	Severe	Pin oak	90	72	Eastern cottonwood, red maple, American sycamore, baldcypress, water tupelo.
						Eastern cottonwood	100	129	
						Sweetgum	---	---	
						Cherrybark oak	---	---	
						American sycamore	---	---	
1420 Piopolis	5W	Slight	Severe	Severe	Severe	Pin oak	90	72	Eastern cottonwood, red maple, American sycamore, sweetgum, pin oak, baldcypress.
						Eastern cottonwood	100	129	
						Sweetgum	---	---	
						Cherrybark oak	---	---	
						American sycamore	---	---	
						Post oak	---	---	
3108 Bonnie	5W	Slight	Severe	Moderate	Moderate	Pin oak	90	72	Eastern cottonwood, red maple, American sycamore, sweetgum, baldcypress, pin oak.
						Eastern cottonwood	100	129	
						Sweetgum	---	---	
						Cherrybark oak	---	---	
						American sycamore	---	---	
3225 Holton	5A	Slight	Moderate	Slight	Moderate	Pin oak	85	67	Black cherry, white ash, swamp white oak, bur oak, sweetgum, red maple, American sycamore, pin oak, baldcypress, green ash.
						Northern red oak	80	62	
						Yellow-poplar	90	86	
						Sugar maple	80	50	
							---	---	
							---	---	
							---	---	
							---	---	
3226 Wirt	4A	Slight	Slight	Slight	Slight	Northern red oak	82	64	Yellow-poplar, black walnut, eastern white pine.
						Yellow-poplar	90	86	
						Sugar maple	---	---	
						Green ash	---	---	
						Black walnut	---	---	
						Boxelder	---	---	

See footnote at end of table.

Table 7.--Woodland Management and Productivity--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
3288---------- Petrolia	5W	Slight	Severe	Moderate	Severe	Pin oak----------	90	72	Eastern cottonwood, red maple, American sycamore, baldcypress, water tupelo.
						Eastern cottonwood--	100	129	
						Sweetgum----------	---	---	
						Cherrybark oak------	---	---	
						American sycamore---	---	---	
3333---------- Wakeland	5A	Slight	Moderate	Slight	Moderate	Pin oak----------	90	72	Swamp white oak, bur oak, sweetgum, red maple, American sycamore, pin oak, baldcypress, green ash.
						Sweetgum----------	88	100	
						Yellow-poplar-------	90	86	
						Virginia pine-------	85	129	
3334---------- Birds	5W	Slight	Severe	Moderate	Moderate	Pin oak----------	90	72	Eastern cottonwood, red maple, American sycamore, baldcypress, water tupelo.
						Eastern cottonwood--	100	129	
						Sweetgum----------	---	---	
						Cherrybark oak------	---	---	
						American sycamore---	---	---	
3382---------- Belknap	6A	Slight	Moderate	Slight	Moderate	Yellow-poplar-------	90	86	Eastern cottonwood, red maple, American sycamore, sweetgum, baldcypress.
						Eastern cottonwood--	100	129	
						American sycamore---	---	---	
						Sweetgum----------	---	---	
						Pin oak----------	90	72	
3420---------- Piopolis	5W	Slight	Severe	Moderate	Severe	Pin oak----------	90	72	Eastern cottonwood, red maple, American sycamore, sweetgum, pin oak, baldcypress.
						Eastern cottonwood--	100	129	
						Sweetgum----------	---	---	
						Cherrybark oak------	---	---	
						American sycamore---	---	---	
						Post oak----------	---	---	
7109---------- Racoon	4W	Slight	Severe	Moderate	Severe	Pin oak----------	80	62	Baldcypress, pin oak, water tupelo, red maple.
						Post oak----------	80	62	
						Green ash----------	---	---	
						White oak----------	---	---	

* Volume is the yield in cubic feet per acre per year calculated at the age of culmination of mean annual increment for fully stocked natural stands.

Table 8.--Windbreaks and Environmental Plantings

(The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil)

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--			
	8-15	16-25	26-35	>35
2---------- Cisne	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, northern whitecedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine----	Pin oak.
3A, 3B, 3B2------- Hoyleton	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, Amur honeysuckle, American cranberrybush.	Austrian pine, green ash, Osage-orange.	Eastern white pine, pin oak.	---
4B, 4C2---------- Richview	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
5C2, 5C3---------- Blair	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce---------	Eastern white pine, pin oak.
7C2, 7C3, 7D2, 7D3---------- Atlas	American cranberrybush, silky dogwood, Amur honeysuckle, arrowwood, Amur privet, Washington hawthorn, eastern redcedar.	Osage-orange, green ash, Austrian pine.	Pin oak, eastern white pine.	---
8D2, 8D3, 8F, 8F3, 8G---------- Hickory	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	White fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
12---------- Wynoose	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, white fir, blue spruce, northern whitecedar, Austrian pine, Norway spruce.	Eastern white pine----	Pin oak.
13A, 13B, 13B2---- Bluford	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, Amur honeysuckle, American cranberrybush.	Austrian pine, green ash, Osage-orange.	Eastern white pine, pin oak.	---

Table 8.--Windbreaks and Environmental Plantings--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--			
	8-15	16-25	26-35	>35
14B, 14C2, 14C3---Ava	Washington hawthorn, Amur privet, eastern redcedar, silky dogwood, arrowwood, Amur honeysuckle, American cranberrybush.	Austrian pine, green ash, Osage-orange.	Eastern white pine, pin oak.	---
138---------- Shiloh	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, northern whitecedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine----	Pin oak.
337B---------- Creal	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce---------	Eastern white pine, pin oak.
434C2---------- Ridgway	Amur honeysuckle, Amur privet, silky dogwood, American cranberrybush.	White fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
786D2, 786F------- Frondorf	Tatarian honeysuckle, Amur honeysuckle, lilac, autumn-olive, Washington hawthorn, radiant crabapple, eastern redcedar.	Jack pine, Austrian pine, red pine, eastern white pine.	---	---
801B. Orthents				
810. Oil-waste land, brine damaged				
871E---------- Lenzburg	Eastern redcedar, jack pine, Russian-olive, Washington hawthorn, Osage-orange.	Honeylocust, northern catalpa.	---	---
889B2:				
Darmstadt--------	Eastern redcedar, Russian-olive.	Siberian elm, green ash.	---	---
Bluford----------	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, Amur honeysuckle, American cranberrybush.	Austrian pine, green ash, Osage-orange.	Eastern white pine, pin oak.	---
912A, 912B2:				
Darmstadt--------	Eastern redcedar, Russian-olive.	Siberian elm, green ash.	---	---

Table 8.--Windbreaks and Environmental Plantings--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--			
	8-15	16-25	26-35	>35
912A, 912B2:				
Hoyleton	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, Amur honeysuckle, American cranberrybush.	Austrian pine, green ash, Osage-orange.	Eastern white pine, pin oak.	---
934C2:				
Blair	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
Grantfork	Eastern redcedar, Russian-olive.	Green ash, Siberian elm.	---	---
967F:				
Hickory	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	White fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
Gosport	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, Amur honeysuckle, American cranberrybush.	Austrian pine, green ash, Osage-orange.	Eastern white pine, pin oak.	---
991:				
Cisne	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Norway spruce, Austrian pine, northern whitecedar, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
Huey	Eastern redcedar, Russian-olive, silky dogwood.	Siberian elm, green ash.	---	---
1288 Petrolia	Silky dogwood, Amur privet, American cranberrybush, Amur honeysuckle.	White fir, blue spruce, Washington hawthorn, Norway spruce, Austrian pine, northern whitecedar.	Eastern white pine	Pin oak.
1420 Piopolis	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, white fir, blue spruce, northern whitecedar, Austrian pine, Norway spruce.	Eastern white pine	Pin oak.
3108 Bonnie	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	White fir, blue spruce, Washington hawthorn, northern whitecedar, Austrian pine, Norway spruce.	Eastern white pine	Pin oak.

Table 8.--Windbreaks and Environmental Plantings--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--			
	8-15	16-25	26-35	>35
3225--Holton	Amur honeysuckle, Amur privet, American cranberrybush, silky dogwood.	White fir, blue spruce, northern whitecedar, Austrian pine, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
3226--Wirt	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Austrian pine, northern whitecedar, white fir, Washington hawthorn, blue spruce.	Norway spruce	Eastern white pine, pin oak.
3288--Petrolia	Silky dogwood, Amur privet, American cranberrybush, Amur honeysuckle.	White fir, blue spruce, Washington hawthorn, Norway spruce, Austrian pine, northern whitecedar.	Eastern white pine	Pin oak.
3333--Wakeland	Amur honeysuckle, Amur privet, American cranberrybush, silky dogwood.	Northern whitecedar, Austrian pine, white fir, blue spruce, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
3334--Birds	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Washington hawthorn, white fir, blue spruce, northern whitecedar, Austrian pine, Norway spruce.	Eastern white pine	Pin oak.
3382--Belknap	Silky dogwood, Amur privet, Amur honeysuckle, American cranberrybush.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce	Pin oak, eastern white pine.
3420--Piopolis	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, white fir, blue spruce, northern whitecedar, Austrian pine, Norway spruce.	Eastern white pine	Pin oak.
4218--Newberry	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, white fir, blue spruce, northern whitecedar, Austrian pine, Norway spruce.	Eastern white pine	Pin oak.
7109--Racoon	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, white fir, blue spruce, northern whitecedar, Austrian pine, Norway spruce.	Eastern white pine	Pin oak.

Table 9.--Recreational Development

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
2 Cisne	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
3A, 3B, 3B2 Hoyleton	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
4B Richview	Slight	Slight	Moderate: slope.	Slight	Slight.
4C2 Richview	Slight	Slight	Severe: slope.	Slight	Slight.
5C2, 5C3 Blair	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: slope.	Moderate: wetness.	Moderate: wetness.
7C2, 7C3 Atlas	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: slope, wetness, percs slowly.	Severe: wetness.	Severe: wetness.
7D2, 7D3 Atlas	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: slope, wetness, percs slowly.	Severe: wetness, erodes easily.	Severe: wetness.
8D2, 8D3 Hickory	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
8F, 8F3, 8G Hickory	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
12 Wynoose	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
13A, 13B, 13B2 Bluford	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
14B Ava	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Moderate: wetness.	Moderate: wetness.
14C2, 14C3 Ava	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Moderate: wetness.	Moderate: wetness.
138 Shiloh	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
337B Creal	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
434C2 Ridgway	Slight	Slight	Severe: slope.	Slight	Slight.

Table 9.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
786D2--- Frondorf	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope, thin layer.
786F--- Frondorf	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
801B. Orthents					
810. Oil-waste land, brine damaged					
871E--- Lenzburg	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
889B2:					
Darmstadt---	Severe: wetness, percs slowly, excess sodium.	Severe: wetness, excess sodium, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: excess sodium, wetness.
Bluford---	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
912A, 912B2:					
Darmstadt---	Severe: wetness, percs slowly, excess sodium.	Severe: wetness, excess sodium, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: excess sodium, wetness.
Hoyleton---	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
934C2:					
Blair---	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: slope.	Moderate: wetness.	Moderate: wetness.
Grantfork---	Severe: wetness.	Severe: wetness.	Severe: slope, wetness.	Severe: wetness.	Severe: wetness.
967F:					
Hickory---	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Gosport---	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, erodes easily.	Severe: slope.
991:					
Cisne---	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.

Table 9.--Recreational Development--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
991: Huey	Severe: ponding, percs slowly, excess sodium.	Severe: ponding, excess sodium, percs slowly.	Severe: ponding, percs slowly, excess sodium.	Severe: ponding.	Severe: excess sodium, ponding.
1288 Petrolia	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding, flooding.	Severe: ponding.	Severe: ponding, flooding.
1420 Piopolis	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding, flooding.	Severe: ponding.	Severe: ponding, flooding.
3108 Bonnie	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
3225 Holton	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
3226 Wirt	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
3288 Petrolia	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding, flooding.	Severe: ponding.	Severe: ponding, flooding.
3333 Wakeland	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
3334 Birds	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
3382 Belknap	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness.	Severe: wetness, flooding.
3420 Piopolis	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding, flooding.	Severe: ponding.	Severe: ponding, flooding.
4218 Newberry	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
7109 Racoon	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.

Table 10.--Wildlife Habitat

(See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
2---- Cisne	Fair	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
3A---- Hoyleton	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
3B, 3B2---- Hoyleton	Fair	Good	Good	Good	Good	Fair	Poor	Good	Good	Poor.
4B---- Richview	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
4C2---- Richview	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
5C2, 5C3---- Blair	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
7C2, 7C3, 7D2, 7D3- Atlas	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
8D2, 8D3---- Hickory	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
8F, 8F3, 8G---- Hickory	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
12---- Wynoose	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
13A---- Bluford	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
13B, 13B2---- Bluford	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
14B, 14C2, 14C3---- Ava	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
138---- Shiloh	Fair	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
337B---- Creal	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
434C2---- Ridgway	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Poor.
786D2---- Frondorf	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
786F---- Frondorf	Very poor.	Fair	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
801B. Orthents										

Table 10.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herba-ceous plants	Hardwood trees	Conif-erous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
810. Oil-waste land, brine damaged										
871E---------- Lenzburg	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
889B2:										
Darmstadt---------	Fair	Good	Poor	Good	Good	Fair	Poor	Fair	Good	Poor.
Bluford----------	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
912A:										
Darmstadt---------	Fair	Good	Poor	Good	Good	Fair	Fair	Fair	Good	Fair.
Hoyleton----------	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
912B2:										
Darmstadt---------	Fair	Good	Poor	Good	Good	Fair	Poor	Fair	Good	Poor.
Hoyleton----------	Fair	Good	Good	Good	Good	Fair	Poor	Good	Good	Poor.
934C2:										
Blair----------	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Grantfork---------	Fair	Good	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
967F:										
Hickory----------	Very poor.	Poor	Good	Good	Good	Very poor.	Very poor.	Poor	Good	Very poor.
Gosport----------	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
991:										
Cisne----------	Fair	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
Huey----------	Poor	Poor	Poor	Fair	Fair	Good	Good	Poor	Fair	Good.
1288---------- Petrolia	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
1420---------- Piopolis	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
3108---------- Bonnie	Poor	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
3225---------- Holton	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
3226---------- Wirt	Poor	Fair	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
3288---------- Petrolia	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.

Table 10.--Wildlife Habitat--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
3333---------- Wakeland	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
3334---------- Birds	Good	Fair	Good	Good	Fair	Good	Good	Good	Good	Good.
3382---------- Belknap	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
3420---------- Piopolis	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
4218---------- Newberry	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
7109---------- Racoon	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.

Table 11.--Building Site Development

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
2---------- Cisne	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
3A, 3B, 3B2------- Hoyleton	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.	Moderate: wetness.
4B---------- Richview	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
4C2---------- Richview	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
5C2, 5C3---------- Blair	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength, frost action.	Moderate: wetness.
7C2, 7C3---------- Atlas	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
7D2, 7D3---------- Atlas	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
8D2, 8D3---------- Hickory	Moderate: wetness, slope.	Moderate: shrink-swell, slope.	Moderate: wetness, slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
8F, 8F3, 8G------- Hickory	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
12---------- Wynoose	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
13A, 13B, 13B2---- Bluford	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
14B---------- Ava	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Moderate: wetness.

Table 11.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
14C2, 14C3-------- Ava	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength, frost action.	Moderate: wetness.
138--------------- Shiloh	Severe: ponding.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: ponding, shrink-swell.	Severe: shrink-swell, low strength, ponding.	Severe: ponding.
337B-------------- Creal	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, frost action.	Severe: wetness.
434C2------------- Ridgway	Slight---------	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
786D2------------- Frondorf	Moderate: depth to rock, slope.	Moderate: slope.	Moderate: depth to rock, slope.	Severe: slope.	Moderate: slope.	Moderate: slope, thin layer.
786F-------------- Frondorf	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
801B. Orthents						
810. Oil-waste land, brine damaged						
871E-------------- Lenzburg	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
889B2: Darmstadt-------- Bluford----------	Severe: wetness. Severe: wetness.	Severe: wetness. Severe: wetness, shrink-swell.	Severe: wetness. Severe: wetness.	Severe: wetness. Severe: wetness, shrink-swell.	Severe: low strength, wetness, frost action. Severe: shrink-swell, low strength, wetness.	Severe: excess sodium, wetness. Severe: wetness.
912A, 912B2: Darmstadt-------- Hoyleton---------	Severe: wetness. Severe: wetness.	Severe: wetness. Severe: wetness, shrink-swell.	Severe: wetness. Severe: wetness.	Severe: wetness. Severe: wetness, shrink-swell.	Severe: low strength, wetness, frost action. Severe: shrink-swell, low strength, frost action.	Severe: excess sodium, wetness. Moderate: wetness.

Table 11.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
934C2:						
Blair	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength, frost action.	Moderate: wetness.
Grantfork	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, wetness, frost action.	Severe: wetness.
967F:						
Hickory	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Gosport	Severe: wetness, slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
991:						
Cisne	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
Huey	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: excess sodium, ponding.
1288 Petrolia	Severe: ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: low strength, ponding, flooding.	Severe: ponding, flooding.
1420 Piopolis	Severe: ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: low strength, ponding, flooding.	Severe: ponding, flooding.
3108 Bonnie	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding.
3225 Holton	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding, frost action.	Severe: wetness, flooding.
3226 Wirt	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
3288 Petrolia	Severe: ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: low strength, ponding, flooding.	Severe: ponding, flooding.

Table 11.--Building Site Development--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
3333--Wakeland	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding, frost action.	Severe: wetness, flooding.
3334--Birds	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding.
3382--Belknap	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: wetness, flooding, frost action.	Severe: wetness. flooding.
3420--Piopolis	Severe: ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: low strength, ponding, flooding.	Severe: ponding, flooding.
4218--Newberry	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
7109--Racoon	Severe: ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.

Table 12.--Sanitary Facilities

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Area sanitary landfill	Daily cover for landfill
2---------- Cisne	Severe: wetness, percs slowly.	Slight----------	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
3A---------- Hoyleton	Severe: wetness, percs slowly.	Slight----------	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
3B, 3B2---------- Hoyleton	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
4B---------- Richview	Moderate: wetness, percs slowly.	Moderate: seepage, slope, wetness.	Moderate: wetness.	Fair: too clayey.
4C2---------- Richview	Moderate: wetness, percs slowly.	Severe: slope.	Moderate: wetness.	Fair: too clayey.
5C2, 5C3---------- Blair	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness.	Fair: too clayey, wetness.
7C2, 7C3, 7D2, 7D3-- Atlas	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
8D2, 8D3---------- Hickory	Moderate: wetness, percs slowly, slope.	Severe: slope.	Moderate: wetness, slope.	Fair: too clayey, slope.
8F, 8F3, 8G--------- Hickory	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
12---------- Wynoose	Severe: wetness, percs slowly.	Slight----------	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
13A---------- Bluford	Severe: wetness, percs slowly.	Slight----------	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
13B, 13B2---------- Bluford	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.

Table 12.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Area sanitary landfill	Daily cover for landfill
14B Ava	Severe: wetness, percs slowly.	Moderate: slope.	Moderate: wetness.	Fair: too clayey, wetness.
14C2, 14C3 Ava	Severe: wetness, percs slowly.	Severe: slope.	Moderate: wetness.	Fair: too clayey, wetness.
138 Shiloh	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
337B Creal	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Poor: wetness.
434C2 Ridgway	Moderate: percs slowly.	Severe: slope.	Slight	Fair: too clayey.
786D2 Frondorf	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Poor: depth to rock.
786F Frondorf	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
801B. Orthents				
810. Oil-waste land, brine damaged				
871E Lenzburg	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Poor: slope.
889B2: Darmstadt	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Poor: wetness, excess sodium.
Bluford	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Poor: wetness.
912A: Darmstadt	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Poor: wetness, excess sodium.
Hoyleton	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
912B2: Darmstadt	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Poor: wetness, excess sodium.

Table 12.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Area sanitary landfill	Daily cover for landfill
912B2:				
Hoyleton	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
934C2:				
Blair	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness.	Fair: too clayey, wetness.
Grantfork	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness.	Poor: wetness.
967F:				
Hickory	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Gosport	Severe: depth to rock, wetness, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
991:				
Cisne	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Huey	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Poor: ponding, excess sodium.
1288 Petrolia	Severe: flooding, ponding, percs slowly.	Severe: flooding, ponding.	Severe: flooding, ponding.	Poor: ponding.
1420 Piopolis	Severe: flooding, ponding, percs slowly.	Severe: flooding, ponding.	Severe: flooding, ponding.	Poor: ponding.
3108 Bonnie	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
3225 Holton	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
3226 Wirt	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding.	Fair: thin layer.
3288 Petrolia	Severe: flooding, ponding, percs slowly.	Severe: flooding, ponding.	Severe: flooding, ponding.	Poor: ponding.

Table 12.--Sanitary Facilities--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Area sanitary landfill	Daily cover for landfill
3333---------- Wakeland	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
3334---------- Birds	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
3382---------- Belknap	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
3420---------- Piopolis	Severe: flooding, ponding, percs slowly.	Severe: flooding, ponding.	Severe: flooding, ponding.	Poor: ponding.
4218---------- Newberry	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Poor: ponding.
7109---------- Racoon	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Poor: ponding.

Table 13.--Construction Materials

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
2 Cisne	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
3A, 3B, 3B2 Hoyleton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
4B, 4C2 Richview	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
5C2, 5C3 Blair	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
7C2, 7C3, 7D2, 7D3 Atlas	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
8D2, 8D3 Hickory	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
8F, 8F3, 8G Hickory	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
12 Wynoose	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
13A, 13B, 13B2 Bluford	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
14B, 14C2, 14C3 Ava	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
138 Shiloh	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
337B Creal	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
434C2 Ridgway	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
786D2 Frondorf	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.

Table 13.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
786F---------- Frondorf	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
801B. Orthents				
810. Oil-waste land, brine damaged				
871E---------- Lenzburg	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
889B2:				
Darmstadt----------	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, excess sodium.
Bluford----------	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
912A, 912B2:				
Darmstadt----------	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness, excess sodium.
Hoyleton----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
934C2:				
Blair----------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
Grantfork----------	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
967F:				
Hickory----------	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Gosport----------	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
991:				
Cisne----------	Poor: shrink-swell, low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
Huey----------	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness, excess sodium.

Table 13.--Construction Materials--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
1288---------- Petrolia	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
1420---------- Piopolis	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
3108---------- Bonnie	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
3225---------- Holton	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
3226---------- Wirt	Good----------	Probable----------	Improbable: too sandy.	Fair: small stones, area reclaim.
3288---------- Petrolia	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
3333---------- Wakeland	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
3334---------- Birds	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
3382---------- Belknap	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
3420---------- Piopolis	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
4218---------- Newberry	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
7109---------- Racoon	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.

Table 14.--Water Management

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
2---------- Cisne	Slight---------	Severe: wetness.	Percs slowly, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
3A---------- Hoyleton	Slight---------	Severe: wetness.	Percs slowly, frost action.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
3B, 3B2---------- Hoyleton	Moderate: slope.	Severe: wetness.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
4B, 4C2---------- Richview	Moderate: seepage, slope.	Slight---------	Deep to water	Slope----------	Erodes easily	Erodes easily.
5C2, 5C3---------- Blair	Moderate: slope.	Severe: wetness.	Frost action, slope.	Slope, wetness, erodes easily.	Erodes easily, wetness.	Erodes easily.
7C2, 7C3---------- Atlas	Moderate: slope.	Severe: hard to pack, wetness.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
7D2, 7D3---------- Atlas	Severe: slope.	Severe: hard to pack, wetness.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
8D2, 8D3---------- Hickory	Severe: slope.	Slight---------	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
8F, 8F3, 8G------- Hickory	Severe: slope.	Moderate: thin layer.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
12---------- Wynoose	Slight---------	Severe: wetness.	Percs slowly, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
13A---------- Bluford	Slight---------	Severe: piping, wetness.	Percs slowly, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
13B, 13B2--------- Bluford	Moderate: slope.	Severe: piping, wetness.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
14B, 14C2, 14C3--- Ava	Moderate: seepage, slope.	Severe: piping.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Erodes easily, wetness, rooting depth.	Erodes easily, rooting depth, percs slowly.
138---------- Shiloh	Slight---------	Severe: ponding.	Ponding, frost action.	Ponding--------	Ponding--------	Wetness.
337B---------- Creal	Moderate: slope.	Severe: thin layer, wetness.	Frost action, slope.	Slope, wetness, erodes easily.	Erodes easily, wetness.	Wetness, erodes easily.

Table 14.--Water Management--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
434C2--Ridgway	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
786D2, 786F--Frondorf	Severe: slope.	Severe: piping.	Deep to water	Depth to rock, slope, erodes easily.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
801B. Orthents						
810. Oil-waste land, brine damaged						
871E--Lenzburg	Severe: slope.	Moderate: piping.	Deep to water	Slope----------	Slope----------	Slope.
889B2:						
Darmstadt	Moderate: slope.	Severe: wetness, excess sodium.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, excess sodium, erodes easily.
Bluford	Moderate: slope.	Severe: piping, wetness.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
912A:						
Darmstadt	Slight	Severe: wetness, excess sodium.	Percs slowly, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, excess sodium, erodes easily.
Hoyleton	Slight	Severe: wetness.	Percs slowly, frost action.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
912B2:						
Darmstadt	Moderate: slope.	Severe: wetness, excess sodium.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, excess sodium, erodes easily.
Hoyleton	Moderate: slope.	Severe: wetness.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
934C2:						
Blair	Moderate: slope.	Severe: wetness.	Frost action, slope.	Slope, wetness, erodes easily.	Erodes easily, wetness.	Erodes easily.
Grantfork	Moderate: slope.	Severe: wetness.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
967F:						
Hickory	Severe: slope.	Moderate: thin layer.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
Gosport	Severe: slope.	Severe: hard to pack.	Percs slowly, depth to rock, slope.	Slope, wetness, percs slowly.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.

Table 14.--Water Management--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
991:						
Cisne	Slight	Severe: wetness.	Percs slowly, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Huey	Slight	Severe: ponding, excess sodium.	Ponding, percs slowly, frost action.	Ponding, percs slowly, erodes easily.	Erodes easily, ponding, percs slowly.	Wetness, excess sodium, erodes easily.
1288 Petrolia	Slight	Severe: ponding.	Ponding, flooding, frost action.	Ponding, flooding.	Ponding	Wetness.
1420 Piopolis	Slight	Severe: ponding.	Ponding, percs slowly, flooding.	Ponding, percs slowly, erodes easily.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
3108 Bonnie	Slight	Severe: wetness.	Flooding, frost action.	Wetness, erodes easily, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
3225 Holton	Moderate: seepage.	Severe: piping, wetness.	Flooding, frost action.	Wetness, erodes easily, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
3226 Wirt	Severe: seepage.	Severe: seepage, piping.	Deep to water	Erodes easily, flooding.	Erodes easily	Erodes easily.
3288 Petrolia	Slight	Severe: ponding.	Ponding, flooding, frost action.	Ponding, flooding.	Ponding	Wetness.
3333 Wakeland	Moderate: seepage.	Severe: piping, wetness.	Flooding, frost action.	Wetness, erodes easily, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
3334 Birds	Slight	Severe: wetness.	Flooding, frost action.	Wetness, erodes easily, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
3382 Belknap	Moderate: seepage.	Severe: piping, wetness.	Flooding, frost action.	Wetness, erodes easily, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
3420 Piopolis	Slight	Severe: ponding.	Ponding, percs slowly, flooding.	Ponding, percs slowly, erodes easily.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
4218 Newberry	Slight	Severe: ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly, erodes easily.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
7109 Racoon	Slight	Severe: ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly, erodes easily.	Erodes easily, ponding.	Wetness, erodes easily, percs slowly.

Table 15.--Engineering Index Properties

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification		Fragments >3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
2---------- Cisne	0-7	Silt loam-----	CL, CL-ML, ML	A-4	0	100	100	90-100	90-100	25-35	5-10
	7-19	Silt loam-----	CL-ML, CL	A-4, A-6	0	100	100	95-100	90-100	25-35	5-15
	19-48	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	90-100	90-100	45-60	20-35
	48-60	Silty clay loam, clay loam, silt loam.	CL	A-6, A-7	0-5	100	95-100	90-100	65-90	30-50	15-30
3A, 3B--------- Hoyleton	0-8	Silt loam-----	CL-ML, CL	A-4, A-6	0	100	100	95-100	85-100	25-35	5-15
	8-12	Silt loam-----	CL-ML, CL	A-4, A-6	0	100	100	95-100	90-100	25-35	5-15
	12-33	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	95-100	85-100	40-55	20-30
	33-60	Silt loam, silty clay loam, clay loam.	CL, CL-ML	A-6, A-7, A-4	0	100	95-100	90-100	65-90	20-45	5-25
3B2---------- Hoyleton	0-8	Silt loam-----	CL-ML, CL	A-4, A-6	0	100	100	95-100	85-100	25-35	5-15
	8-29	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	95-100	85-100	40-55	20-30
	29-60	Silt loam, loam, clay loam.	CL, CL-ML	A-6, A-7, A-4	0	100	95-100	90-100	65-90	20-45	5-25
4B---------- Richview	0-8	Silt loam-----	CL-ML, CL	A-4, A-6	0	100	100	95-100	90-100	25-35	5-15
	8-33	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	90-100	35-50	15-30
	33-60	Sandy loam, loam, clay loam.	CL, SC	A-6, A-7	0	100	95-100	90-100	45-90	25-45	10-20
4C2---------- Richview	0-7	Silt loam-----	CL-ML, CL	A-4, A-6	0	100	100	95-100	90-100	25-35	5-15
	7-30	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	90-100	35-50	15-30
	30-60	Sandy loam, loam, clay loam.	CL, SC	A-6, A-7	0	100	95-100	90-100	45-90	25-45	10-20
5C2---------- Blair	0-5	Silt loam-----	CL-ML, CL	A-4, A-6	0-2	95-100	90-100	90-100	85-95	20-35	5-15
	5-34	Silty clay loam, clay loam, loam.	CL	A-6, A-7	0-5	95-100	90-100	90-100	70-85	30-50	15-30
	34-60	Silty clay loam, clay loam, loam.	CL	A-6, A-7	0-5	95-100	90-100	85-100	70-85	30-50	15-30

Table 15.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments >3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
5C3---------- Blair	0-8	Silty clay loam.	CL	A-6	0-5	95-100	90-100	90-100	85-100	25-40	10-20
	8-33	Silty clay loam, clay loam, loam.	CL	A-6, A-7	0-5	95-100	90-100	90-100	70-85	30-50	15-30
	33-60	Silty clay loam, clay loam, loam.	CL	A-6, A-7	0-5	95-100	90-100	85-100	70-85	30-50	15-30
7C2---------- Atlas	0-9	Silt loam-----	CL, CL-ML	A-6, A-4	0	100	100	95-100	75-95	25-35	5-15
	9-60	Silty clay loam, clay, clay loam.	CH	A-7	0	100	95-100	95-100	75-95	50-70	30-45
7C3---------- Atlas	0-4	Silty clay loam.	CH, CL	A-7	0	100	100	95-100	75-100	40-60	25-40
	4-22	Silty clay loam, clay, clay loam.	CH	A-7	0	100	95-100	95-100	75-95	50-70	30-45
	22-60	Silty clay loam, clay, clay loam.	CH	A-7	0	100	95-100	95-100	75-95	50-70	30-45
7D2---------- Atlas	0-6	Silt loam-----	CL, CL-ML	A-6, A-4	0	100	100	95-100	75-95	25-35	5-15
	6-48	Silty clay loam, clay, clay loam.	CH	A-7	0	100	95-100	95-100	75-95	50-70	30-45
	48-60	Silty clay loam, clay, clay loam.	CH	A-7	0	100	95-100	95-100	75-95	50-70	30-45
7D3---------- Atlas	0-4	Silty clay loam.	CH, CL	A-7	0	100	100	95-100	75-100	40-60	25-40
	4-18	Silty clay loam, clay, clay loam.	CH	A-7	0	100	95-100	95-100	75-95	50-70	30-45
	18-60	Silty clay loam, clay, clay loam.	CH	A-7	0	100	95-100	95-100	75-95	50-70	30-45
8D2---------- Hickory	0-3	Silt loam-----	CL	A-4, A-6	0-1	95-100	90-100	90-100	75-95	20-35	8-15
	3-60	Clay loam, loam.	CL	A-7, A-6	0-5	95-100	80-100	70-95	50-80	30-50	15-30
8D3---------- Hickory	0-5	Clay loam-----	CL	A-6, A-7	0-5	95-100	90-100	90-100	80-95	30-50	15-30
	5-60	Clay loam, loam.	CL	A-7, A-6	0-5	95-100	80-100	70-95	50-80	30-50	15-30
8F---------- Hickory	0-9	Loam----------	CL, ML, CL-ML	A-6, A-4	0-5	95-100	90-100	90-100	75-95	20-35	3-15
	9-44	Clay loam, loam.	CL	A-6, A-7	0-5	95-100	80-100	70-95	50-80	30-50	15-30
	44-60	Clay loam, loam, gravelly clay loam.	CL-ML, CL	A-4, A-6	0-5	85-100	75-95	70-95	50-75	20-40	5-20

Table 15.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments >3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
8F3----------	0-2	Clay loam-----	CL	A-6, A-7	0-5	95-100	90-100	80-95	70-85	30-50	15-30
Hickory	2-38	Clay loam, loam.	CL	A-6, A-7	0-5	95-100	80-100	70-95	50-80	30-50	15-30
	38-60	Clay loam, loam, gravelly clay loam.	CL-ML, CL	A-4, A-6	0-5	85-100	75-95	70-95	50-75	20-40	5-20
8G----------	0-6	Loam----------	CL, ML, CL-ML	A-6, A-4	0-5	95-100	90-100	90-100	75-95	20-35	3-15
Hickory	6-40	Clay loam, loam.	CL	A-6, A-7	0-5	95-100	80-100	70-95	50-80	30-50	15-30
	40-60	Clay loam, loam, gravelly clay loam.	CL-ML, CL	A-4, A-6	0-5	85-100	75-95	70-95	50-75	20-40	5-20
12----------	0-6	Silt loam-----	CL-ML, CL	A-4, A-6	0	100	100	95-100	85-95	20-35	5-15
Wynoose	6-21	Silt loam-----	CL, ML, CL-ML	A-4, A-6	0	100	100	95-100	85-95	15-30	2-15
	21-41	Silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	85-95	40-55	20-35
	41-60	Silt loam, clay loam, silty clay loam.	CL	A-6, A-7	0	100	95-100	90-100	65-90	30-45	15-25
13A, 13B------	0-7	Silt loam-----	CL, CL-ML	A-6, A-4	0	100	95-100	95-100	90-100	20-35	5-15
Bluford	7-12	Silt loam-----	ML, CL-ML, CL	A-4	0	100	95-100	95-100	90-100	20-30	NP-10
	12-38	Silty clay loam, silty clay.	CL, CH	A-7, A-6	0	100	95-100	95-100	90-100	35-50	15-30
	38-60	Loam, clay loam, silty clay loam.	CL-ML, CL	A-6, A-4	0-5	100	95-100	90-100	65-90	25-40	5-20
13B2----------	0-6	Silt loam-----	CL, CL-ML	A-6, A-4	0	100	95-100	95-100	90-100	20-35	5-15
Bluford	6-32	Silty clay loam, silty clay.	CL, CH	A-7, A-6	0	100	95-100	95-100	90-100	35-50	15-30
	32-60	Loam, clay loam, silty clay loam.	CL-ML, CL	A-6, A-4	0-5	100	95-100	90-100	65-90	25-40	5-20
14B----------	0-11	Silt loam-----	CL, ML, CL-ML	A-6, A-4	0	100	100	95-100	90-100	25-35	5-15
Ava	11-23	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	90-100	25-45	10-20
	23-36	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	90-100	25-45	10-20
	36-60	Silty clay loam, loam, clay loam.	CL, CL-ML, ML	A-4, A-6, A-7	0	100	95-100	90-100	65-90	20-45	5-20

Table 15.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments >3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
14C2---------- Ava	0-5	Silt loam-----	CL, ML, CL-ML	A-6, A-4	0	100	100	95-100	90-100	25-35	5-15
	5-16	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	90-100	25-45	10-20
	16-30	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	90-100	25-45	10-20
	30-52	Silty clay loam, loam, clay loam.	CL, CL-ML, ML	A-4, A-6, A-7	0	100	95-100	90-100	65-90	20-45	5-20
	52-60	Loam, silt loam, clay loam.	CL, ML, CL-ML	A-4, A-6	0	100	95-100	90-100	65-80	25-40	5-20
14C3---------- Ava	0-7	Silty clay loam.	CL	A-6, A-7	0	100	100	95-100	90-100	30-45	10-20
	7-18	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	90-100	25-45	10-20
	18-34	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	90-100	25-45	10-20
	34-60	Silty clay loam, loam, clay loam.	CL, CL-ML, ML	A-4, A-6, A-7	0	100	95-100	90-100	65-90	20-45	5-20
138---------- Shiloh	0-16	Silty clay loam.	CL	A-7	0	100	100	95-100	90-100	40-50	15-25
	16-60	Silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	90-100	40-65	15-40
337B---------- Creal	0-6	Silt loam-----	ML, CL	A-4, A-6	0	100	100	95-100	85-100	30-40	5-15
	6-25	Silt loam-----	CL-ML, CL	A-4, A-6	0	100	100	95-100	85-100	25-35	4-12
	25-60	Silt loam, silty clay loam, clay loam.	CL, ML	A-6, A-7	0	100	95-100	95-100	65-100	35-50	10-25
434C2---------- Ridgway	0-5	Silt loam-----	CL, ML, CL-ML	A-6, A-4	0	100	95-100	95-100	90-100	20-35	3-15
	5-33	Silty clay loam, silt loam.	CL	A-6	0	100	95-100	95-100	90-100	30-40	15-25
	33-60	Clay loam, loam.	CL, ML	A-4, A-6	0	90-100	85-100	80-90	50-70	20-40	3-15
786D2, 786F--- Frondorf	0-7	Silt loam-----	ML, CL, CL-ML	A-4	0-5	90-100	90-100	85-100	75-100	25-35	5-10
	7-35	Channery clay loam, silty clay loam, loam.	ML, CL, GM, GC	A-4, A-6, A-2, A-7	0-40	55-100	50-85	40-85	30-85	<45	NP-25
	35-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
801B. Orthents											

Table 15.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments >3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
810. Oil-waste land, brine damaged											
871E---------- Lenzburg	0-4	Clay loam-----	CL	A-6, A-7	3-15	80-95	75-90	65-90	50-85	30-45	10-25
	4-60	Gravelly loam, gravelly silty clay loam, gravelly clay loam.	CL	A-6, A-7	3-25	70-95	60-90	55-90	50-90	25-45	10-25
889B2:											
Darmstadt----	0-8	Silt loam-----	CL, CL-ML	A-6, A-7, A-4	0	95-100	95-100	95-100	75-100	25-45	5-20
	8-18	Silty clay loam, silty clay.	CL, CH	A-7	0	100	95-100	95-100	90-100	40-65	20-40
	18-37	Silty clay loam.	CL	A-7	0	100	95-100	95-100	90-100	40-65	20-40
	37-60	Clay loam, silty clay loam, loam.	CL	A-6, A-7, A-4	0	95-100	95-100	90-100	65-90	20-50	7-30
Bluford------	0-7	Silt loam-----	CL, CL-ML	A-6, A-4	0	100	95-100	95-100	90-100	20-35	5-15
	7-33	Silty clay loam, silty clay.	CL, CH	A-7, A-6	0	100	95-100	95-100	90-100	35-50	15-30
	33-60	Loam, clay loam, silty clay loam.	CL-ML, CL	A-6, A-4	0-5	100	95-100	90-100	65-90	25-40	5-20
912A:											
Darmstadt----	0-13	Silt loam-----	CL, CL-ML	A-6, A-7, A-4	0	95-100	95-100	95-100	75-100	25-45	5-20
	13-20	Silty clay loam, silty clay.	CL, CH	A-7	0	100	95-100	95-100	90-100	40-65	20-40
	20-40	Silty clay loam.	CL	A-7	0	100	95-100	95-100	90-100	40-65	20-40
	40-60	Silt loam, silty clay loam, clay loam.	CL	A-6, A-7, A-4	0	95-100	95-100	90-100	65-90	20-50	7-30
Hoyleton-----	0-8	Silt loam-----	CL-ML, CL	A-4, A-6	0	100	100	95-100	85-100	25-35	5-15
	8-11	Silt loam-----	CL-ML, CL	A-4, A-6	0	100	100	95-100	90-100	25-35	5-15
	11-34	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	95-100	85-100	40-55	20-30
	34-60	Silt loam, clay loam, silty clay loam.	CL, CL-ML	A-6, A-7, A-4	0	100	95-100	90-100	65-90	20-45	5-25

Table 15.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments >3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
912B2:											
Darmstadt----	0-7	Silt loam-----	CL, CL-ML	A-6, A-7, A-4	0	95-100	95-100	95-100	75-100	25-45	5-20
	7-21	Silty clay loam, silty clay.	CL, CH	A-7	0	100	95-100	95-100	90-100	40-65	20-40
	21-28	Silty clay loam.	CL	A-7	0	100	95-100	95-100	90-100	40-65	20-40
	28-60	Silty clay loam, clay loam, loam.	CL	A-6, A-7, A-4	0	95-100	95-100	90-100	65-90	20-50	7-30
Hoyleton-----	0-7	Silt loam-----	CL-ML, CL	A-4, A-6	0	100	100	95-100	85-100	25-35	5-15
	7-27	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	95-100	85-100	40-55	20-30
	27-60	Silty clay loam, clay loam, loam.	CL, CL-ML	A-6, A-7, A-4	0	100	95-100	90-100	65-90	20-45	5-25
934C2:											
Blair--------	0-7	Silt loam-----	CL-ML, CL	A-4, A-6	0-2	95-100	90-100	90-100	85-95	20-35	5-15
	7-26	Silty clay loam, clay loam, loam.	CL	A-6, A-7	0-5	95-100	90-100	90-100	70-85	30-50	15-30
	26-60	Silty clay loam, clay loam, loam.	CL	A-6, A-7	0-5	95-100	90-100	85-100	70-85	30-50	15-30
Grantfork----	0-8	Silty clay loam.	CL	A-6	0	100	95-100	85-95	80-90	30-40	10-20
	8-26	Silty clay loam, clay loam, loam.	CL	A-6, A-7	0	100	90-100	80-90	60-85	30-45	10-20
	26-60	Clay loam, loam, silt loam.	CL	A-6, A-7	0-5	95-100	85-95	70-80	55-75	25-45	10-25
967F:											
Hickory------	0-6	Loam----------	CL, ML, CL-ML	A-6, A-4	0-5	95-100	90-100	90-100	75-95	20-35	3-15
	6-46	Clay loam, loam.	CL	A-6, A-7	0-5	95-100	80-100	70-95	50-80	30-50	15-30
	46-60	Clay loam, loam, gravelly clay loam.	CL-ML, CL	A-4, A-6	0-5	85-100	75-95	70-95	50-75	20-40	5-20
Gosport------	0-6	Loam----------	CL, CL-ML	A-4, A-6	0	100	90-100	90-100	70-100	25-40	5-15
	6-38	Clay, silty clay, silty clay loam.	CH	A-7	0	100	90-100	90-100	85-100	50-65	35-50
	38-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---

Table 15.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments >3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
991:											
Cisne	0-7	Silt loam	CL, CL-ML, ML	A-4	0	100	100	90-100	90-100	25-35	5-10
	7-14	Silt loam	CL-ML, CL	A-4, A-6	0	100	100	95-100	90-100	25-35	5-15
	14-46	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	90-100	90-100	45-60	20-35
	46-60	Silty clay loam, clay loam, silt loam.	CL	A-6, A-7	0-5	100	95-100	90-100	65-90	30-50	15-30
Huey	0-8	Silt loam	CL, CL-ML, ML	A-4, A-6	0	100	100	90-100	85-95	20-35	3-15
	8-12	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	95-100	90-100	25-45	10-25
	12-52	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	95-100	90-100	30-50	15-30
	52-60	Clay loam, silty clay loam, silt loam.	CL	A-6	0	100	95-100	90-100	65-90	20-35	10-20
1288 Petrolia	0-10	Silty clay loam.	CL	A-6, A-7	0	100	95-100	90-100	80-100	30-45	10-20
	10-60	Silty clay loam.	CL	A-6, A-7	0	100	95-100	90-100	85-100	35-45	15-25
1420 Piopolis	0-7	Silty clay loam.	CL	A-6, A-7	0	100	100	90-100	80-95	35-50	15-25
	7-60	Silty clay loam.	CL	A-6, A-7	0	100	100	90-100	85-95	35-50	15-25
3108 Bonnie	0-9	Silt loam	CL	A-4, A-6	0	100	100	95-100	90-100	27-34	8-12
	9-45	Silt loam	CL	A-4, A-6	0	100	100	95-100	90-100	27-34	8-12
	45-60	Silt loam, silty clay loam.	CL	A-4, A-6	0	100	100	90-100	80-100	25-39	8-15
3225 Holton	0-8	Silt loam	ML, CL-ML, CL	A-4	0	100	100	85-100	60-90	14-28	2-10
	8-60	Silt loam, loam, sandy loam.	ML, CL, SM, SC	A-4, A-2-4	0	90-100	85-100	50-100	30-85	14-28	2-10
3226 Wirt	0-8	Loam	CL-ML, ML	A-4	0	95-100	90-100	80-100	65-90	<25	3-7
	8-45	Loam, silt loam, fine sandy loam.	CL-ML, ML, SP, SM	A-4, A-2, A-6	0	95-100	90-100	75-100	40-85	<25	3-7
	45-60	Stratified sand to loamy fine sand.	SP, SP-SM, SM	A-1, A-3, A-2-4, A-4	0-5	85-100	80-100	50-95	5-15	<25	NP-4
3288 Petrolia	0-14	Silty clay loam.	CL	A-6, A-7	0	100	95-100	90-100	80-100	30-45	10-20
	14-60	Silty clay loam.	CL	A-6, A-7	0	100	95-100	90-100	85-100	35-45	15-25

Table 15.--Engineering Index Properties--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO	>3 inches	4	10	40	200		
	In				Pct					Pct	
3333---------- Wakeland	0-6	Silt loam-----	ML, CL-ML, CL	A-4	0	100	100	90-100	80-100	16-28	3-9
	6-60	Silt loam-----	ML, CL-ML, CL	A-4	0	100	100	90-100	85-100	16-28	3-9
3334---------- Birds	0-10	Silt loam-----	CL	A-4, A-6	0	100	95-100	90-100	80-100	24-34	8-15
	10-60	Silt loam, silty clay loam.	CL	A-4, A-6	0	100	95-100	90-100	80-100	24-34	8-15
3382---------- Belknap	0-7	Silt loam-----	ML, CL, CL-ML	A-4	0	100	95-100	90-100	80-100	20-30	2-8
	7-60	Silt loam-----	ML, CL-ML, CL	A-4, A-6	0	100	95-100	90-100	85-100	20-35	NP-12
3420---------- Piopolis	0-12	Silty clay loam.	CL	A-6, A-7	0	100	100	90-100	80-95	35-50	15-25
	12-44	Silty clay loam.	CL	A-6, A-7	0	100	100	90-100	85-95	35-50	15-25
	44-60	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	90-100	85-95	35-50	15-25
4218---------- Newberry	0-7	Silt loam-----	CL	A-6	0	100	100	95-100	85-100	25-40	10-20
	7-13	Silt loam-----	CL	A-4, A-6	0	100	100	95-100	85-100	25-40	8-15
	13-52	Silt loam, silty clay loam.	CL	A-7, A-6	0	100	100	95-100	85-100	35-55	15-30
	52-60	Silty clay loam, silt loam, clay loam.	CL	A-7, A-6	0	100	95-100	90-100	65-90	30-45	15-25
7109---------- Racoon	0-7	Silt loam-----	CL	A-4, A-6	0	100	100	95-100	90-100	20-40	8-20
	7-36	Silt loam-----	CL, CL-ML	A-4, A-6	0	100	100	95-100	90-100	20-40	5-20
	36-50	Silty clay loam.	CL	A-6, A-7	0	100	100	95-100	85-100	35-50	15-30
	50-60	Stratified loam to silty clay loam.	ML, CL	A-4, A-6, A-7	0	100	90-100	55-100	45-90	25-45	3-20

Table 16.--Physical and Chemical Properties of the Soils

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					Pct
2	0-7	15-27	1.30-1.50	0.6-2.0	0.22-0.24	4.5-7.8	Low	0.37	3	6	1-3
Cisne	7-19	15-27	1.25-1.45	0.06-0.6	0.18-0.20	4.5-6.0	Low	0.37			
	19-48	35-45	1.40-1.60	<0.06	0.09-0.15	4.5-6.0	High	0.37			
	48-60	25-37	1.50-1.70	<0.06	0.08-0.14	5.1-6.5	Moderate	0.37			
3A, 3B	0-8	20-27	1.30-1.50	0.6-2.0	0.22-0.24	4.5-7.3	Low	0.32	3	6	1-3
Hoyleton	8-12	15-27	1.35-1.60	0.2-0.6	0.16-0.18	4.5-6.5	Low	0.43			
	12-33	35-45	1.40-1.65	0.06-0.2	0.13-0.20	4.5-6.0	High	0.43			
	33-60	15-33	1.35-1.70	0.06-0.2	0.17-0.22	5.1-7.3	Moderate	0.43			
3B2	0-8	20-27	1.30-1.50	0.6-2.0	0.22-0.24	4.5-7.3	Low	0.32	3	6	1-3
Hoyleton	8-29	35-45	1.40-1.65	0.06-0.2	0.13-0.20	4.5-6.0	High	0.43			
	29-60	15-33	1.35-1.70	0.06-0.2	0.17-0.22	5.1-7.3	Moderate	0.43			
4B	0-8	20-27	1.20-1.40	0.6-2.0	0.22-0.24	5.1-7.3	Low	0.32	5	6	1-3
Richview	8-33	25-35	1.30-1.50	0.6-2.0	0.18-0.20	4.5-6.5	Moderate	0.43			
	33-60	15-35	1.50-1.70	0.6-2.0	0.14-0.20	4.5-6.5	Moderate	0.43			
4C2	0-7	20-27	1.20-1.40	0.6-2.0	0.22-0.24	5.1-7.3	Low	0.32	5	6	1-3
Richview	7-30	25-35	1.30-1.50	0.6-2.0	0.18-0.20	4.5-6.5	Moderate	0.43			
	30-60	15-35	1.50-1.70	0.6-2.0	0.14-0.20	4.5-6.5	Moderate	0.43			
5C2	0-5	20-27	1.35-1.55	0.6-2.0	0.15-0.24	5.1-7.3	Low	0.37	5	6	1-3
Blair	5-34	25-35	1.45-1.60	0.2-0.6	0.16-0.21	4.5-6.0	Moderate	0.37			
	34-60	18-35	1.45-1.60	0.2-0.6	0.16-0.21	5.1-7.8	Moderate	0.37			
5C3	0-8	27-35	1.35-1.55	0.2-0.6	0.14-0.18	5.1-7.3	Moderate	0.37	4	7	.5-1
Blair	8-33	25-35	1.45-1.60	0.2-0.6	0.16-0.21	4.5-6.0	Moderate	0.37			
	33-60	18-35	1.45-1.60	0.2-0.6	0.16-0.21	5.1-7.8	Moderate	0.37			
7C2	0-9	20-27	1.30-1.50	0.2-0.6	0.20-0.25	4.5-7.3	Moderate	0.43	3	6	1-3
Atlas	9-60	35-45	1.35-1.55	<0.06	0.07-0.19	4.5-7.3	High	0.32			
7C3	0-4	30-40	1.35-1.55	0.06-0.2	0.14-0.19	4.5-7.3	High	0.43	2	7	.5-1
Atlas	4-22	35-45	1.35-1.55	<0.06	0.07-0.19	4.5-7.3	High	0.32			
	22-60	30-45	1.35-1.55	<0.06	0.07-0.19	4.5-7.8	High	0.32			
7D2	0-6	20-27	1.30-1.50	0.2-0.6	0.20-0.25	4.5-7.3	Moderate	0.43	3	6	1-3
Atlas	6-48	35-45	1.35-1.55	<0.06	0.07-0.19	4.5-7.3	High	0.32			
	48-60	30-45	1.35-1.55	<0.06	0.07-0.19	4.5-7.8	High	0.32			
7D3	0-4	30-40	1.35-1.55	0.06-0.2	0.14-0.19	4.5-7.3	High	0.43	2	7	.5-1
Atlas	4-18	35-45	1.35-1.55	<0.06	0.07-0.19	4.5-7.3	High	0.32			
	18-60	30-45	1.35-1.55	<0.06	0.07-0.19	4.5-7.8	High	0.32			
8D2	0-3	15-27	1.20-1.35	0.6-2.0	0.20-0.22	5.1-7.3	Low	0.37	5	6	1-2
Hickory	3-60	24-35	1.45-1.65	0.6-2.0	0.15-0.19	4.5-7.8	Moderate	0.37			
8D3	0-5	27-35	1.30-1.45	0.6-2.0	0.18-0.20	5.1-7.3	Moderate	0.37	4	6	.5-1
Hickory	5-60	24-35	1.45-1.65	0.6-2.0	0.15-0.19	4.5-7.8	Moderate	0.37			
8F	0-9	19-25	1.30-1.50	0.6-2.0	0.20-0.22	4.5-7.3	Low	0.37	5	6	1-2
Hickory	9-44	24-35	1.45-1.65	0.6-2.0	0.15-0.19	4.5-7.3	Moderate	0.28			
	44-60	15-32	1.50-1.70	0.6-2.0	0.11-0.19	5.1-8.4	Low	0.28			
8F3	0-2	27-35	1.40-1.65	0.6-2.0	0.17-0.19	4.5-7.3	Moderate	0.37	4	6	.5-1
Hickory	2-38	24-35	1.45-1.65	0.6-2.0	0.15-0.19	4.5-6.0	Moderate	0.28			
	38-60	15-32	1.50-1.70	0.6-2.0	0.11-0.19	5.1-8.4	Low	0.28			

Table 16.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					Pct
8G----------	0-6	19-25	1.30-1.50	0.6-2.0	0.20-0.22	4.5-7.3	Low----------	0.37	5	6	1-2
Hickory	6-40	24-35	1.45-1.65	0.6-2.0	0.15-0.19	4.5-7.3	Moderate-----	0.28			
	40-60	15-32	1.50-1.70	0.6-2.0	0.11-0.19	5.1-8.4	Low----------	0.28			
12----------	0-6	15-25	1.25-1.45	0.6-2.0	0.22-0.24	4.5-7.8	Low----------	0.43	3	6	.5-2
Wynoose	6-21	12-18	1.30-1.50	0.06-0.2	0.18-0.20	3.6-7.3	Low----------	0.43			
	21-41	35-42	1.40-1.60	<0.06	0.09-0.13	3.6-6.0	High---------	0.43			
	41-60	25-37	1.50-1.70	0.06-0.2	0.11-0.15	3.6-6.0	Moderate-----	0.43			
13A, 13B----------	0-7	20-27	1.30-1.50	0.6-2.0	0.22-0.24	4.5-7.3	Low----------	0.43	3	6	1-3
Bluford	7-12	15-25	1.40-1.60	0.2-0.6	0.18-0.20	4.5-6.0	Low----------	0.43			
	12-38	35-42	1.45-1.65	0.06-0.6	0.11-0.20	4.5-5.5	High---------	0.43			
	38-60	22-35	1.60-1.70	0.06-0.2	0.11-0.16	4.5-6.0	Moderate-----	0.43			
13B2----------	0-6	20-27	1.30-1.50	0.6-2.0	0.22-0.24	4.5-7.3	Low----------	0.43	3	6	1-3
Bluford	6-32	35-42	1.45-1.65	0.06-0.6	0.11-0.20	4.5-5.5	High---------	0.43			
	32-60	22-35	1.60-1.70	0.06-0.2	0.11-0.16	4.5-6.0	Moderate-----	0.43			
14B----------	0-11	20-27	1.40-1.60	0.6-2.0	0.21-0.24	4.5-7.3	Low----------	0.43	4	6	1-2
Ava	11-23	22-33	1.40-1.60	0.6-2.0	0.18-0.21	4.5-5.5	Moderate-----	0.43			
	23-36	24-35	1.50-1.70	0.2-0.6	0.18-0.21	4.5-5.5	Moderate-----	0.43			
	36-60	20-30	1.55-1.80	<0.06	0.09-0.11	4.5-5.5	Low----------	0.43			
14C2----------	0-5	20-27	1.40-1.60	0.6-2.0	0.21-0.24	4.5-7.3	Low----------	0.43	4	6	1-2
Ava	5-16	22-33	1.40-1.60	0.6-2.0	0.18-0.21	4.5-5.5	Moderate-----	0.43			
	16-30	24-35	1.50-1.70	0.2-0.6	0.18-0.21	4.5-5.5	Moderate-----	0.43			
	30-52	20-30	1.55-1.80	<0.06	0.09-0.11	4.5-5.5	Low----------	0.43			
	52-60	20-30	1.55-1.75	0.2-0.6	0.05-0.10	4.5-6.0	Low----------	0.43			
14C3----------	0-7	27-35	1.35-1.55	0.6-2.0	0.15-0.19	4.5-7.3	Moderate-----	0.43	3	7	.5-1
Ava	7-18	22-33	1.40-1.60	0.6-2.0	0.18-0.21	4.5-5.5	Moderate-----	0.43			
	18-34	24-35	1.50-1.70	0.2-0.6	0.18-0.21	4.5-5.5	Moderate-----	0.43			
	34-60	20-30	1.55-1.80	<0.06	0.09-0.11	4.5-5.5	Low----------	0.43			
138----------	0-16	35-40	1.30-1.50	0.2-0.6	0.18-0.21	6.1-7.3	High---------	0.28	5	4	4-6
Shiloh	16-60	35-45	1.35-1.55	0.2-0.6	0.09-0.18	6.1-7.8	High---------	0.28			
337B----------	0-6	20-27	1.30-1.50	0.2-0.6	0.22-0.24	5.1-7.3	Low----------	0.37	5	6	1-3
Creal	6-25	18-25	1.35-1.60	0.2-0.6	0.18-0.20	4.5-7.3	Low----------	0.37			
	25-60	25-35	1.35-1.60	0.2-0.6	0.18-0.20	4.5-6.5	Moderate-----	0.37			
434C2----------	0-5	14-27	1.15-1.35	0.6-2.0	0.22-0.24	5.1-7.3	Low----------	0.37	5	6	1-3
Ridgway	5-33	22-35	1.35-1.55	0.6-2.0	0.16-0.20	4.5-7.3	Moderate-----	0.43			
	33-60	15-30	1.45-1.65	0.6-2.0	0.11-0.18	4.5-6.5	Low----------	0.32			
786D2, 786F------	0-7	18-27	1.20-1.40	0.6-2.0	0.18-0.22	4.5-7.3	Low----------	0.37	3	5	1-3
Frondorf	7-35	18-35	1.20-1.45	0.6-2.0	0.08-0.16	4.5-5.5	Low----------	0.17			
	35-60	---	---	<2.0	---	---	----------	----			
801B.											
Orthents											
810.											
Oil-waste land, brine damaged											
871E----------	0-4	27-35	1.30-1.60	0.6-2.0	0.17-0.22	6.6-8.4	Moderate-----	0.28	5	8	.5-2
Lenzburg	4-60	18-35	1.40-1.70	0.2-0.6	0.11-0.18	6.6-8.4	Moderate-----	0.24			

Table 16.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					Pct
889B2:											
Darmstadt-------	0-8	10-27	1.30-1.50	0.06-0.2	0.22-0.24	5.1-7.8	Low----------	0.43	3	6	.5-2
	8-18	27-42	1.40-1.65	0.06-0.2	0.11-0.20	4.5-7.8	Moderate-----	0.43			
	18-37	27-35	1.40-1.65	<0.06	0.09-0.10	6.6-9.0	Moderate-----	0.43			
	37-60	15-30	1.50-1.70	<0.06	0.10-0.15	7.4-9.0	Low----------	0.43			
Bluford---------	0-7	20-27	1.30-1.50	0.6-2.0	0.22-0.24	4.5-7.3	Low----------	0.43	3	6	1-3
	7-33	35-42	1.45-1.65	0.06-0.6	0.11-0.20	4.5-6.5	High---------	0.43			
	33-60	22-35	1.60-1.70	0.06-0.2	0.11-0.16	4.5-7.3	Moderate-----	0.43			
912A:											
Darmstadt-------	0-13	10-27	1.30-1.50	0.06-0.2	0.22-0.24	5.1-7.8	Low----------	0.43	3	6	1-2
	13-20	27-42	1.40-1.65	0.06-0.2	0.11-0.20	4.5-7.8	Moderate-----	0.43			
	20-40	27-35	1.40-1.65	<0.06	0.09-0.10	6.6-9.0	Moderate-----	0.43			
	40-60	15-30	1.50-1.70	<0.06	0.10-0.15	7.4-9.0	Low----------	0.43			
Hoyleton--------	0-8	20-27	1.30-1.50	0.6-2.0	0.22-0.24	4.5-7.3	Low----------	0.32	3	6	1-3
	8-11	15-27	1.35-1.60	0.2-0.6	0.16-0.18	4.5-6.5	Low----------	0.43			
	11-34	35-45	1.40-1.65	0.06-0.2	0.13-0.20	4.5-6.0	High---------	0.43			
	34-60	15-33	1.35-1.70	0.06-0.2	0.17-0.22	5.1-7.3	Moderate-----	0.43			
912B2:											
Darmstadt-------	0-7	10-27	1.30-1.50	0.06-0.2	0.22-0.24	5.1-7.8	Low----------	0.43	3	6	.5-2
	7-21	27-42	1.40-1.65	0.06-0.2	0.11-0.20	4.5-7.8	Moderate-----	0.43			
	21-28	27-35	1.40-1.65	<0.06	0.09-0.10	6.6-9.0	Moderate-----	0.43			
	28-60	15-30	1.50-1.70	<0.06	0.10-0.15	7.4-9.0	Low----------	0.43			
Hoyleton--------	0-7	20-27	1.30-1.50	0.6-2.0	0.22-0.24	4.5-7.3	Low----------	0.32	3	6	1-3
	7-27	35-45	1.40-1.65	0.06-0.2	0.13-0.20	4.5-6.0	High---------	0.43			
	27-60	15-33	1.35-1.70	0.06-0.2	0.17-0.22	5.1-7.3	Moderate-----	0.43			
934C2:											
Blair-----------	0-7	20-27	1.35-1.55	0.6-2.0	0.15-0.24	5.1-7.3	Low----------	0.37	5	6	1-3
	7-26	25-35	1.45-1.60	0.2-0.6	0.16-0.21	4.5-6.0	Moderate-----	0.37			
	26-60	18-35	1.45-1.60	0.2-0.6	0.16-0.21	5.1-7.8	Moderate-----	0.37			
Grantfork-------	0-8	27-30	1.35-1.55	0.2-0.6	0.15-0.18	4.5-7.8	Low----------	0.37	4	7	.5-1
	8-26	20-30	1.40-1.60	0.2-0.6	0.15-0.20	5.1-9.0	Low----------	0.37			
	26-60	20-30	1.65-1.80	0.06-0.2	0.07-0.10	7.4-9.0	Moderate-----	0.37			
967F:											
Hickory---------	0-6	19-25	1.30-1.50	0.6-2.0	0.20-0.22	4.5-7.3	Low----------	0.37	5	6	1-2
	6-46	24-35	1.45-1.65	0.6-2.0	0.15-0.19	4.5-7.3	Moderate-----	0.28			
	46-60	15-32	1.50-1.70	0.6-2.0	0.11-0.19	5.1-8.4	Low----------	0.28			
Gosport---------	0-6	18-27	1.30-1.40	0.2-0.6	0.18-0.20	5.1-6.5	Low----------	0.43	3	6	1-2
	6-38	36-60	1.50-1.60	<0.06	0.12-0.14	3.6-5.5	High---------	0.32			
	38-60	---	---	<0.06	---	---	-------------	-----			
991:											
Cisne-----------	0-7	15-27	1.30-1.50	0.6-2.0	0.22-0.24	4.5-7.8	Low----------	0.37	3	6	1-3
	7-14	15-27	1.25-1.45	0.06-0.6	0.18-0.20	4.5-6.0	Low----------	0.37			
	14-46	35-45	1.40-1.60	<0.06	0.09-0.15	4.5-6.0	High---------	0.37			
	46-60	25-37	1.50-1.70	<0.06	0.08-0.14	5.1-6.5	Moderate-----	0.37			
Huey------------	0-8	15-27	1.35-1.50	0.2-0.6	0.22-0.24	5.1-7.8	Low----------	0.43	3	6	1-3
	8-12	20-35	1.40-1.60	0.06-0.2	0.10-0.18	5.6-9.0	Moderate-----	0.43			
	12-52	25-35	1.45-1.65	<0.06	0.05-0.08	7.4-9.0	Moderate-----	0.43			
	52-60	18-35	1.55-1.75	0.06-0.2	0.10-0.15	6.6-9.0	Moderate-----	0.43			
1288------------ Petrolia	0-10	27-35	1.20-1.40	0.2-0.6	0.21-0.23	5.6-7.3	Moderate-----	0.32	5	7	2-3
	10-60	27-35	1.35-1.45	0.2-0.6	0.18-0.20	6.1-7.3	Moderate-----	0.32			

Table 16.--Physical and Chemical Properties of the Soils--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					Pct
1420----------	0-7	27-35	1.20-1.40	0.06-0.2	0.21-0.23	5.1-6.5	Moderate-----	0.43	5	7	1-3
Piopolis	7-60	27-35	1.40-1.60	0.06-0.2	0.18-0.20	4.5-5.5	Moderate-----	0.43			
3108----------	0-9	18-27	1.30-1.50	0.6-2.0	0.22-0.25	4.5-7.3	Low----------	0.43	5	6	1-3
Bonnie	9-45	18-27	1.35-1.55	0.2-0.6	0.21-0.24	4.5-5.5	Low----------	0.43			
	45-60	18-30	1.35-1.55	0.2-0.6	0.14-0.24	4.5-7.3	Low----------	0.43			
3225----------	0-8	6-18	1.35-1.55	0.6-2.0	0.20-0.24	5.6-7.3	Low----------	0.37	5	5	1-3
Holton	8-60	6-18	1.35-1.55	0.6-2.0	0.14-0.22	5.1-7.3	Low----------	0.37			
3226----------	0-8	10-18	1.30-1.45	0.6-2.0	0.17-0.20	5.6-7.3	Low----------	0.37	5	5	.5-3
Wirt	8-45	7-18	1.40-1.55	0.6-2.0	0.15-0.20	5.6-7.3	Low----------	0.24			
	45-60	3-12	1.25-1.50	2.0-20	0.03-0.10	5.6-7.3	Low----------	0.17			
3288----------	0-14	27-35	1.20-1.40	0.2-0.6	0.21-0.23	5.6-7.3	Moderate-----	0.32	5	7	2-3
Petrolia	14-60	27-35	1.35-1.45	0.2-0.6	0.18-0.20	6.1-7.3	Moderate-----	0.32			
3333----------	0-6	10-18	1.30-1.50	0.6-2.0	0.20-0.24	5.6-7.3	Low----------	0.37	5	5	1-3
Wakeland	6-60	10-18	1.30-1.50	0.6-2.0	0.20-0.24	5.6-7.8	Low----------	0.37			
3334----------	0-10	15-25	1.30-1.50	0.2-0.6	0.21-0.25	5.6-7.8	Low----------	0.43	5	6	1-3
Birds	10-60	18-30	1.40-1.60	0.2-0.6	0.20-0.22	5.1-7.8	Low----------	0.43			
3382----------	0-7	8-18	1.35-1.55	0.6-2.0	0.21-0.25	4.5-7.3	Low----------	0.37	5	5	1-3
Belknap	7-60	8-25	1.40-1.60	0.6-2.0	0.21-0.24	4.5-5.5	Low----------	0.37			
3420----------	0-12	27-35	1.20-1.40	0.06-0.2	0.21-0.23	5.1-6.5	Moderate-----	0.43	5	7	1-3
Piopolis	12-44	27-35	1.40-1.60	0.06-0.2	0.18-0.20	4.5-5.5	Moderate-----	0.43			
	44-60	25-38	1.50-1.70	0.06-0.2	0.18-0.20	5.1-7.3	Moderate-----	0.43			
4218----------	0-7	20-27	1.25-1.50	0.2-0.6	0.22-0.24	5.6-7.3	Low----------	0.37	5	6	2-3
Newberry	7-13	18-25	1.30-1.50	0.2-0.6	0.20-0.22	4.5-6.0	Low----------	0.37			
	13-52	27-35	1.30-1.55	0.06-0.2	0.18-0.20	4.5-6.0	Moderate-----	0.37			
	52-60	22-33	1.50-1.70	0.06-0.2	0.14-0.20	4.5-7.3	Moderate-----	0.37			
7109----------	0-7	20-27	1.30-1.50	0.2-0.6	0.22-0.24	4.5-7.3	Moderate-----	0.37	5	6	1-2
Racoon	7-36	18-25	1.35-1.50	0.2-0.6	0.20-0.22	4.5-7.3	Moderate-----	0.37			
	36-50	27-35	1.35-1.60	0.06-0.2	0.18-0.20	4.5-5.5	Moderate-----	0.37			
	50-60	18-30	1.40-1.65	0.2-0.6	0.09-0.17	5.6-7.3	Moderate-----	0.37			

Table 17.--Soil and Water Features

("Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
2---------- Cisne	D	None---------	---	---	0-1.0	Perched	Feb-Jun	>60	---	High-----	High-----	Moderate.
3A, 3B, 3B2------- Hoyleton	C	None---------	---	---	1.0-3.0	Apparent	Mar-Jun	>60	---	High-----	High-----	High.
4B, 4C2---------- Richview	C	None---------	---	---	4.0-6.0	Apparent	Feb-May	>60	---	High-----	Moderate	High.
5C2, 5C3---------- Blair	C	None---------	---	---	1.5-3.5	Apparent	Mar-Jun	>60	---	High-----	High-----	High.
7C2, 7C3, 7D2, 7D3---------- Atlas	D	None---------	---	---	0.5-2.0	Perched	Apr-Jun	>60	---	High-----	High-----	Moderate.
8D2, 8D3---------- Hickory	C	None---------	---	---	4.0-6.0	Apparent	Jan-Apr	>60	---	Moderate	Moderate	Moderate.
8F, 8F3, 8G------- Hickory	C	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
12---------- Wynoose	D	None---------	---	---	0-1.0	Perched	Mar-Jun	>60	---	High-----	High-----	High.
13A, 13B, 13B2---- Bluford	C	None---------	---	---	0.5-2.0	Perched	Mar-Jun	>60	---	High-----	High-----	High.
14B, 14C2, 14C3--- Ava	C	None---------	---	---	1.5-3.5	Perched	Mar-Jun	>60	---	High-----	Moderate	High.
138---------- Shiloh	B/D	None---------	---	---	+1-1.0	Apparent	Mar-Jun	>60	---	High-----	High-----	Low.
337B---------- Creal	C	None---------	---	---	0.5-2.0	Apparent	Feb-May	>60	---	High-----	High-----	High.
434C2---------- Ridgway	B	None---------	---	---	>6.0	---	---	>60	---	High-----	Moderate	Moderate.
786D2, 786F------- Frondorf	B	None---------	---	---	>6.0	---	---	20-40	Soft	Moderate	Moderate	High.

Table 17.--Soil and Water Features--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
801B. Orthents												
810. Oil-waste land, brine damaged												
871E---------- Lenzburg	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
889B2:												
Darmstadt--------	D	None--------	---	---	0.5-2.0	Perched	Feb-May	>60	---	High-----	High-----	High.
Bluford----------	C	None--------	---	---	0.5-2.0	Perched	Mar-Jun	>60	---	High-----	High-----	High.
912A, 912B2:												
Darmstadt--------	D	None--------	---	---	0.5-2.0	Perched	Feb-May	>60	---	High-----	High-----	High.
Hoyleton---------	C	None--------	---	---	1.0-3.0	Apparent	Mar-Jun	>60	---	High-----	High-----	High.
934C2:												
Blair----------	C	None--------	---	---	1.5-3.5	Apparent	Mar-Jun	>60	---	High-----	High-----	High.
Grantfork--------	D	None--------	---	---	0.5-2.0	Perched	Jan-May	>60	---	High-----	High-----	Low.
967F:												
Hickory----------	C	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Gosport----------	C	None--------	---	---	1.5-3.0	Perched	Jan-Apr	20-40	Soft	Moderate	High-----	High.
991:												
Cisne----------	D	None--------	---	---	0-1.0	Perched	Feb-Jun	>60	---	High-----	High-----	Moderate.
Huey----------	D	None--------	---	---	+.5-1.0	Perched	Mar-Jun	>60	---	High-----	High-----	Low.
1288---------- Petrolia	C/D	Frequent----	Long------	Dec-Jun	+2-0.5	Apparent	Dec-Jun	>60	---	High-----	High-----	Low.
1420---------- Piopolis	C/D	Frequent----	Long------	Dec-Jun	+2-0.5	Apparent	Dec-Jun	>60	---	High-----	High-----	Moderate.
3108---------- Bonnie	C/D	Frequent----	Brief-----	Dec-Jun	0-1.0	Apparent	Jan-Jun	>60	---	High-----	High-----	High.
3225---------- Holton	C	Frequent----	Brief-----	Dec-Jun	0.5-2.0	Apparent	Jan-May	>60	---	High-----	High-----	Moderate.

Table 17.--Soil and Water Features--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
3226--- Wirt	B	Frequent	Very brief	Dec-Jun	>6.0	---	---	>60	---	Moderate	Low	Moderate.
3288--- Petrolia	C/D	Frequent	Brief	Dec-Jun	+1-1.0	Apparent	Jan-Jun	>60	---	High	High	Low.
3333--- Wakeland	C	Frequent	Brief	Dec-Jun	0.5-2.0	Apparent	Jan-May	>60	---	High	High	Low.
3334--- Birds	C/D	Frequent	Brief	Dec-Jun	0-1.0	Apparent	Jan-Jun	>60	---	High	High	Moderate.
3382--- Belknap	C	Frequent	Brief	Dec-Jun	0.5-2.0	Apparent	Jan-May	>60	---	High	High	High.
3420--- Piopolis	C/D	Frequent	Brief	Dec-Jun	+1-1.0	Apparent	Jan-Jun	>60	---	High	High	Moderate.
4218--- Newberry	C	None	---	---	+.5-1.0	Apparent	Mar-Jun	>60	---	High	High	High.
7109--- Racoon	C/D	Rare	---	---	+.5-1.0	Apparent	Mar-Jun	>60	---	High	High	High.

Table 18.--Engineering Index Test Data

(MAX means maximum dry density; OPT, optimum moisture; LL, liquid limit; PI, plasticity index; and UN, Unified)

Soil name and location	Sample number	Horizon	Depth	Moisture density		Percentage passing sieve--				LL	PI	Classification	
				MAX	OPT	No. 4	No. 10	No. 40	No. 200			AASHTO	UN
			In	Lb/ cu ft	Pct					Pct			
Ava silt loam:	90IL-025-10-1	Ap	0-5	109	17	100	100	96	66	28	4	A-4	ML
1,220 feet north and	90IL-025-10-3	Bt2	10-16	105	20	100	100	99	97	38	17	A-6	CL
2,310 feet west of	90IL-025-10-5	B't	19-30	108	18	100	100	97	83	37	17	A-6	CL
the southeast	90IL-025-10-6	2Btx	30-52	122	12	99	98	91	65	23	9	A-4	CL
corner of sec. 15, T. 4 N., R. 7 E.													
Bluford silt loam:	89IL-025-14-1	Ap	0-6	113	13	100	98	90	71	23	2	A-4	ML
2,500 feet south and	89IL-025-14-3	E2	9-18	117	13	100	98	92	78	25	6	A-4	CL
1,070 feet west of	89IL-025-14-5	Bt2	21-28	103	21	100	99	97	89	48	29	A-7-6	CL
the northeast	89IL-025-14-7	2Btx	40-60	114	16	99	98	93	76	34	18	A-6	CL
corner of sec. 16, T. 2 N., R. 7 E.													
Cisne silt loam:	90IL-025-52-1	Ap	0-7	109	16	100	100	97	89	29	7	A-4	CL
315 feet south and	90IL-025-52-3	Eg2	12-19	109	17	100	99	95	87	34	15	A-6	CL
245 feet east of	90IL-025-52-4	Btg1	19-28	97	23	100	99	98	95	52	28	A-7-6	CH
the northwest	90IL-025-52-8	2BCg	58-73	112	17	100	99	96	86	39	23	A-6	CL
corner of sec. 26, T. 4 N., R. 5 E.													
Darmstadt silt loam:	90IL-025-47-1	Ap	0-8	118	15	100	100	97	85	26	6	A-4	ML-CL
950 feet south and	90IL-025-47-3	Bt1	11-15	109	18	100	99	97	91	41	23	A-7-6	CL
660 feet west of	90IL-025-47-6	Btg2	25-34	113	15	100	99	97	90	40	23	A-7-6	CL
the center of sec.	90IL-025-47-8	2Btg4	49-69	119	13	100	99	96	75	32	18	A-6	CL
16, T. 3 N., R. 7 E.													
Hickory loam:	90IL-025-51-1	A	0-4	122	13	98	97	89	59	26	2	A-4	ML
2,225 feet south and	90IL-025-51-4	Bt2	14-21	110	16	99	97	91	67	37	20	A-6	CL
1,115 feet west of	90IL-025-51-7	Bt5	42-62	127	10	98	91	74	33	21	8	A-2-4	SC
the northeast	90IL-025-51-8	C1	62-83	128	10	97	93	85	59	20	7	A-4	ML-CL
corner of sec. 17, T. 5 N., R. 6 E.													
Holton silt loam:	90IL-025-50-1	Ap	0-8	108	17	100	99	99	92	43	21	A-7-6	CL
2,065 feet south and	90IL-025-50-3	Bw1	15-24	114	15	100	100	99	84	28	10	A-4	CL
495 feet west of	90IL-025-50-5	Cg1	36-51	121	12	100	99	96	89	20	3	A-4	CL
the northeast corner of sec. 17, T. 5 N., R. 6 E.													
Huey silt loam:	90IL-025-12-1	Ap	0-8	113	15	100	99	96	84	28	10	A-4	CL
1,070 feet north and	90IL-025-12-3	Btng1	12-23	112	15	100	99	96	88	41	25	A-7-6	CL
245 feet east of	90IL-025-12-6	2BCng	52-70	115	15	100	100	97	80	48	32	A-5	ML
the southwest corner of sec. 18, T. 4 N., R. 8 E.													

Table 19.--Classification of the Soils

(An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series)

Soil name	Family or higher taxonomic class
Atlas	Fine, montmorillonitic, mesic, sloping Aeric Ochraqualfs
*Ava	Fine-silty, mixed, mesic Typic Fragiudalfs
Belknap	Coarse-silty, mixed, acid, mesic Aeric Fluvaquents
Birds	Fine-silty, mixed, nonacid, mesic Typic Fluvaquents
*Blair	Fine-silty, mixed, mesic Aquic Hapludalfs
Bluford	Fine, montmorillonitic, mesic Aeric Ochraqualfs
Bonnie	Fine-silty, mixed, acid, mesic Typic Fluvaquents
Cisne	Fine, montmorillonitic, mesic Mollic Albaqualfs
Creal	Fine-silty, mixed, mesic Aeric Ochraqualfs
Darmstadt	Fine-silty, mixed, mesic Albic Natraqualfs
Frondorf	Fine-loamy, mixed, mesic Ultic Hapludalfs
Gosport	Fine, illitic, mesic Typic Dystrochrepts
Grantfork	Fine-loamy, mixed, mesic, sloping Aeric Ochraqualfs
Hickory	Fine-loamy, mixed, mesic Typic Hapludalfs
Holton	Coarse-loamy, mixed, nonacid, mesic Aeric Fluvaquents
Hoyleton	Fine, montmorillonitic, mesic Aquollic Hapludalfs
Huey	Fine-silty, mixed, mesic Typic Natraqualfs
Lenzburg	Fine-loamy, mixed (calcareous), mesic Typic Udorthents
Newberry	Fine-silty, mixed, mesic Mollic Ochraqualfs
Orthents	Orthents
Petrolia	Fine-silty, mixed, nonacid, mesic Typic Fluvaquents
Piopolis	Fine-silty, mixed, acid, mesic Typic Fluvaquents
Racoon	Fine-silty, mixed, mesic Typic Ochraqualfs
Richview	Fine-silty, mixed, mesic Mollic Hapludalfs
Ridgway	Fine-silty, mixed, mesic Typic Hapludalfs
Shiloh	Fine, montmorillonitic, mesic Cumulic Haplaquolls
Wakeland	Coarse-silty, mixed, nonacid, mesic Aeric Fluvaquents
Wirt	Coarse-loamy, mixed, nonacid, mesic Typic Udifluvents
Wynoose	Fine, montmorillonitic, mesic Typic Albaqualfs

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