United States
Department of
Agriculture

Natural
Resources
Conservation
Service

In cooperation with
Illinois Agricultural
Experiment Station

Soil Survey of Marion County, Illinois

How To Use This Soil Survey

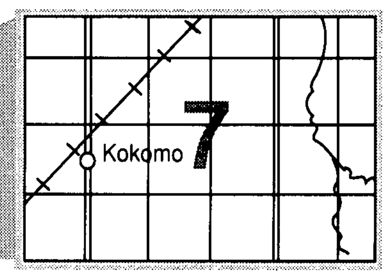
General Soil Map

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.

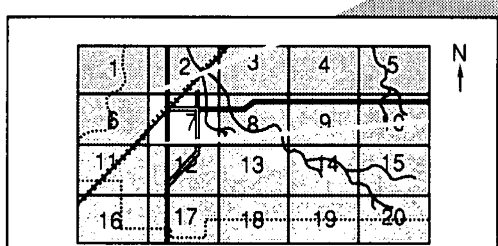
Detailed Soil Maps

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



MAP SHEET

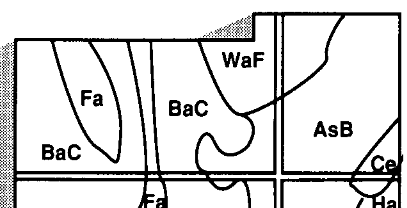
To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet, and turn to that sheet.



INDEX TO MAP SHEETS

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

MAP SHEET



AREA OF INTEREST

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

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

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The 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 1987. Soil names and descriptions were approved in 1988. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1987. 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 Marion County Soil and Water Conservation District. Financial assistance was provided by the Marion 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 144.

All programs of the Natural Resources Conservation Service are offered on a nondiscriminatory basis, without regard to race, color, national origin, religion, sex, age, marital status, or handicap.

Cover: A marshy area that provides food and cover for wildlife in Marion County.

Contents

Issued May 1996

Index to Map Units

Summary of Tables

Foreword

This soil survey contains information that can be used in land-planning programs in Marion 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 over bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to 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.

Thomas W. Christenson
State Conservationist
Natural Resources Conservation Service

Soil Survey of
Marion County, Illinois

By C.C. Miles, Natural Resources Conservation Service

Soils surveyed by C.C. Miles and T.J. Andres, Natural Resources Conservation Service, and B.W. Davis, D.B. Gaines, and A.V. Gallager, Marion County

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

General Nature of the County

MARION COUNTY is in the southern part of Illinois (fig. 1). It is bordered on the north by Fayette County, on the east by Clay and Wayne Counties, on the south by Jefferson County, and on the west by Clinton and Washington Counties. Marion County is approximately 40 miles east of the St. Louis metropolitan area. It has an area of 368,685 acres, or about 576 square miles. In 1980, it had a population of 42,365 *(10)*. The population of Centralia was 12,157, and the population of Salem, the county seat, was 7,543.

In 1986, a total of 219,500 acres in the county was used as cropland. This included 99,100 acres of soybeans, 56,200 acres of corn, 30,000 acres of winter wheat, 12,000 acres of hay, 21,000 acres of grain sorghum, and 1,200 acres of oats. Also included were many acres of pasture and land used for the commercial production of fruits and vegetables. About 97,210 acres in the county was wooded *(11)*.

This soil survey updates the survey of Marion County published in 1926 *(6)*. It provides more information about the soils and has larger maps, which show soils in greater detail.

History and Development

Sam Winfrey, retired district conservationist, prepared this section.

In the winter of 1811, Captain Samuel Young and his 9-year-old son, Matthew, built a makeshift camp along Crooked Creek, 6 miles west of the present site of Salem *(1)*. No crops were planted until 1815. Father

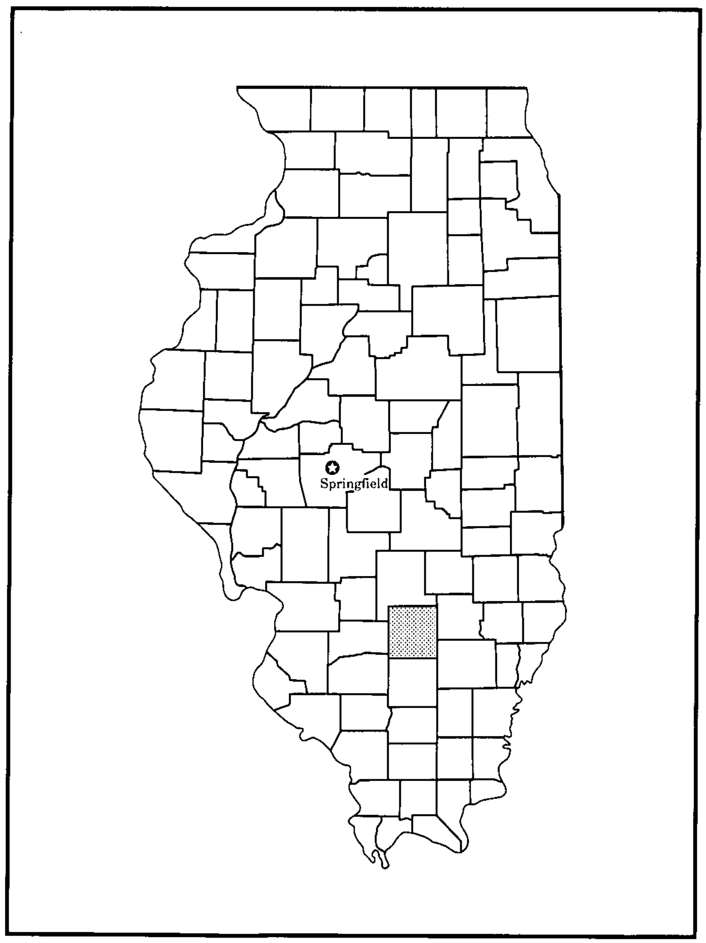


Figure 1.—Location of Marion County in Illinois.

and son lived by hunting and fishing, as did a tribe of Indians who lived nearby. The level land and the land along creeks stayed wet until the middle of summer because drift in the creeks turned the water out of the nearly level channels, flooding the surrounding areas.

The surface of the land was covered with loess blown in during and after the Illinoian Glaciation. For the most part, the county was free of rocks. As a result, tillage of the land was easy. The soils were low or medium in natural fertility. The available water capacity was adequate for the yields of grain grown by the settlers.

The main crops were corn, wheat, and oats, which were planted year after year until the fertility of the soils was nearly depleted. When yields became unsatisfactory, redtop was grown for seed. The fields were kept in redtop until they could not produce a good crop of seed. Then, corn was planted, but with no success. The productive capacity of the soils had been depleted.

In 1884, Lee Borden, an owner of the Borden Condensed Milk Company in Chicago, bought 964 acres near Tonti and established a showplace where prize polled Durham cattle, registered horses, and other livestock were raised. He had trainloads of manure shipped from the Chicago stockyards to build up the soil.

In 1903, Dr. Cyril Hopkins, an agricultural chemist and a professor at the University of Illinois, purchased 316 acres in Marion county to be used as a demonstration farm. He chose poor land that had been abandoned as unproductive because he wanted to prove that the soil could once again become productive and profitable with the proper application of minerals. After 10 years, the farm, which he named Poorland Farm, was producing 35 bushels of wheat per acre per year under the operation of local farm tenants. It later produced yields of 50 bushels of wheat per acre. The yields were made possible by applications of raw rock phosphate from Tennessee and limestone from Illinois. The original soil survey of Illinois was begun by Dr. Hopkins.

When the Marion County Soil and Water Conservation District was established, a few terraces, diversions, and ponds were constructed. During the earlier years, the greatest interest was in drainage of level areas and creek bottoms. Neighborhood farmers met in groups to study the soils. A soil scientist would explain conditions as the group walked over the land, and the local conservationist would describe the effects of soil depth, slope, and erosion, using the soil maps prepared on each farm. Presently, the main concerns in managing the cropland in the county are water erosion, soil blowing, wetness, fertility, tilth, and limited soil moisture.

Climate

Andrey A. Bryan and Wayne M. Wendland, State Water Survey Division, Illinois Department of Energy and Natural Resources, helped prepare this section.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Salem 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 31.8 degrees F and the average daily minimum temperature is 22.6 degrees. The lowest temperature on record, which occurred on January 17, 1977, is -23 degrees. In summer, the average temperature is 75.7 degrees and the average daily maximum temperature is 87.4 degrees. The highest recorded temperature, which occurred on July 14, 1953, is 108 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 40.76 inches. Of this, more than 22 inches, or about 54 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 18.25 inches. The heaviest 1-day rainfall during the period of record was 6.76 inches.

The average seasonal snowfall is 16.1 inches. The greatest snow depth at any one time during the period of record was 10 inches. On the average, 25 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 59 percent. Humidity is higher at night, and the average at dawn is about 82 percent. The sun shines 74 percent of the time possible in summer and 44 percent in winter. The prevailing wind is from the southwest. Average windspeed is highest, 10.6 miles per hour, in March.

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 landscape or with a segment of the landscape. By observing the soils in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil at a specific location on the landscape.

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

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, 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.

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 landscape segments on the map provides sufficient information for the development of resource plans, but onsite investigation is needed to plan for intensive uses in small areas.

General Soil Map Units

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

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

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

Soil Descriptions

1. Cisne-Darmstadt-Huey Association

Nearly level to gently sloping, poorly drained and somewhat poorly drained, very slowly permeable soils that formed in loess and in the underlying loamy sediments; on uplands

This association is on broad till plains. It originally was covered dominantly by prairie grasses. Slopes range from 0 to 6 percent.

This association makes up about 30 percent of the county. It is about 40 percent Cisne soils, 25 percent Darmstadt soils, 20 percent Huey soils, and 15 percent soils of minor extent.

The nearly level Cisne soils are on broad till plains. They commonly are adjacent to or intermingled with areas of Huey soils. They are poorly drained and are very slowly permeable in the subsoil. Typically, the surface layer is very dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is grayish brown and light brownish gray, mottled, friable silt loam about 8 inches thick. The subsoil is about 39 inches thick. It typically has reddish mottles and dark coatings. The upper part is grayish brown, mottled, very firm silty clay and silty clay loam, and the lower part is grayish brown and light brownish gray, mottled, firm silty clay loam. The substratum to a depth of 60 inches or more is light brownish gray, firm silty clay loam.

The nearly level to gently sloping Darmstadt soils are on low ridges and on side slopes along shallow drainageways. They are somewhat poorly drained and are very slowly permeable in the subsoil. Typically, the surface layer is dark brown, friable silt loam. Erosion has reduced the thickness of this layer to about 7 inches. The subsoil extends to a depth of 60 inches or more. It has a high content of sodium. The upper part is yellowish brown and brown, mottled, very firm silty clay and firm silty clay loam; the next part is dark yellowish brown and gray, mottled, firm silty clay loam; and the lower part is grayish brown, mottled, firm silty clay loam.

The nearly level Huey soils are on broad flats and in slight depressions. They commonly are adjacent to or intermingled with areas of Cisne soils. They are poorly drained and are very slowly permeable in the subsoil. Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The subsoil extends to a depth of 60 inches or more. It has a high content of sodium. The upper part is dark grayish brown, mottled, firm silty clay, and the lower part is light brownish gray, mottled, firm silty clay loam.

Of minor extent in this association are Atlas, Blair, Grantfork, Grantfork Variant, Hoyleton, Newberry, Tamalco, and Wynoose soils. The somewhat poorly drained Atlas, Blair, Grantfork, and Grantfork Variant soils are on side slopes along drainageways. The somewhat poorly drained Hoyleton soils are on knolls, low ridges, and side slopes. They do not have a high content of sodium in the subsoil. The very poorly drained Newberry soils are in depressions. They have less clay in the subsoil than the Cisne soils. The moderately well drained Tamalco soils are on low ridges. They have more clay in the subsoil than the Darmstadt soils. The poorly drained Wynoose soils are in landscape positions similar to those of the major soils. They do not have a dark surface layer.

Most areas of this association are used for corn, soybeans, grain sorghum, or small grain. Improving drainage, controlling water erosion, and improving fertility are the main management concerns in cultivated areas.

Some areas of this association are used as sites for buildings and sanitary facilities. Seasonal wetness, the shrink-swell potential, restricted permeability, and the excess sodium are the main management concerns in areas used for urban development.

2. Cisne-Hoyleton Association

Nearly level to gently sloping, poorly drained and somewhat poorly drained, very slowly permeable and slowly permeable soils that formed in loess and in the underlying loamy sediments; on uplands

This association is on broad till plains, ridges, and knolls. It originally was covered dominantly by prairie grasses. Slopes range from 0 to 7 percent.

This association makes up about 20 percent of the county. It is about 35 percent Cisne soils, 35 percent Hoyleton soils, and 30 percent soils of minor extent.

The nearly level Cisne soils are on broad till plains. They are poorly drained and are very slowly permeable in the subsoil. Typically, the surface layer is very dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is grayish brown and light brownish gray, mottled, friable silt loam about 8 inches thick. The subsoil is about 39 inches thick. It typically has reddish mottles and dark coatings. The upper part is grayish brown, mottled, very firm silty clay and silty clay loam, and the lower part is grayish brown and light brownish gray, mottled, firm silty clay loam. The substratum to a depth of 60 inches or more is light brownish gray, firm silty clay loam.

The nearly level to gently sloping Hoyleton soils are on low ridges, on knolls, and on side slopes along shallow drainageways. They are somewhat poorly drained and are slowly permeable in the subsoil. Typically, the surface layer is very dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is brown, friable silt loam about 4 inches thick. The subsoil is about 38 inches thick. It typically has reddish mottles and dark coatings. The upper part is brown, mottled, firm silty clay loam and very firm silty clay, and the lower part is pale brown and brown, mottled, firm silty clay loam and friable silt loam. The substratum to a depth of 60 inches or more is brown, mottled, friable silty clay loam.

Of minor extent in this association are Atlas, Blair, Bluford, Richview, and Wynoose soils. The somewhat poorly drained Atlas and Blair soils formed in accretion gley and erosional sediments. They are on moderately sloping and strongly sloping side slopes along drainageways. The somewhat poorly drained Bluford soils are on ridges and on side slopes along shallow drainageways. They have a light colored surface layer. The moderately well drained Richview soils are on the side slopes and crest of prominent ridges and on narrow ridgetops. The poorly drained Wynoose soils are in landscape positions similar to those of the major soils.

Most areas of this association are used for corn, soybeans, grain sorghum, or small grain. Improving drainage, controlling water erosion, and improving fertility are the main management concerns in cultivated areas.

Some areas of this association are used as sites for buildings and sanitary facilities. Seasonal wetness, the shrink-swell potential, and restricted permeability are the main management concerns in areas used for urban development.

3. Bluford-Hickory-Ava Association

Nearly level to very steep, somewhat poorly drained to well drained, very slowly permeable to moderately permeable soils that formed in loess and the underlying silty or loamy sediments or in glacial till; on uplands

This association is on side slopes along drainageways and on broad ridgetops. It originally was covered dominantly by deciduous trees. Slopes range from 1 to 45 percent.

This association makes up about 45 percent of the county. It is about 30 percent Bluford soils, 15 percent Hickory soils, 10 percent Ava soils, and 45 percent soils of minor extent.

The nearly level to gently sloping Bluford soils formed in loess and in the underlying silty sediments. They are on low ridges and broad ridgetops along drainageways. They are somewhat poorly drained and are slowly permeable in the subsoil. Typically, the surface layer is dark brown, friable silt loam about 8 inches thick. The subsurface layer is pale brown, friable silt loam about 5 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is brown, mottled, firm silty clay loam; the next part is brown, mottled, very firm silty clay and firm silty clay loam; and the lower part is brown and grayish brown, mottled, firm, slightly brittle silt loam.

The strongly sloping to very steep Hickory soils formed in glacial till. They are on side slopes along drainageways. They are well drained and are moderately permeable in the subsoil. Typically, the surface layer is dark brown, very friable loam about 2 inches thick. The subsurface layer is yellowish brown, friable loam about 5 inches thick. The subsoil is about 41 inches thick. The upper part is strong brown, friable loam and firm clay loam, and the lower part is yellowish brown and dark yellowish brown, friable clay loam. The substratum to a depth of 60 inches or more is dark yellowish brown, friable, calcareous gravelly sandy loam.

The very gently sloping to strongly sloping Ava soils formed in loess and in the underlying silty or loamy sediments. They are on narrow ridgetops and on side slopes. They are moderately well drained and are moderately permeable in the upper part of the subsoil and very slowly permeable in the lower part. Typically, the surface layer is dark brown, friable silt loam. Erosion has reduced the thickness of this layer to about 7 inches thick. The subsoil is about 37 inches thick. The upper part is strong brown, friable silty clay loam; the next part is a thin layer of strong brown, mottled, firm silt loam and pinkish gray silt; and the lower part is a fragipan of brown, mottled, firm, brittle loam. The substratum to a depth of 60 inches or more is dark brown, firm sandy loam.

Of minor extent in this association are Atlas, Gosport, Holton, Eleva, and Wirt soils. The somewhat poorly drained Atlas soils formed mainly in accretion gley or glacial till. They are on moderately sloping and strongly sloping side slopes along drainageways. The moderately well drained Gosport soils formed in material weathered from shale. They are on strongly sloping to very steep side slopes along drainageways. The somewhat poorly drained Holton soils formed in loamy alluvium. They are on narrow flood plains. The somewhat excessively drained Eleva soils formed in material weathered from interbedded siltstone and sandstone. They are on very steep side slopes along drainageways. The well drained Wirt soils formed in loamy alluvium. They are on narrow flood plains and on natural levees along tributary streams on broad flood plains.

Most areas of this association are used for soybeans, grain sorghum, corn, or winter wheat. Most areas of the strongly sloping to very steep soils are used as woodland or pasture. Controlling water erosion and improving fertility are the main management concerns in cultivated areas. Water erosion, an equipment limitation, and seedling mortality are the main management concerns in wooded areas.

Some areas of this association are used as sites for buildings and sanitary facilities. Seasonal wetness, the shrink-swell potential, restricted permeability, and the slope are the main management concerns in areas used for urban development.

4. Belknap-Bonnie Association

Nearly level, somewhat poorly drained and poorly drained, moderately permeable and moderately slowly permeable soils that formed in silty alluvium; on flood plains

This association is on flood plains along the major streams and tributaries. It originally was covered dominantly by deciduous trees. Slopes range from 0 to 2 percent.

This association makes up about 5 percent of the county. It is about 40 percent Belknap soils, 20 percent Bonnie soils, and 40 percent soils of minor extent.

The Belknap soils are on flood plains. They are somewhat poorly drained and are moderately permeable or moderately slowly permeable. They are subject to occasional flooding of brief or long duration from January through May in most years. Typically, the surface layer is dark brown and brown, mottled, friable silt loam about 17 inches thick. The substratum to a depth of 60 inches or more is grayish brown, light brownish gray, and gray, mottled, friable, stratified silt loam.

The Bonnie soils are on broad flood plains. They are poorly drained and moderately slowly permeable. They are subject to frequent flooding of long duration from January through June in most years. Typically, the surface layer is grayish brown and gray, mottled, friable silt loam about 10 inches thick. The substratum extends to a depth of 60 inches or more. The upper part is light brownish gray and grayish brown, mottled, friable silt loam, and the lower part is light brownish gray, mottled, friable, stratified silt loam and silt.

Of minor extent in this association are Banlic, Birds, Creal, Holton, Petrolia, Sharon, Wakeland, and Wirt soils. The somewhat poorly drained Banlic soils are on low stream terraces above the flood plains. They have a firm, brittle layer in the subsoil. The poorly drained Birds soils are on flood plains. The somewhat poorly drained Creal soils are on foot slopes. They have a subsoil of silty clay loam. The somewhat poorly drained Holton soils are on narrow flood plains. They formed in loamy alluvial sediments. The very poorly drained Petrolia soils are in slight depressions on broad flood plains. The moderately well drained Sharon and well drained Wirt soils are on slight rises on flood plains and on natural levees along stream channels. The somewhat poorly drained Wakeland soils are on flood plains.

Most areas of this association are used for corn, soybeans, grain sorghum, or winter wheat. Some areas are wooded. Controlling flooding, improving drainage, and improving fertility are the main management concerns in cultivated areas. An equipment limitation, seedling mortality, and windthrow are the main management concerns in wooded areas.

This association is generally unsuited to building site development and sanitary facilities because of the flooding.

Broad Land Use Considerations

The soils in Marion County vary widely in their suitability for major land uses. About 60 percent of the acreage in the county is used for cultivated crops. About 10 percent is used as pasture, and 20 percent is used as woodland. Less than 5 percent of the acreage occurs as urban or suburban areas, which include towns, cities, highways, industrial sites, and unincorporated subdivisions.

Corn, soybeans, grain sorghum, and winter wheat are the principal cultivated crops grown in the county. Vegetables, small fruits, apples, and peaches are the main specialty crops. Crops are grown most extensively in associations 1, 2, and 4. These associations generally are well suited or moderately well suited to cultivated crops. Wetness is the primary concern in managing these associations. Ponding is a hazard in low areas. Controlling erosion also is a management concern on very long slopes and on the more sloping soils. Darmstadt and Huey soils have a high content of sodium. Darmstadt soils are moderately well suited to cultivated crops, and Huey soils are poorly suited. The high content of sodium results in moisture stress during dry periods and excess moisture during wet periods. Also, the sodium restricts the availability and uptake of some plant nutrients. Flooding is a hazard in areas of association 4. It delays planting or damages crops in some years.

Most of the woodland in the county is in areas of associations 3 and 4. These associations are moderately well suited or well suited to woodland. The most important trees are white oak, red oak, sugar maple, shagbark hickory, and green ash in areas of association 3 and sycamore, river birch, and black walnut in areas of association 4. In areas of association 3 where the slope is more than 15 percent, the hazard of erosion and an equipment limitation are management concerns. In areas of association 4, the wetness of the Bonnie soils is a limitation. Associations 1 and 2 are moderately well suited to woodland.

The potential for the development of wildlife habitat is good throughout the county. Associations 1 and 2 are moderately well suited to openland wildlife habitat. Association 4 is well suited to openland or woodland wildlife habitat. Association 3 is well suited to woodland wildlife habitat. The poorly drained soils in associations 1, 2, and 4 are well suited to wetland wildlife habitat.

Various limitations affect the use of the soils in the county for building site development and sanitary facilities. Associations 1 and 2 are poorly suited to these uses because of seasonal wetness, the shrink-swell potential, and very slow to moderately slow permeability. Association 3 is poorly suited, mainly because the slope is a severe limitation in areas where it is more than 15 percent. In the less sloping areas of this association, seasonal wetness, the shrink-swell potential, and slow or very slow permeability are severe limitations. Association 4 is generally unsuited to building site development and sanitary facilities because of the hazard of flooding.

Detailed Soil Map Units

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

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

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

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

Soils of one series can differ in texture of the surface layer or of the substratum. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Ava silt loam, 1 to 5 percent slopes, is a phase of the Ava 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. Hickory-Gosport complex, 18 to 30 percent slopes, is an example.

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

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. 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 "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

Soil Descriptions

2—Cisne silt loam. This nearly level, poorly drained soil is on broad, loess-covered till plains. Individual areas are irregularly shaped or rounded and range from 3 to 1,500 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is grayish brown and light brownish gray, mottled, friable silt loam about 8 inches thick. The subsoil is about 39 inches thick. The upper part is grayish brown, very firm silty clay and silty clay loam, and the lower part is grayish brown and light brownish gray, firm silty clay loam. The substratum to a depth of 60 inches or more is light brownish gray, mottled, firm silty clay loam. In some areas the surface layer is lighter in color. In other areas it is thicker. In places the subsoil has less clay.

Included with this soil in mapping are small, closely intermingled areas of Huey soils. These soils have a high content of sodium in the subsoil. Also included are areas of the somewhat poorly drained Darmstadt and Hoyleton soils on slight ridges and knolls above the Cisne soil and small areas of soils that are affected by oil brine and are in the same landscape positions as the Cisne soil. Included soils make up about 10 to 20 percent of the unit.

Water and air move through the Cisne soil at a very slow rate. Surface runoff is slow. The seasonal high water table is perched within a depth of 2 feet from February through June in most years. Available water capacity is high. Organic matter content is moderate. The surface layer is friable and can be easily tilled when moist. The shrink-swell potential and the potential for frost action are high.

Most areas are used for cultivated crops. Some areas are used as sites for dwellings. This soil is moderately suited to cultivated crops. It is poorly suited to dwellings and septic tank absorption fields.

Corn, soybeans, and small grain can be grown in most areas of this soil because a drainage system has been installed. Measures that maintain the drainage system are needed. In some areas additional drainage measures are needed. A system of surface drains reduces the wetness. Tilling during wet periods causes surface compaction and decreases the rate of water infiltration. Leaving crop residue on the surface, adding other organic material, and minimizing tillage help to maintain tilth and increase the rate of water infiltration.

The seasonal high water table and the shrink-swell potential are limitations if this soil is used as a site for dwellings. Backfilling with sand and gravel and reinforcing footings and foundations help to prevent the structural damage caused by shrinking and swelling. Installing subsurface drains around footings, elevating the floor of dwellings without basements above the surrounding ground level, grading, and diverting surface water from the site reduce the wetness.

The seasonal high water table and the very slow permeability are limitations if this soil is used as a site for septic tank absorption fields. A septic tank system can function satisfactorily only if a sealed sand filter or an aeration unit is installed and the system is disinfected as needed. A sewage lagoon is an alternative method of waste disposal.

The land capability classification is IIIw.

3A—Hoyleton silt loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on low ridges on broad, loess-covered till plains. Individual areas are irregularly shaped or rounded and range from 3 to 500 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is brown, friable silt loam about 4 inches thick. The subsoil is about 38 inches thick. It is mottled. The upper part is brown, firm silty clay loam and very firm silty clay. The lower part is pale brown and brown, firm silty clay loam and friable silt loam. The substratum to a depth of 60 inches or more is brown, mottled, friable silty clay loam. In some areas the surface layer is lighter in color. In other areas the subsoil has less clay.

Included with this soil in mapping are a few small, closely intermingled areas of Darmstadt soils. These soils have a high content of sodium in the subsoil. Also included are areas of the poorly drained Cisne and Huey soils on the lower flats. Included soils make up about 10 to 20 percent of the unit.

Water and air move through the Hoyleton soil at a slow rate. Surface runoff is slow. The seasonal high water table is 1 to 3 feet below the surface from March through June in most years. Available water capacity is high. Organic matter content is moderate. The surface layer is friable and can be easily tilled when moist. The shrink-swell potential and the potential for frost action are high.

Most areas are used for cultivated crops. Some areas are used as sites for dwellings and septic tank absorption fields. This soil is well suited to cultivated crops. It is poorly suited to dwellings and septic tank absorption fields.

In the areas used for corn, soybeans, or small grain, the seasonal high water table delays planting in some years. The wetness can be reduced, however, by installing a system of random surface drains. Tilling during wet periods causes surface compaction and reduces the rate of water infiltration. Leaving crop residue on the surface and regularly adding other organic material help to maintain tilth and increase the rate of water infiltration.

The seasonal high water table and the shrink-swell potential are limitations if this soil is used as a site for dwellings. Backfilling with sand and gravel and reinforcing footings and foundations help to prevent the structural damage caused by shrinking and swelling. Installing subsurface drains around footings, elevating the floor of dwellings without basements above the surrounding ground level, grading, and diverting surface water from the site reduce the wetness.

The seasonal high water table and the slow permeability are limitations if this soil is used as a site for septic tank absorption fields. A septic tank system can function satisfactorily only if a sealed sand filter or an aeration unit is installed and the system is disinfected as needed. A sewage lagoon is an alternative method of waste disposal.

The land capability classification is IIw.

3B—Hoyleton silt loam, 2 to 5 percent slopes. This gently sloping, somewhat poorly drained soil is on broad ridges, knolls, and side slopes along shallow drainageways on loess-covered till plains. Individual areas are irregularly shaped or rounded and range from 3 to 130 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is brown, friable silt loam about 3 inches thick. The subsoil is about 31 inches thick. It is mottled. The upper part is brown and pale brown, very firm silty clay; the next part is brown, firm silty clay loam; and the lower part is grayish brown, friable silt loam. The substratum to a depth of 60 inches or more is dark yellowish brown and grayish brown, mottled, friable silt loam. In some areas the subsoil has less clay. In other areas the surface layer is lighter in color. In some eroded areas cultivation has mixed the upper part of the subsoil with the surface layer.

Included with this soil in mapping are a few small, closely intermingled areas of Darmstadt soils, which have a high content of sodium in the subsoil. Also included are small areas of the poorly drained Cisne and Huey soils on the lower flats. Included soils make up 8 to 16 percent of the unit.

Water and air move through the Hoyleton soil at a slow rate. Surface runoff is medium. The seasonal high water table is at a depth of 1 to 3 feet from March through June in most years. Available water capacity is high. Organic matter content is moderate. The surface layer is friable and can be easily tilled when moist. The shrink-swell potential and the potential for frost action are high.

Most areas are used for cultivated crops. Some areas are used as sites for dwellings. This soil is well suited to cultivated crops. It is poorly suited to building site development.

In the areas used for corn, soybeans, or small grain, erosion is a hazard unless the surface is protected. Also, the seasonal high water table delays planting in some years. The wetness can be reduced by installing a system of random surface drains. A system of conservation tillage that leaves crop residue on the surface after planting, contour farming, and terraces help to control erosion. Tilling during wet periods causes surface compaction and reduces the rate of water infiltration. Leaving crop residue on the surface and regularly adding other organic material help to maintain tilth and increase the rate of water infiltration.

The seasonal high water table and the shrink-swell potential are limitations if this soil is used as a site for dwellings. Backfilling with sand and gravel and reinforcing footings and foundations help to prevent the structural damage caused by shrinking and swelling. Installing subsurface drains around footings, elevating the floor of dwellings without basements above the surrounding ground level, grading, and diverting surface water from the site reduce the wetness.

The seasonal high water table and the slow permeability are limitations if this soil is used as a site for septic tank absorption fields. A septic tank system can function satisfactorily only if a sealed sand filter or an aeration unit is installed and the system is disinfected as needed. A sewage lagoon is an alternative method of waste disposal.

The land capability classification is IIe.

3B2—Hoyleton silt loam, 3 to 7 percent slopes, eroded. This gently sloping, somewhat poorly drained soil is on the side slopes of prominent ridges and along shallow drainageways on loess-covered till plains. Individual areas are irregular in shape and range from 3 to 330 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam. Erosion has reduced the thickness of this layer to about 7 inches. The subsoil is about 35 inches thick. The upper part is brown, friable silt loam and silty clay loam. The next part is brown, very firm silty clay. The lower part is brown, firm silty clay loam and silt loam. The substratum to a depth of 60 inches or more is brown, mottled, firm silt loam that has a high content of sand. In some severely eroded areas, the surface layer is silty clay loam because it has been mixed by cultivation with the more clayey subsoil. In some places the subsoil has less clay. In other places the substratum has a higher content of sand.

Included with this soil in mapping are small, closely intermingled areas of Darmstadt and Grantfork soils and small areas of Atlas soils on the lower part of the slopes. Darmstadt and Grantfork soils have a high content of sodium in the subsoil. Atlas soils have more clay in the lower part of the subsoil than the Hoyleton soil. Included soils make up 8 to 16 percent of the unit.

Water and air move through the Hoyleton soil at a slow rate. Surface runoff is medium. The seasonal high water table is 1 to 3 feet below the surface from March through June in most years. Available water capacity is moderate or high. Organic matter content is moderate. The surface layer is friable and can be easily tilled when moist, but it tends to crust and puddle after hard rains. Seepy spots are common in some areas. The shrink-swell potential and the potential for frost action are high.

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

In the areas used for corn, soybeans, or small grain, erosion is a hazard unless the surface is protected.

Figure 2.—Installing drainage tile in an area Hoyleton silt loam, 3 to 7 percent slopes, eroded.

Also, the seasonal high water table delays planting in some years. Random surface or subsurface drains reduce the wetness (fig. 2). A crop rotation that includes 1 or more years of forage crops, a conservation tillage system that leaves crop residue on the surface after planting, contour farming, and terraces help to control erosion. Tilling during wet periods causes surface compaction, cloddiness, and excessive runoff and erosion. Leaving crop residue on the surface and regularly adding other organic material minimize crusting, help to maintain tilth, and increase the rate of water infiltration.

The seasonal high water table and the shrink-swell potential are limitations if this soil is used as a site for dwellings. Backfilling with sand and gravel and reinforcing footings and foundations help to prevent the structural damage caused by shrinking and swelling. Installing subsurface drains around footings, elevating the floor of dwellings without basements above the surrounding ground level, grading, and diverting surface water from the site reduce the wetness.

The seasonal high water table and the slow permeability are limitations if this soil is used as a site for septic tank absorption fields. A septic tank system can function satisfactorily only if a sealed sand filter and a disinfection tank or an evapotranspiration bed are installed. A sewage lagoon is an alternative method of waste disposal.

The land capability classification is IIIe.

4B—Richview silt loam, 1 to 5 percent slopes. This gently sloping, moderately well drained soil is on narrow ridgetops and the crest of prominent ridges in the uplands. Individual areas are rounded or oval and range from 3 to 70 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 9 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is dark brown, friable silty clay loam that has reddish mottles and dark coatings. The next part is yellowish brown and strong brown, firm silty clay loam. The lower part is strong brown, mottled, friable silt loam and loam. In some areas the lower part of the subsoil has more sand.

Included with this soil in mapping are areas of the somewhat poorly drained, slowly permeable Hoyleton soils. These soils are on the lower part of the slopes. They make up about 8 to 12 percent of the unit.

Water and air move through the Richview soil at a moderate rate. Surface runoff is medium. The seasonal high water table is 4 to 6 feet below the surface from February through May in most years. Available water capacity is high. Organic matter content is moderate. The surface layer is friable and can be easily tilled when moist. The shrink-swell potential is moderate. The potential for frost action is high.

Most areas are used for cultivated crops. Some areas are used as sites for dwellings and septic tank absorption fields. This soil is well suited to cultivated crops. It is moderately suited to dwellings and septic tank absorption fields.

In the areas used for corn, soybeans, or small grain, erosion is a hazard unless the surface is protected. A system of conservation tillage that leaves crop residue on the surface after planting, contour farming, and terraces help to control erosion. Tilling during wet periods causes surface compaction. Leaving crop residue on the surface and regularly adding other organic material help to maintain tilth and increase the rate of water infiltration.

The seasonal high water table and the shrink-swell potential are limitations if this soil is used as a site for dwellings. The wetness is more severely limiting on sites for dwellings with basements than on sites for dwellings without basements. Reinforcing footings and foundations helps to prevent the structural damage caused by shrinking and swelling. Subsurface drains help to remove excess water around the foundation.

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

The land capability classification is IIe.

4C2—Richview silt loam, 5 to 10 percent slopes, eroded. This moderately sloping, moderately well drained soil is on the side slopes of prominent ridges in the uplands. Individual areas are irregularly shaped or oval and range from 4 to 85 acres in size.

Typically, the surface layer is dark brown, friable silt loam. Erosion has reduced the thickness of this layer to about 5 inches. The subsoil extends to a depth of 60 inches or more. The upper part is yellowish brown and brown, firm silty clay loam that has reddish mottles and dark coatings. The next part is brown and strong brown, mottled, friable silt loam. The lower part is strong brown, mottled, friable, stratified loam and sandy loam. In some areas the surface layer is lighter in color. In severely eroded areas it is commonly silty clay loam because it has been mixed by cultivation with the more clayey subsoil. In places the lower part of the subsoil has less sand.

Included with this soil in mapping are small areas of the somewhat poorly drained, slowly permeable Hoyleton and somewhat poorly drained, moderately slowly permeable Blair soils. These soils are on the lower part of side slopes. They make up about 8 to 15 percent of the unit.

Water and air move through the Richview soil at a moderate rate. Surface runoff is medium. The seasonal high water table is 4 to 6 feet below the surface from February through May in most years. Available water capacity is high. Organic matter content is moderate. The surface layer is friable and can be easily tilled when moist, but it tends to crust and puddle after hard rains, especially in areas where the subsoil has been mixed with the surface layer through cultivation. The shrink-swell potential is moderate. The potential for frost action is high.

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

Measures that control erosion are needed in the areas used for soybeans, corn, or small grain. A system of conservation tillage that leaves crop residue on the surface after planting, contour farming, terraces, and a crop rotation that includes 1 or more years of forage crops help to control erosion. Tilling during wet periods causes surface cloddiness and compaction and excessive runoff and erosion. Leaving crop residue on the surface and regularly adding other organic material help to maintain tilth and increase the rate of water infiltration.

A cover of grasses and legumes improves tilth and helps to control erosion. Selection of suitable species for planting, proper stocking rates, rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition.

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

The land capability classification is IIIe.

5C3—Blair silt loam, 4 to 10 percent slopes, severely eroded. This moderately sloping, somewhat poorly drained soil is on side slopes along drainageways in the uplands. In most areas, nearly all of the original surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. Individual areas are long and narrow or irregularly shaped and range from 3 to 230 acres in size.

Typically, the surface layer is dark brown, firm silt loam about 4 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is yellowish brown and light yellowish brown, mottled, friable silt loam and loam. The lower part is grayish brown and gray, mottled, firm loam. Till pebbles are throughout the soil. In places the subsoil has more clay. In some areas slopes are more than 10 percent. In other areas the surface layer is silty clay loam.

Included with this soil in mapping are small areas of Atlas and Darmstadt soils. The very slowly permeable Atlas soils have more clay in the subsoil than the Blair soil. They are on the steeper slopes below the Blair soil. Darmstadt soils have a high content of sodium in the subsoil. They are upslope from the Blair soil. Included soils make up about 8 to 16 percent of the unit.

Water and air move through the Blair soil at a moderately slow rate. Surface runoff is medium or rapid. The seasonal high water table is 1.5 to 3.5 feet below the surface from March through June in most years. Available water capacity is moderate or high. Organic matter content is low. The surface layer tends to crust after hard rains. Some areas have seepy spots. The shrink-swell potential is moderate. The potential for frost action is high.

Most areas are used for cultivated crops, pasture, or hay. This soil is poorly suited to cultivated crops. It is moderately suited to pasture and hay and to dwellings without basements. It is poorly suited to septic tank absorption fields and to dwellings with basements.

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

Establishing pasture plants or hay on this soil helps to control erosion. Overgrazing or grazing during wet periods reduces forage production and causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, rotation grazing, and deferred grazing during wet periods help to keep the pasture in good condition. Preparing a good seedbed is difficult because of surface crusting and the tendency of the soil to become cloddy. Applying a no-till method of pasture renovation and seeding on the contour help to control erosion.

The seasonal high water table and the shrink-swell potential are limitations if this soil is used as a site for dwellings. The seasonal high water table can be lowered by installing tile drains around the base of foundations. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. Some land shaping by cutting and filling helps to overcome the slope in the steeper areas. Erosion is a hazard during construction. It can be controlled by leaving as much vegetation on the surface as possible. Disturbed areas should be seeded or sodded as soon as possible after construction.

The moderately slow permeability and the seasonal high water table are limitations if this soil is used as a site for septic tank absorption fields. A septic tank system can function satisfactorily only if a sealed sand filter or an aeration unit is installed and the system is disinfected as needed. A sewage lagoon is an alternative method of waste disposal.

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

The land capability classification is IVe.

5D3—Blair clay loam, 10 to 18 percent slopes, severely eroded. This strongly sloping, somewhat poorly drained soil is on side slopes along drainageways in the uplands. In most areas, nearly all of the original surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. Individual areas are long and narrow or irregularly shaped and range from 4 to 70 acres in size.

Typically, the surface layer is brown, friable silt loam about 4 inches thick. The subsoil to a depth of 60 inches or more is mottled, firm clay loam. The upper part is brown and light brownish gray, and the lower part is brown. In some places the subsoil has more clay. In other places slopes are more than 18 percent.

Included with this soil in mapping are small areas of moderately well drained soils. Also included are areas of soils in which the surface layer has significant amounts of sodium and areas of the somewhat poorly drained, very slowly permeable Atlas soils on the lower part of side slopes. Included soils make up 8 to 30 percent of the unit.

Water and air move through the Blair soil at a moderately slow rate. Surface runoff is rapid. The seasonal high water table is 1.5 to 3.5 feet below the surface from March through June in most years. Available water capacity is moderate or high. Organic matter content is low. The surface layer tends to crust after hard rains. It becomes hard and cloddy if it is tilled when too wet. Some areas have seepy spots. The shrink-swell potential is moderate. The potential for frost action is high.

Most areas are used for cultivated crops, pasture, or hay. This soil is poorly suited to cultivated crops because of a severe hazard of erosion. It is moderately suited to pasture and hay and to dwellings without basements. It is poorly suited to dwellings with basements and to septic tank absorption fields.

Establishing pasture plants or hay on this soil helps to control erosion. Overgrazing or grazing during wet periods reduces forage production and causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, rotation grazing, and deferred grazing during wet periods help to keep the pasture in good condition. Preparing a good seedbed is difficult because of surface crusting and the tendency of the soil to become cloddy. Applying a no-till method of pasture renovation and seeding on the contour help to control erosion.

If this soil is used as a site for dwellings, the seasonal high water table, the shrink-swell potential, and the slope are limitations. Installing tile drains around the base of foundations helps to lower the seasonal high water table. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. Land shaping by cutting and filling helps to overcome the slope. Erosion is a hazard during construction. It can be controlled by leaving as much vegetation on the surface as possible. Disturbed areas should be seeded or sodded as soon as possible.

The moderately slow permeability, the seasonal high water table, and the slope are limitations if this soil is used as a site for septic tank absorption fields. A septic tank system can function satisfactorily only if a sealed sand filter or aeration unit is installed and the system is disinfected as needed. If the site is leveled, a sewage lagoon is an alternative method of waste disposal.

The land capability classification is VIe.

7C2—Atlas silt loam, 4 to 10 percent slopes, eroded. This moderately sloping, somewhat poorly drained soil is on side slopes along drainageways in the uplands. Individual areas are long and narrow or irregularly shaped and range from 3 to 150 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam. Erosion has reduced the thickness of this layer to about 7 inches. The subsoil extends to a depth of 60 inches or more. The upper part is brown, friable silty clay loam. The next part is dark grayish brown and light brownish gray, mottled, very firm silty clay. The lower part is olive gray and strong brown, mottled, very firm silty clay. In some areas the subsoil has less sand and clay. In a few areas it has thin layers of loam or sandy loam. In places the surface layer is silty clay loam because it has been mixed by cultivation with the more clayey subsoil.

Included with this soil in mapping are small areas of soils that have a high content of sodium and soils that are moderately well drained. Also included are the somewhat poorly drained Blair soils in areas above the Atlas soil. Included soils make up 10 to 15 percent of the unit.

Water and air move through the Atlas soil at a very slow rate. Surface runoff is medium. The seasonal high water table is perched at a depth of 1 to 2 feet from April through June in most years. Available water capacity is moderate. Organic matter content is moderately low. The surface layer dries more slowly than that of the surrounding soils in spring and tends to be droughty late in the growing season. The shrink-swell potential and the potential for frost action are high.

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

In the areas used for corn or small grain, erosion is a hazard unless the surface is protected. A conservation tillage system that leaves crop residue on the surface after planting, contour farming, and terraces help to control erosion. Tilling during wet periods causes surface compaction. Leaving crop residue on the surface and regularly adding other organic material help to maintain tilth and increase the rate of water infiltration.

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

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

The seasonal high water table and the shrink-swell potential are limitations if this soil is used as a site for dwellings. The seasonal high water table can be lowered by installing tile drains around the base of foundations. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. Some land shaping by cutting and filling helps to overcome the slope in the steeper areas. Erosion is a hazard during construction. It can be controlled by leaving as much vegetation on the surface as possible. Disturbed areas should be seeded or sodded as soon as possible after construction.

The seasonal high water table and the very slow permeability are limitations if this soil is used as a site for septic tank absorption fields. A septic tank system can function satisfactorily only if a sealed sand filter or an aeration unit is installed and the system is disinfected as needed. A sewage lagoon is an alternative method of waste disposal.

The land capability classification is IIIe.

7C3—Atlas silty clay loam, 4 to 10 percent slopes, severely eroded. This moderately sloping, somewhat poorly drained soil is on side slopes along drainageways in the uplands. In most areas, nearly all of the original surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. Individual areas are long and narrow or irregularly shaped and range from 3 to 60 acres in size.

Typically, the surface layer is yellowish brown, firm silty clay loam about 4 inches thick. The subsoil to a depth of 60 inches or more is light brownish gray, mottled, very firm silty clay loam and clay loam. In some places the surface layer is silt loam. In other places the subsoil has less clay. In some areas it has thin layers of loam or sandy loam.

Included with this soil in mapping are small areas of moderately well drained soils. Also included are small areas of the somewhat poorly drained Blair soils on the upper part of the slopes, the moderately well drained Hickory soils on the steeper part of the slopes, and alluvial soils in drainageways. Included soils make up about 10 to 15 percent of the unit.

Water and air move through the Atlas soil at a very slow rate. Surface runoff is rapid. The seasonal high water table is perched at a depth of 1 to 2 feet from April through June in most years. Available water capacity is moderate. Organic matter content is low. The surface layer is firm and sticky when wet and hard and cloddy when dry. This soil cannot be tilled so easily as the less eroded adjacent soils. Also, it is seepy in many spots and dries more slowly in spring than the adjacent soils. It tends to be droughty late in the growing season. The shrink-swell potential and the potential for frost action are high.

Most areas are used for cultivated crops or for hay or pasture. This soil is generally unsuited to cultivated crops because of the hazard of erosion and poor tilth. It is moderately suited to pasture and hay and well suited to woodland. It is poorly suited to dwellings and septic tank absorption fields.

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

Establishing pasture plants or hay on this soil helps to control erosion. Overgrazing or grazing during wet periods reduces forage production and causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, rotation grazing, and deferred grazing during wet periods help to keep the pasture in good condition. Preparing a good seedbed is difficult because of surface crusting and the tendency of the soil to become cloddy. Applying a no-till method of pasture renovation and seeding on the contour help to control erosion.

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

The seasonal high water table and the shrink-swell potential are limitations if this soil is used as a site for dwellings. The seasonal high water table can be lowered by installing tile drains around the base of foundations. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. Some land shaping by cutting and filling helps to overcome the slope in the steeper areas. Erosion is a hazard during construction. It can be controlled by leaving as much vegetation on the surface as possible. Disturbed areas should be seeded or sodded as soon as possible after construction.

The seasonal high water table and the very slow permeability are limitations if this soil is used as a site for septic tank absorption fields. A septic tank system can function satisfactorily only if a sealed sand filter or an aeration unit is installed and the system is disinfected as needed. A sewage lagoon is an alternative method of waste disposal.

The shrink-swell potential and low strength are limitations on sites for local roads and streets. Providing suitable subgrade material helps to prevent the damage caused by low strength and by shrinking and swelling.

The land capability classification is IVe.

7D2—Atlas silt loam, 10 to 18 percent slopes, eroded. This strongly sloping, somewhat poorly drained soil is on side slopes along drainageways in the uplands. Individual areas are long and narrow or irregularly shaped and range from 4 to 85 acres in size.

Typically, the surface layer is dark brown, friable silt loam. Erosion has reduced the thickness of this layer to about 6 inches. The subsoil extends to a depth of 60 inches or more. The upper part is brown, mottled, very firm silty clay loam, and the lower part is brown and light gray, mottled, firm silty clay and clay loam. In some areas the subsoil has more clay. In other areas it has thin layers of loam or sandy loam. In places the surface layer is silty clay loam because it has been mixed by cultivation with the more clayey subsoil.

Included with this soil in mapping are small areas of the moderately well drained Ava soils on the higher ridges. Also included are areas of somewhat poorly drained soils that are on side slopes and have a high content of sodium in the subsoil and areas of alluvial soils in drainageways. Included soils make up about 10 to 15 percent of the unit.

Water and air move through the Atlas soil at a very slow rate. Surface runoff is rapid. The seasonal high water table is perched at a depth of 1 to 2 feet from April through June in most years. Available water capacity is moderate. Organic matter content is moderately low. The shrink-swell potential and the potential for frost action are high.

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

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

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

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

The seasonal high water table, the shrink-swell potential, and the slope are limitations on sites for dwellings. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. Installing subsurface drains around foundations helps to remove excess water. Land shaping by cutting and filling helps to overcome the slope. Erosion and sedimentation are hazards during construction. Bare areas should be seeded and mulched or sodded as soon as possible. Sediment basins on the construction sites minimize offsite sedimentation.

The seasonal high water table and the very slow permeability are limitations if this soil is used as a site for septic tank absorption fields. A septic tank system can function satisfactorily only if a sealed sand filter or an aeration unit is installed and the system is disinfected as needed. If the site is leveled, a sewage lagoon is an alternative method of waste disposal.

The shrink-swell potential, low strength, and the slope are limitations on sites for local roads and streets. Strengthening or replacing the base material can help to prevent road damage. Grading may be needed during construction. Maintaining a cover of mulch until vegetation is established helps to control erosion in bare areas.

The land capability classification is IVe.

7D3—Atlas clay loam, 10 to 18 percent slopes, severely eroded. This strongly sloping, somewhat poorly drained soil is on side slopes along drainageways in the uplands. In most areas, nearly all of the original surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. Individual areas are long and narrow or irregularly shaped and range from 4 to 70 acres in size.

Typically, the surface layer is yellowish brown, friable clay loam about 5 inches thick. The subsoil is about 44 inches thick. The upper part is yellowish brown and brown, mottled, very firm clay loam and loam. The lower part is gray, mottled, firm clay loam. The substratum to a depth of 60 inches or more is brown, mottled, firm loam. In places the surface layer is silt loam. In some areas the subsoil has less clay. In other areas it has thin layers of loam or sandy loam.

Included with this soil in mapping are small areas of the moderately slowly permeable Blair soils on the upper part of the slopes. Also included are small areas of alluvial soils in drainageways. Included soils make up 10 to 15 percent of the unit.

Water and air move through the Atlas soil at a very slow rate. Surface runoff is rapid. The seasonal high water table is perched at a depth of 1 to 2 feet from April through June in most years. Available water capacity is moderate. Organic matter content is low. The surface layer tends to crust after hard rains and becomes hard and cloddy if it is tilled when wet. The shrink-swell potential and the potential for frost action are high.

Most areas are used for cultivated crops, pasture, or hay. This soil is generally unsuited to cultivated crops because of the slope and the hazard of erosion. It is moderately suited to pasture and hay. It is poorly suited to dwellings and septic tank absorption fields.

Establishing pasture plants or hay on this soil helps to control erosion. Overgrazing or grazing during wet periods reduces forage production and causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, rotation grazing, and deferred grazing during wet periods help to keep the pasture in good condition. Preparing a good seedbed is difficult because of surface crusting and the tendency of the soil to become cloddy. Applying a no-till method of pasture renovation and seeding on the contour help to control erosion.

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

The seasonal high water table, the shrink-swell potential, and the slope are limitations on sites for dwellings. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. Installing subsurface drains around foundations helps to remove excess water. Land shaping by cutting and filling helps to overcome the slope. Erosion and sedimentation are hazards during construction. Bare areas should be seeded and mulched or sodded as soon as possible. Sediment basins on the construction sites minimize offsite sedimentation.

The seasonal high water table and the very slow permeability are limitations if this soil is used as a site for septic tank absorption fields. A septic tank system can function satisfactorily only if a sealed sand filter or an aeration unit is installed and the system is disinfected as needed. If the site is leveled, a sewage lagoon is an alternative method of waste disposal.

The shrink-swell potential, low strength, and the slope are limitations on sites for local roads and streets. Strengthening or replacing the base material can help to prevent road damage. Grading may be needed during construction. Maintaining a cover of mulch until vegetation is established helps to control erosion in bare areas.

The land capability classification is VIe.

8D2—Hickory loam, 10 to 15 percent slopes, eroded. This strongly sloping, well drained soil is on side slopes along drainageways in strongly dissected areas on till plains. Individual areas are long and narrow or irregularly shaped and range from 5 to 20 acres in size.

Typically, the surface layer is dark brown, friable loam. Erosion has reduced the thickness of this layer to about 9 inches. The subsoil extends to a depth of 60 inches or more. The upper part is brown, yellowish brown, and grayish brown, very firm clay loam; the next part is dark yellowish brown and grayish brown, mottled, very firm clay loam; and the lower part is light brownish gray, mottled, firm loam, fine sandy loam, and silty clay loam. In some areas slopes are less than 10 percent. In other areas the subsoil contains more clay and less sand.

Included with this soil in mapping are small areas of Ava and Atlas soils and small areas of alluvial soils. The silty Ava soils are along the crest of the slopes. The somewhat poorly drained Atlas soils are near the head of drainageways. Included soils make up 10 to 15 percent of the unit.

Water and air move through the Hickory soil at a moderate rate. Surface runoff is rapid. The seasonal high water table is 4 to 6 feet below the surface from March through June in most years. Available water capacity is high. Organic matter content is moderately low. The shrink-swell potential is high in the subsoil. The potential for frost action is moderate.

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

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

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

The seasonal high water table, the shrink-swell potential, and the slope are limitations on sites for dwellings. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. Installing subsurface drains around foundations helps to remove excess water. Land shaping by cutting and filling helps to overcome the slope. Erosion and sedimentation are hazards during construction. Bare areas should be seeded and mulched or sodded as soon as possible. Sediment basins on the construction sites minimize offsite sedimentation.

The seasonal wetness, the moderate permeability, and the slope are limitations if this soil is used as a site for septic tank absorption fields. Installing subsurface tile drains helps to lower the water table. Increasing the size of the absorption field or replacing the soil with material that is more permeable helps to overcome the moderate permeability. Installing the filter lines on the contour or land shaping by cutting and filling helps to overcome the slope.

The shrink-swell potential, low strength, and the slope are limitations on sites for local roads and streets. Strengthening or replacing the base material can help to prevent road damage. Grading may be needed during construction. Maintaining a cover of mulch until vegetation is established helps to control erosion in bare areas.

The land capability classification is IIIe.

8D3—Hickory clay loam, 10 to 15 percent slopes, severely eroded. This strongly sloping, moderately well drained soil is on side slopes along drainageways in the uplands. In most areas, nearly all of the original surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. Individual areas are long and narrow or irregularly shaped and range from 8 to 30 acres in size.

Typically, the surface layer is brown, firm clay loam about 5 inches thick. The subsoil is about 48 inches thick. The upper part is yellowish brown and light brownish gray, firm clay, and the lower part is light brownish gray and yellowish brown, mottled, firm clay loam. The substratum to a depth of 60 inches or more is brown, very firm loam. In some areas the surface layer is silty clay loam. In other areas the subsoil contains less clay. In some places slopes are less than 10 percent or more than 15 percent. In other places the soil is less eroded and has a surface layer of silt loam or loam.

Included with this soil in mapping are small areas of Ava and Atlas soils and small areas of alluvial soils. The silty, moderately well drained Ava soils are along the crest of the slopes. The somewhat poorly drained Atlas soils are near the head of drainageways. The somewhat poorly drained alluvial soils are along drainageways. Included soils make up 5 to 10 percent of the unit.

Water and air move through the Hickory soil at a moderate rate. Surface runoff is rapid. The seasonal high water table is 4 to 6 feet below the surface from March through June in most years. Available water capacity is high. The subsoil is strongly acid to slightly acid. Organic matter content is low. The surface layer is firm and sticky when wet and hard and cloddy when dry because it contains clayey subsoil material. The shrink-swell potential is high in the subsoil. The potential for frost action is moderate.

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

Establishing pasture plants or hay on this soil helps to control erosion (fig. 3). Overgrazing or grazing during wet periods reduces forage production and causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, rotation grazing, and deferred grazing during wet periods help to keep the pasture in good condition. Preparing a good seedbed is difficult because of surface crusting and the tendency of the soil to become cloddy. Applying a no-till method of pasture renovation and seeding on the contour help to control erosion.

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

The seasonal high water table, the shrink-swell potential, and the slope are limitations on sites for dwellings. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. Installing subsurface drains around foundations helps to remove excess water. Land shaping by cutting and filling helps to overcome the slope. Erosion and sedimentation are hazards during construction. Bare areas should be seeded and mulched or sodded as soon as possible. Sediment basins on the construction sites minimize offsite sedimentation.

The seasonal wetness, the moderate permeability, and the slope are limitations if this soil is used as a site for septic tank absorption fields. Installing subsurface tile drains helps to lower the water table. Increasing the size of the absorption field or replacing the soil with material that is more permeable helps to overcome the moderate permeability. Installing the filter lines on the contour or land shaping by cutting and filling helps to overcome the slope.

The shrink-swell potential, low strength, and the slope are limitations on sites for local roads and streets. Strengthening or replacing the base material can help to prevent road damage. Grading may be needed during construction. Maintaining a cover of mulch until vegetation is established helps to control erosion in bare areas.

The land capability classification is IVe.

8E3—Hickory loam, 15 to 25 percent slopes, severely eroded. This steep, well drained soil is on side slopes along drainageways in strongly dissected areas on till plains. In most areas, nearly all of the original surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. Individual areas are long and narrow or irregularly shaped and range from 5 to 40 acres in size.

Typically, the surface layer is dark brown, friable loam about 3 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is a thin layer of yellowish brown, friable clay loam; the next part is strong brown and grayish brown, mottled, very firm clay; and the lower part is light brownish gray, mottled, very firm clay loam. Till pebbles are common throughout the soil. In some areas the surface layer is silty clay loam or clay loam. In other areas the subsoil has less clay. In places the soil is calcareous within a depth of 50 inches.

Included with this soil in mapping are small areas of the silty Ava soils on the crest of the slopes and the somewhat poorly drained Blair soils at the head of drainageways. Also included are somewhat poorly drained alluvial soils along drainageways. Included soils make up 8 to 15 percent of the unit.

Water and air move through the Hickory soil at a

Figure 3.—A protective cover of grasses in an area of Hickory clay loam, 10 to 15 percent slopes, severely eroded.

moderate rate. Surface runoff is very rapid. Available water capacity is high. Organic matter content is low. The surface layer is firm and sticky when wet and hard and cloddy when dry because it contains clayey subsoil material. The shrink-swell potential is high in the subsoil. The potential for frost action is moderate.

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

Erosion control is needed when grasses and legumes are becoming established in the pastured areas. In areas where the pasture is established, interseeding legumes through a no-till system of seeding and seeding on the contour improve the quality of the forage and help to control erosion. A permanent cover of pasture plants helps to control erosion and maintains tilth. Selection of suitable species for planting, proper stocking rates, rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition.

If this soil is used as woodland, the hazard of erosion and an equipment limitation are management concerns because of the slope. Logging roads and skid trails should be established on the contour as much as possible. On the steeper slopes logs or trees should be skidded uphill with a cable and winch. Firebreaks should be the grass type. Bare areas should be seeded to grasses or to a grass-legume mixture after logging activities have been completed. Machinery should be used only during periods when the soil is firm enough to support the equipment. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, surface compaction, and damage to tree roots. Measures that protect the woodland from fire are needed.

The shrink-swell potential and the slope are limitations on sites for dwellings. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. Land shaping by cutting and filling helps to overcome the slope. Erosion and sedimentation are hazards during construction. Bare areas should be seeded and mulched or sodded as soon as possible. Sediment basins on the construction sites minimize offsite sedimentation.

The moderate permeability and the slope are limitations if this soil is used as a site for septic tank absorption fields. Increasing the size of the absorption field or replacing the soil with material that is more permeable helps to overcome the moderate permeability. Installing the filter lines on the contour or land shaping by cutting and filling helps to overcome the slope.

The shrink-swell potential, low strength, and the slope are limitations on sites for local roads and streets. Strengthening or replacing the base material can help to prevent road damage. Grading may be needed during construction. Maintaining a cover of mulch until vegetation is established helps to control erosion in bare areas.

The land capability classification is VIe.

8F—Hickory loam, 18 to 35 percent slopes. This steep, well drained soil is on side slopes along drainageways in strongly dissected areas on till plains. Individual areas are long and narrow or irregularly shaped and range from 3 to 190 acres in size.

Typically, the surface layer is dark brown, very friable loam about 5 inches thick. The subsurface layer is yellowish brown, friable loam about 6 inches thick. The subsoil is about 34 inches of yellowish brown, firm loam and clay loam. The substratum to a depth of 60 inches or more is yellowish brown, very firm, calcareous clay loam. Till pebbles are common throughout the soil. Calcareous till is commonly within a depth of 40 inches on the lower, steeper part of the slopes. In some areas the surface layer and subsurface layer are thicker. In other areas they are silt loam. In places the substratum has less sand.

Included with this soil in mapping are small areas of moderately well drained soils. These soils are at the head of drainageways above the Hickory soil. They have more clay in the subsoil than the Hickory soil. Also included are soils that are shallow over bedrock and are on some steep slopes below the Hickory soil, small areas of the silty Ava soils on the crest of ridges above the Hickory soil, and small areas of alluvial soils in drainageways below the Hickory soil. Included soils make up about 10 to 20 percent of the unit.

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

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

Erosion control is needed when grasses and legumes are becoming established in pastured areas. In areas where the pasture is established, interseeding legumes through a no-till system of seeding and seeding on the contour improve the quality of the forage and help to control erosion. A permanent cover of pasture plants helps to control erosion and maintains tilth. Operating machinery is difficult on the steeper slopes. Selection of suitable species for planting, proper stocking rates, rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition.

If this soil is used as woodland, the hazard of erosion and an equipment limitation are management concerns because of the slope. Logging roads and skid trails should be established on the contour as much as possible. On the steeper slopes logs or trees should be skidded uphill with a cable and winch. Firebreaks should be the grass type. Bare areas should be seeded to grasses or to a grass-legume mixture after logging activities have been completed. Machinery should be used only during periods when the soil is firm enough to support the equipment. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, surface compaction, and damage to tree roots. Measures that protect the woodland from fire are needed.

The dense stands of timber provide good habitat for woodland wildlife. Food plots of grain or seed crops should be established only in the less steep areas. Also, the crops should be planted on the contour. Measures that protect the habitat from fire and grazing help to prevent depletion of the shrubs and sprouts that provide food for the wildlife.

The land capability classification is VIe.

8G—Hickory loam, 35 to 50 percent slopes. This very steep, well drained soil is on side slopes along drainageways in the uplands. Individual areas are long and narrow or irregularly shaped and range from 4 to 45 acres in size.

Typically, the surface layer is very dark grayish brown, friable loam about 4 inches thick. The subsurface layer is yellowish brown, friable silt loam about 5 inches thick. The subsoil is friable clay loam about 31 inches thick. The upper part is yellowish brown, and the lower part is strong brown. The substratum to a depth of 60 inches or more is brown and strong brown, friable loam. In most places the soil is calcareous within a depth of 40 inches. In some areas the subsoil has less sand. In other areas it has more clay.

Included with this soil in mapping are small areas of Eleva soils. These soils are in landscape positions similar to those of the Hickory soil. They have more sand than the Hickory soil. Also included are rock outcrops at the base of a few slopes. Included areas make up 10 to 15 percent of the unit.

Water and air move through the Hickory soil at a moderate rate. Surface runoff is very rapid. Available water capacity is high. Organic matter content is moderately low. The shrink-swell potential and the potential for frost action are moderate.

Most areas support native hardwoods. This soil is well suited to woodland and to habitat for woodland wildlife. It is generally unsuited to dwellings and septic tank absorption fields because of the slope.

If this soil is used as woodland, the hazard of erosion and an equipment limitation are management concerns because of the slope. Logging roads and skid trails should be established on the contour as much as possible. On the steeper slopes logs or trees should be skidded uphill with a cable and winch. Firebreaks should be the grass type. Bare areas should be seeded to grasses or to a grass-legume mixture after logging activities have been completed. Machinery should be used only during periods when the soil is firm enough to support the equipment. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, surface compaction, and damage to tree roots. Measures that protect the woodland from fire are needed.

The stands of timber provide good habitat for deer, wild turkey, squirrels, and other woodland wildlife. Adequate stands of herbaceous plants can be maintained, but the slope and a low fertility level limit the growth of grain and seed crops. Measures that protect the habitat from fire and grazing are needed.

The land capability classification is VIIe.

12—Wynoose silt loam. This nearly level, poorly drained soil is on broad, loess-covered till plains. Individual areas are irregularly shaped or rounded and range from 3 to 170 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 6 inches thick. The subsurface layer is grayish brown and light gray, mottled, friable silt loam about 7 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is grayish brown and light brownish gray, mottled, very firm silty clay loam and silty clay. The next part is light brownish gray, mottled, firm silty clay loam. The lower part is gray, mottled, friable silty clay loam. In some areas the surface soil is thicker. In other areas the subsoil has less clay.

Included with this soil in mapping are small areas of Bluford and Racoon soils. The somewhat poorly drained Bluford soils are on broad ridges and knolls above the Wynoose soil. The poorly drained Racoon soils are in slight depressions below the Wynoose soil. They are subject to ponding. Included soils make up about 10 to 15 percent of the unit.

Water and air move through the Wynoose soil at a very slow rate. Surface runoff is slow. The seasonal high water table is perched within a depth of 2 feet from March through June in most years. Available water capacity is high. Organic matter content is low. The surface layer is friable and can be easily tilled when moist, but it tends to crust or puddle after hard rains. The shrink-swell potential and the potential for frost action are high.

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

Corn, soybeans, and small grain can be grown in most areas of this soil because a drainage system has been installed. Measures that maintain the drainage system are needed. In some areas additional drainage measures are needed. A system of surface drains reduces the wetness. Tilling during wet periods causes surface compaction and decreases the rate of water infiltration. Leaving crop residue on the surface, adding other organic material, and minimizing tillage help to maintain tilth and increase the rate of water infiltration.

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

The seasonal high water table and the shrink-swell potential are limitations if this soil is used as a site for dwellings. Backfilling with sand and gravel and reinforcing footings and foundations help to prevent the structural damage caused by shrinking and swelling. Installing subsurface drains around footings, elevating the floor of dwellings without basements above the surrounding ground level, grading, and diverting surface water from the site reduce the wetness.

The seasonal high water table and the very slow permeability are limitations if this soil is used as a site for septic tank absorption fields. A septic tank system can function satisfactorily only if a sealed sand filter or an aeration unit is installed and the system is disinfected as needed. A sewage lagoon is an alternative method of waste disposal.

Low strength, the seasonal high water table, frost action, and the shrink-swell potential are limitations on sites for local roads and streets. Providing suitable subgrade material helps to prevent the damage caused by low strength, frost action, and shrinking and swelling. Installing a drainage system and then grading the roads so that they shed water help to prevent the damage caused by the seasonal high water table and by frost action.

The land capability classification is IIIw.

13A—Bluford silt loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on broad ridgetops or low ridges on loess-covered till plains. Individual areas are irregular in shape and range from 4 to 500 acres in size.

Typically, the surface layer is brown, friable silt loam about 7 inches thick. The subsurface layer is pale brown, friable silt loam about 3 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is brown, mottled, firm silty clay loam and very firm silty clay. The next part is brown, mottled, firm silty clay loam. The lower part is yellowish brown, firm, slightly brittle silt loam. In some areas the lower part of the subsoil has less sand. In other areas, the surface soil is thicker and the subsoil has less clay. In a few places the surface layer is darker.

Included with this soil in mapping are small areas of the moderately well drained Ava soils on the higher ridges and knolls. Also included are small areas of the poorly drained Wynoose soils on flats or in depressions below the Bluford soil. Included soils make up about 8 to 16 percent of the unit.

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

Most areas are used for cultivated crops. Some areas are used as sites for dwellings and septic tank absorption fields. This soil is well suited to cultivated crops. It is poorly suited to dwellings and septic tank absorption fields.

In the areas used for corn, soybeans, or small grain, the wetness delays planting in some years. It can be reduced, however, by installing a system of random surface drains. Tilling during wet periods causes surface compaction and reduces the rate of water infiltration. Leaving crop residue on the surface and regularly adding other organic material help to maintain tilth and increase the rate of water infiltration.

A cover of pasture plants or hay improves tilth. The wetness limits the choice of plants and the period of grazing or cutting. Shallow ditches and land smoothing reduce the wetness. Applications of fertilizer, applications of lime in areas where the surface soil is medium acid to very strongly acid, weed control, rotation grazing, proper stocking rates, timely harvesting, and timely deferment of grazing help to keep the pasture or hayland in good condition.

The seasonal high water table and the shrink-swell potential are limitations if this soil is used as a site for dwellings. Backfilling with sand and gravel and reinforcing footings and foundations help to prevent the structural damage caused by shrinking and swelling. Installing subsurface drains around footings, elevating the floor of dwellings without basements above the surrounding ground level, grading, and diverting surface water from the site reduce the wetness.

The seasonal high water table and the slow permeability are limitations if this soil is used as a site for septic tank absorption fields. A septic tank system can function satisfactorily only if a sealed sand filter or an aeration unit is installed and the system is disinfected as needed. A sewage lagoon is an alternative method of waste disposal.

Low strength, the seasonal high water table, frost action, and the shrink-swell potential are limitations on sites for local roads and streets. Providing suitable subgrade material helps to prevent the damage caused by low strength, frost action, and shrinking and swelling. Installing a drainage system and then grading the roads so that they shed water help to prevent the damage caused by the seasonal high water table and by frost action.

The land capability classification is IIw.

13B—Bluford silt loam, 2 to 5 percent slopes. This gently sloping, somewhat poorly drained soil is on knolls, broad ridgetops, or side slopes along shallow drainageways on loess-covered till plains. Individual areas are irregular in shape and range from 3 to 185 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 8 inches thick. The subsurface layer is pale brown, friable silt loam about 5 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is brown, mottled, firm silty clay loam. The next part is brown, mottled, very firm silty clay and firm silty clay loam. The lower part is brown and grayish brown, mottled, firm, slightly brittle silt loam. In some areas the lower part of the subsoil has less sand. In other areas the surface soil is thinner. In places the subsoil has less clay.

Included with this soil in mapping are small areas of the moderately well drained Ava soils on the higher ridges and knolls. Also included are small areas of the poorly drained Wynoose soils in depressions below the Bluford soil. Included soils make up about 8 to 16 percent of the unit.

Water and air move through the Bluford soil at a slow rate. Surface runoff is medium. The seasonal high water table is perched at a depth of 1 to 3 feet from March through June in most years. Available water capacity is high. Organic matter content is moderately low. The surface layer is friable and can be easily tilled when moist. It tends to crust and puddle, however, after hard rains, especially in cultivated areas where it has been mixed with subsoil material. The shrink-swell potential is moderate in the subsoil. The potential for frost action is high.

Most areas are used for cultivated crops. Some areas are used as sites for dwellings and septic tank absorption fields. This soil is well suited to cultivated crops and to hay and pasture. It is poorly suited to dwellings and septic tank absorption fields.

In the areas used for corn, soybeans, or small grain, erosion is a hazard unless the surface is protected. Also, the seasonal wetness delays planting in some years. It can be reduced, however, by installing a system of random surface drains. Erosion can be controlled by a system of conservation tillage that leaves crop residue on the surface after planting, by contour farming, or by terraces. Tilling during wet periods causes surface compaction and reduces the rate of water infiltration. Leaving crop residue on the surface and regularly adding other organic material help to maintain tilth and increase the rate of water infiltration.

The seasonal high water table and the shrink-swell potential are limitations if this soil is used as a site for dwellings. Backfilling with sand and gravel and reinforcing footings and foundations help to prevent the structural damage caused by shrinking and swelling. Installing subsurface drains around footings, elevating the floor of dwellings without basements above the surrounding ground level, grading, and diverting surface water from the site reduce the wetness.

The seasonal high water table and the slow permeability are limitations if this soil is used as a site for septic tank absorption fields. A septic tank system can function satisfactorily only if a sealed sand filter or an aeration unit is installed and the system is disinfected as needed. A sewage lagoon is an alternative method of waste disposal.

Low strength, the seasonal high water table, frost action, and the shrink-swell potential are limitations on sites for local roads and streets. Providing suitable subgrade material helps to prevent the damage caused by low strength, frost action, and shrinking and swelling. Installing a drainage system and then grading the roads so that they shed water help to prevent the damage caused by the seasonal high water table and by frost action.

The land capability classification is IIe.

13B2—Bluford silt loam, 3 to 7 percent slopes, eroded. This gently sloping, somewhat poorly drained soil is on the short side slopes of ridges and drainageways on loess-covered till plains. Individual areas are long and narrow or irregularly shaped and range from 3 to 90 acres in size.

Typically, the surface layer is grayish brown, friable silt loam. Erosion has reduced the thickness of this layer to about 6 inches. The subsoil is about 38 inches thick. The upper part is brown, firm silty clay loam and clay loam; the next part is brown and grayish brown, mottled, firm loam. The lower part is light brownish gray, mottled, firm, brittle clay loam. The substratum to a depth of 60 inches or more is light brownish gray, mottled, friable clay loam. In places the surface layer is silty clay loam because it has been mixed by cultivation with the upper part of the subsoil. In some areas the lower part of the subsoil has less sand. In other areas the subsoil has more clay.

Included with this soil in mapping are small areas of Blair and Atlas soils. These soils are on the steeper side slopes along drainageways below the Bluford soil. Blair soils have less clay in the subsoil than the Bluford soil. Atlas soils have more clay in the subsoil than the Bluford soil and are very slowly permeable. Included soils make up about 8 to 15 percent of the unit.

Water and air move through the Bluford soil at a slow rate. Surface runoff is medium. The seasonal high water table is perched at a depth of 1 to 3 feet from March through June in most years. Available water capacity is high. Organic matter content is moderately low. The surface layer tends to crust and puddle after hard rains. The shrink-swell potential is moderate in the subsoil. The potential for frost action is high.

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

In the areas used for corn, soybeans, or small grain, erosion is a hazard unless the surface is protected. Also, the seasonal wetness delays planting in some years. Random surface drains reduce the wetness. A crop rotation that includes 1 or more years of forage crops, a conservation tillage system that leaves crop residue on the surface after planting, contour farming, and terraces help to control erosion. Tilling during wet periods causes surface compaction, cloddiness, and excessive runoff and erosion. Leaving crop residue on the surface and regularly adding other organic material help to maintain tilth and increase the rate of water infiltration.

Growing grasses and legumes on this soil improves tilth and helps to control erosion. Establishing plants is difficult because of poor tilth and the slope. Preparing a seedbed on the contour, growing a nurse crop or mulching, and adding lime and fertilizer help to establish a stand and control erosion. Also, seeding on the contour with a no-till seeder helps to control erosion during establishment or renovation. Proper stocking rates, rotation grazing, weed control, and restricted use during wet periods help to keep the pasture in good condition.

The seasonal high water table and the shrink-swell potential are limitations if this soil is used as a site for dwellings. Backfilling with sand and gravel and reinforcing footings and foundations help to prevent the structural damage caused by shrinking and swelling. Installing subsurface drains around footings, elevating the floor of dwellings without basements above the surrounding ground level, grading, and diverting surface water from the site reduce the wetness.

The seasonal high water table and the slow permeability are limitations if this soil is used as a site for septic tank absorption fields. A septic tank system can function satisfactorily only if a sealed sand filter or an aeration unit is installed and the system is disinfected as needed. A sewage lagoon is an alternative method of waste disposal.

Low strength, the seasonal high water table, frost action, and the shrink-swell potential are limitations on sites for local roads and streets. Providing suitable subgrade material helps to prevent the damage caused by low strength, frost action, and shrinking and swelling. Installing a drainage system and then grading the roads so that they shed water help to prevent the damage caused by the seasonal high water table and by frost action.

The land capability classification is IIIe.

14B—Ava silt loam, 1 to 5 percent slopes. This gently sloping, moderately well drained soil is on narrow ridgetops and the crest and side slopes of prominent ridges in the uplands. Individual areas are irregular in shape and range from 3 to 85 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 7 inches thick. The subsurface layer is dark yellowish brown, friable silt loam about 4 inches thick. The subsoil is about 41 inches thick. The upper part is yellowish brown, firm silty clay loam. The lower part is yellowish brown and dark brown, mottled, firm, brittle silty clay loam and silt loam. The substratum to a depth of 60 inches or more is strong brown, friable silt loam. In some areas the subsoil has more sand. In other areas the lower part of the subsoil is not so brittle. In some places slopes are more than 5 percent. In other places the surface layer is thinner.

Included with this soil in mapping are small areas of the somewhat poorly drained Bluford soils on the lower ridges. Also included are small areas of the well drained, moderately permeable Parke soils on the higher ridges. Included soils make up about 6 to 10 percent of the unit.

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

Most areas are used for cultivated crops. Some areas are used as woodland. This soil is well suited to cultivated crops. It is moderately suited to dwellings without basements. It is poorly suited to dwellings with basements and to septic tank absorption fields.

In the areas used for corn, soybeans, or small grain, erosion is a hazard unless the surface is protected. A conservation tillage system that leaves crop residue on the surface after planting, contour farming, and terraces help to control erosion. Tilling during wet periods causes surface compaction. Leaving crop residue on the surface and regularly adding other organic material help to maintain tilth and increase the rate of water infiltration.

A cover of grasses and legumes improves tilth and helps to control erosion. Selection of suitable species for planting, proper stocking rates, rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition.

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

The seasonal wetness and the shrink-swell potential are limitations if this soil is used as a site for dwellings. The wetness is more severely limiting on sites for dwellings with basements than on sites for dwellings without basements. Reinforcing footings and foundations helps to prevent the structural damage caused by shrinking and swelling. Subsurface drains help to remove excess water around walls and floors.

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

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

The land capability classification is IIe.

14C2—Ava silt loam, 5 to 10 percent slopes, eroded. This moderately sloping, moderately well drained soil is on the side slopes of prominent ridges and drainageways in the uplands. Individual areas are long and narrow or irregularly shaped and range from 3 to 80 acres in size.

Typically, the surface layer is dark brown, friable silt loam. Erosion has reduced the thickness of this layer to about 7 inches. The subsoil is about 37 inches thick. The upper part is strong brown, friable silty clay loam. The next part is strong brown, mottled, firm silt loam and pinkish gray silt. The lower part is brown, mottled, firm, brittle loam. The substratum to a depth of 60 inches or more is dark brown, firm loam. In some areas the lower part of the subsoil is not so brittle. In other areas slopes are more than 10 percent. In some places the subsoil has less sand. In other places the surface layer is silty clay loam because it has been mixed by cultivation with the upper part of the subsoil.

Included with this soil in mapping are small areas of Blair, Bluford, and Parke soils. The somewhat poorly drained Blair soils are on the steeper slopes below the Ava soil. The somewhat poorly drained Bluford soils are at the head of drainageways above the Ava soil. They have more clay in the subsoil than the Ava soil. The well drained, moderately permeable Parke soils are on the higher ridges. Included soils make up about 8 to 12 percent of the unit.

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

Most areas are used for cultivated crops. Some areas are used as woodland. This soil is moderately suited to cultivated crops, hay, pasture, and woodland and to dwellings without basements. It is poorly suited to dwellings with basements and to septic tank absorption fields.

Measures that control erosion are needed in the areas used for soybeans, corn, or small grain. A conservation tillage system that leaves crop residue on the surface after planting, contour farming, terraces, and a crop rotation that includes 1 or more years of forage crops help to control erosion. Tilling during wet periods causes surface cloddiness and compaction and excessive runoff and erosion. Leaving crop residue on the surface and regularly adding other organic material help to maintain tilth and increase the rate of water infiltration.

A cover of grasses and legumes improves tilth and helps to control erosion. Selection of suitable species for planting, proper stocking rates, rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition.

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

The seasonal high water table and the shrink-swell potential are limitations if this soil is used as a site for dwellings. The seasonal high water table can be lowered by installing tile drains around the base of foundations. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. Some land shaping by cutting and filling helps to overcome the slope in the steeper areas. Erosion is a hazard during construction. It can be controlled by leaving as much vegetation on the surface as possible. Disturbed areas should be seeded or sodded as soon as possible after construction.

The seasonal high water table and the very slow permeability are limitations if this soil is used as a site for septic tank absorption fields. A septic tank system can function satisfactorily only if a sealed sand filter or an aeration unit is installed and the system is disinfected as needed.

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

The land capability classification is IIIe.

14C3—Ava silt loam, 5 to 10 percent slopes, severely eroded. This moderately sloping, moderately well drained soil is on the sides of ridges and drainageways in the uplands. In most areas, nearly all of the original surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. Individual areas are long and narrow or irregularly shaped and are 3 to 40 acres in size.

Typically, the surface layer is dark yellowish brown, friable silt loam about 3 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is yellowish brown, firm silty clay loam. The next part is yellowish brown, mottled, very firm, brittle clay loam. The lower part is yellowish brown, firm clay loam. In places the surface layer is silty clay loam. In some areas the subsoil is not so brittle.

Included with this soil in mapping are small areas of the somewhat poorly drained Atlas and Blair soils. These soils are lower on the landscape than the Ava soil or are at the head of drainageways above the Ava soil. Also included are Frondorf soils on the steeper part of the slopes below the Ava soil. Frondorf soils have bedrock within a depth of 40 inches. Included soils make up about 8 to 16 percent of the unit.

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

Most areas are used for cultivated crops. This soil is poorly suited to cultivated crops and moderately suited to hay and pasture and to dwellings without basements. It is poorly suited to dwellings with basements and to septic tank absorption fields.

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

Establishing pasture plants or hay on this soil helps to control erosion. Overgrazing or grazing during wet periods reduces forage production and causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, rotation grazing, and deferred grazing during wet periods help to keep the pasture in good condition. Preparing a good seedbed is difficult because of surface crusting and the tendency of the soil to become cloddy. Applying a no-till method of pasture renovation and seeding on the contour help to control erosion.

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

The seasonal high water table and the shrink-swell potential are limitations if this soil is used as a site for dwellings. The seasonal high water table can be lowered by installing tile drains around the base of foundations. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling.

Some land shaping by cutting and filling helps to overcome the slope in the steeper areas. Erosion is a hazard during construction. It can be controlled by leaving as much vegetation on the surface as possible. Disturbed areas should be seeded or sodded as soon as possible after construction.

The seasonal high water table and the very slow permeability are limitations if this soil is used as a site for septic tank absorption fields. A septic tank system can function satisfactorily only if a sealed sand filter or an aeration unit is installed and the system is disinfected as needed. Sewage lagoons function satisfactorily if the site is leveled.

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

The land capability classification is IVe.

15B2—Parke silt loam, 3 to 7 percent slopes, eroded. This gently sloping, well drained soil is on side slopes and narrow ridgetops in the uplands. Individual areas are rounded and range from 3 to 45 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 6 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is yellowish brown, firm silty clay loam. The lower part is strong brown, firm loam and sandy clay loam. In some areas the surface layer is thicker. In other areas the lower part of the subsoil has less sand and gravel. In places the solum is mildly alkaline or moderately alkaline.

Included with this soil in mapping are small areas of the moderately well drained Ava and somewhat poorly drained Bluford soils on the lower ridges. Ava soils have a fragipan and are very slowly permeable in the lower part of the solum. Included soils make up less than 10 percent of the unit.

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

Most areas are used for cultivated crops. Some areas are used for pasture or hay. This soil is moderately suited to cultivated crops, to dwellings without basements, and to septic tank absorption fields. It is well suited to dwellings with basements.

In the areas used for corn, soybeans, or small grain, erosion is a hazard unless the surface is protected. A conservation tillage system that leaves crop residue on the surface after planting, contour farming, and terraces help to control erosion. Tilling during wet periods causes surface compaction. Leaving crop residue on the surface and regularly adding other organic material help to maintain tilth and increase the rate of water infiltration.

A cover of grasses and legumes improves tilth and helps to control erosion. Selection of suitable species for planting, proper stocking rates, rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition.

If this soil is used as a site for dwellings without basements, the shrink-swell potential is a limitation. Reinforcing the foundation or extending the foundation below the subsoil helps to prevent the structural damage caused by shrinking and swelling.

The moderate permeability is a limitation if this soil is used as a site for septic tank absorption fields. Increasing the size of the absorption field or replacing the soil with material that is more permeable helps to overcome this limitation.

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

The land capability classification is IIIe.

109—Racoon silt loam. This nearly level, poorly drained soil is in slight depressions at the head of drainageways and on foot slopes in the uplands. It is subject to brief periods of ponding from March through June in most years. Individual areas are rounded and range from 3 to 35 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 6 inches thick. The subsurface layer is grayish brown and light brownish gray, friable silt loam about 20 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is grayish brown, firm silt loam. The next part is grayish brown and light brownish gray, mottled, firm silty clay loam. The lower part is light brownish gray, mottled, firm silt loam. In some places the surface soil is thicker. In other places the subsoil has less clay.

Included with this soil in mapping are small areas of the somewhat poorly drained Bluford and Creal soils on the higher parts of the landscape. Also included are small areas of Wynoose soils, which are not subject to ponding. Included soils make up about 6 to 12 percent of the unit.

Water and air move through the Racoon soil at a slow rate. Surface runoff is slow to ponded. Available water capacity is high. The seasonal high water table is 0.5 foot above to 1.0 foot below the surface from March through June in most years. Organic matter content is moderately low. The shrink-swell potential is high in the lower part of the subsoil. The potential for frost action is high.

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

Corn and soybeans can be grown in most areas of this soil because a drainage system has been installed. The seasonal high water table and the ponding, however, delay planting in most years. Measures that maintain or improve the drainage system are needed. In some areas additional drainage measures are needed. A system of surface drains reduces the wetness. Tilling during wet periods causes surface compaction and decreases the rate of water infiltration. Leaving crop residue on the surface, adding other organic material, and minimizing tillage help to maintain tilth and increase the rate of water infiltration.

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

If this soil is used as a site for dwellings, the seasonal high water table and the shrink-swell potential are limitations and the ponding is a hazard. Backfilling with sand and gravel and reinforcing footings and foundations help to prevent the structural damage caused by shrinking and swelling. Installing subsurface drains around footings, elevating the floor of dwellings without basements above the surrounding ground level, grading, and diverting surface water reduce the wetness. Pumps may be needed to discharge the water.

If this soil is used as a site for septic tank absorption fields, the seasonal high water table and the slow permeability are limitations and the ponding is a hazard. An aeration waste disposal system or a sewage lagoon functions satisfactorily.

Low strength, ponding, frost action, and the shrink-swell potential are limitations on sites for local roads and streets. Providing suitable subgrade material helps to prevent the damage caused by low strength, frost action, and shrinking and swelling. Installing a drainage system and then grading the roads so that they shed water help to prevent the damage caused by ponding and frost action.

The land capability classification is IIIw.

120—Huey silt loam. This nearly level, poorly drained soil is in broad areas or slight depressions on loess-covered till plains. It is subject to brief periods of ponding from March through June in most years. The soil has a high content of exchangeable sodium, which affects plant growth. Individual areas are irregularly shaped or rounded and range from 5 to 30 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The subsoil to a depth of 60 inches or more is dark grayish brown and light brownish gray, mottled, firm silty clay loam. In some areas the soil has a thicker surface soil and has a subsurface layer of silt loam. In other areas the subsoil contains more clay. In places the surface layer is darker.

Included with this soil in mapping are small areas of Cisne, Newberry, and Wynoose soils. These soils do not have a concentration of sodium in the subsoil. They are in the same landscape positions as the Huey soil. Also included are small areas of the somewhat poorly drained Darmstadt soils on slight rises above the Huey soil. Included soils make up about 8 to 16 percent of the unit.

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

Most areas are used for cultivated crops. This soil is poorly suited to cultivated crops and to dwellings and septic tank absorption fields.

If this soil is drained, such crops as soybeans, corn, and small grain can be grown, but the seasonal wetness and the ponding delay planting in most years. Measures that maintain or improve the drainage system are needed. A system of surface drains can reduce the wetness. Tilling during wet periods causes surface compaction. The high content of exchangeable sodium in the subsoil restricts the availability and uptake of some plant nutrients. The excess sodium also increases moisture stress during dry periods and inhibits drying after wet periods. Yields of wheat and soybeans are usually less affected by the sodium content than are yields of corn. Leaving crop residue on the surface, adding other organic material, and minimizing tillage help to maintain tilth and increase the rate of water infiltration.

If this soil is used as a site for dwellings, the seasonal high water table and the shrink-swell potential are limitations and the ponding is a hazard. Backfilling with sand and gravel and reinforcing footings and foundations help to prevent the structural damage caused by shrinking and swelling. Installing subsurface drains around footings, elevating the floor of dwellings without basements above the surrounding ground level, grading, and diverting surface water reduce the wetness. Pumps may be needed to discharge the water.

If this soil is used as a site for septic tank absorption fields, the seasonal high water table and the very slow permeability are limitations and the ponding is a hazard. An aeration waste disposal system or a sewage lagoon functions satisfactorily.

Low strength, ponding, frost action, and the shrink-swell potential are limitations on sites for local roads and streets. Providing suitable subgrade material helps to prevent the damage caused by low strength, frost action, and shrinking and swelling. Installing a drainage system and then grading the roads so that they shed water help to prevent the damage caused by ponding and frost action.

The land capability classification is IVw.

218—Newberry silt loam. This nearly level, very poorly drained soil is in depressions on loess-covered till plains. It is subject to brief periods of ponding from March through June in most years. Individual areas are irregularly shaped or oval and range from 5 to 215 acres in size.

Typically, the surface layer is very dark grayish brown, friable silt loam about 9 inches thick. The subsurface layer is grayish brown, mottled, friable silt loam about 12 inches thick. The subsoil to a depth of 60 inches or more is grayish brown and mottled. It is friable silt loam in the upper part and firm silty clay loam in the lower part. In some areas the dark surface soil is thicker. In other areas the surface soil and subsoil contain more clay. In places the surface layer is lighter in color.

Included with this soil in mapping are small areas of the somewhat poorly drained Darmstadt and Hoyleton soils. These soils are on slight rises above the Newberry soil. Also included are small areas of Huey soils, which have a high content of sodium in the subsoil. Included soils make up about 5 to 15 percent of the unit.

Water and air move through the Newberry soil at a slow rate. Surface runoff is very slow or ponded. The seasonal high water table is 0.5 foot above to 1.0 foot below the surface from March through June in most years. Available water capacity is high. Organic matter content is moderate. The surface layer is friable and can be easily tilled when moist. The shrink-swell potential is moderate. The potential for frost action is high.

Most areas are used for cultivated crops. A few areas are used as sites for dwellings and septic tank absorption fields. This soil is moderately suited to cultivated crops. It is poorly suited to dwellings and septic tank absorption fields.

If this soil is drained, such crops as corn and soybeans can be grown, but the seasonal high water table and the ponding delay planting in most years. Measures that maintain or improve the drainage system are needed. In some areas additional drainage measures are needed. A system of surface drains reduces the wetness. Tilling during wet periods causes surface compaction and decreases the rate of water infiltration. Leaving crop residue on the surface, adding other organic material, and minimizing tillage help to maintain tilth and increase the rate of water infiltration.

If this soil is used as a site for dwellings, the seasonal high water table and the shrink-swell potential are limitations and the ponding is a hazard. Backfilling with sand and gravel and reinforcing footings and foundations help to prevent the structural damage caused by shrinking and swelling. Installing subsurface drains around footings, elevating the floor of dwellings without basements above the surrounding ground level, grading, and diverting surface water reduce the wetness. Pumps may be needed to discharge the water.

If this soil is used as a site for septic tank absorption fields, the seasonal high water table and the slow permeability are limitations and the ponding is a hazard. An aeration waste disposal system or a sewage lagoon functions satisfactorily.

Low strength, ponding, frost action, and the shrink-swell potential are limitations on sites for local roads and streets. Providing suitable subgrade material helps to prevent the damage caused by low strength, frost action, and shrinking and swelling. Installing a drainage system and then grading the roads so that they shed water help to prevent the damage caused by ponding and frost action.

The land capability classification is IIIw.

337B—Creal silt loam, 1 to 5 percent slopes. This gently sloping, somewhat poorly drained soil is on foot slopes and low stream terraces above flood plains. Individual areas are irregular in shape and range from 3 to 35 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 6 inches thick. The subsurface layer is pale brown, brown, and grayish brown, mottled, friable silt loam about 21 inches thick. The subsoil to a depth of 60 inches or more is mottled, firm silty clay loam. The upper part is light brownish gray, and the lower part is yellowish brown and grayish brown. In places the surface layer is thicker because it has received local alluvium from the higher adjacent soils. In some areas the subsurface layer is thinner. In other areas the subsoil contains more clay.

Included with this soil in mapping are small areas of the moderately well drained Ava soils. These soils are on slopes above the Creal soil. Also included are small areas of alluvial soils in drainageways and on flood plains below the Creal soil. Included soils make up about 6 to 12 percent of the unit.

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

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

In the areas used for corn, soybeans, or small grain, erosion is a hazard. It can be controlled by a system of conservation tillage that leaves crop residue on the surface after planting. Wetness delays planting in some years. It can be reduced by diverting surface runoff from the higher adjacent areas and by installing surface drains in areas where drainage outlets are available. Tilling during wet periods causes surface cloddiness and compaction. Leaving crop residue on the surface and regularly adding other organic material help to maintain tilth and increase the rate of water infiltration.

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

The seasonal high water table and the shrink-swell potential are limitations if this soil is used as a site for dwellings. Backfilling with sand and gravel and reinforcing footings and foundations help to prevent the structural damage caused by shrinking and swelling. Installing subsurface drains around footings, elevating the floor of dwellings without basements above the surrounding ground level, grading, and diverting surface water from the site reduce the wetness.

The moderately slow permeability and the seasonal high water table are limitations if this soil is used as a site for septic tank absorption fields. A septic tank system can function satisfactorily only if a sealed sand filter or an aeration unit is installed and the system is disinfected as needed. A sewage lagoon is an alternative method of waste disposal.

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

The land capability classification is IIe.

533—Urban land. This map unit occurs as areas that generally are covered by pavement and buildings. It is mainly in Centralia and Salem. Because of extensive land smoothing, the unit generally is nearly level or gently sloping. Individual areas commonly are square or rectangular, but some are long and narrow. They are 5 to 240 acres in size.

More than 85 percent of this map unit is covered by buildings and pavement. Most of the paved areas are parking lots adjacent to shopping centers, industrial plants, and other commercial buildings.

Included in this unit in mapping are areas of Cisne and Hoyleton soils and small areas of the silty Orthents. The poorly drained Cisne soils are in low areas, and the somewhat poorly drained Hoyleton soils are on low ridges adjacent to the urban areas. Orthents are soils that have been modified by construction during urban development. Included soils generally make up less than 15 percent of the unit.

Runoff generally is medium or rapid on the Urban land, but it is ponded in some areas. Because of the design of most paved areas, the water commonly is diverted to storm drainage systems. In some areas, however, it is diverted to the adjacent soils. The additional runoff causes erosion on these soils. Also, it increases the hazard of flooding.

The vegetation on this map unit is confined to the areas of included soils. Special management is needed when trees and shrubs are planted and after they are established. Periodic supplemental watering is needed in most areas.

This map unit is not assigned a land capability classification.

551D2—Gosport loam, 10 to 18 percent slopes, eroded. This moderately deep, strongly sloping, moderately well drained soil is on side slopes along drainageways in the uplands. Individual areas are long and narrow or irregularly shaped and range from 3 to 200 acres in size.

Typically, the surface layer is dark brown, friable loam. Erosion has reduced the thickness of this layer to about 5 inches. The subsoil is about 22 inches thick. The upper part is brown and yellowish brown, very firm silty clay. The lower part is yellowish brown and pale brown, mottled, very firm silty clay and firm silty clay loam. Gray and light gray shale bedrock is at a depth of about 27 inches. In some areas the subsoil has less clay. In other areas the soil is deeper over bedrock.

Included with this soil in mapping are small areas of Marseilles soils on the steeper slopes. These soils are more silty in the subsoil than the Gosport soil. Also included are small areas of the somewhat poorly drained Atlas and Blair soils on the upper part of the slopes and the somewhat poorly drained Bluford soils on ridges. Atlas, Blair, and Bluford soils do not have bedrock within a depth of 60 inches. Included soils make up 8 to 16 percent of the unit.

Water and air move through the Gosport soil at a very slow rate. Surface runoff is rapid. The seasonal high water table is perched at a depth of 1.5 to 3.0 feet from January through April in most years. Available water capacity is moderate. Organic matter content is moderately low. Soft bedrock at a depth of 20 to 40 inches restricts the rooting depth of some plants. Where cultivated, the surface layer is generally firm and sticky when wet and hard and cloddy when dry. The shrink-swell potential is high. The potential for frost action is moderate.

Most areas are used for cultivated crops or for pasture or hay. A few areas are wooded. This soil is generally unsuited to cultivated crops because of the slope and the hazard of erosion. It is moderately suited to pasture and well suited to woodland and to woodland wildlife habitat. It is poorly suited to dwellings and septic tank absorption fields.

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

If this soil is used as woodland, the hazard of erosion, an equipment limitation, seedling mortality, and windthrow are management concerns. The slope and the clayey subsoil cause a hazard of erosion and limit the use of equipment. Logging roads and skid trails should be established on the contour if possible. On the steeper slopes the logs or trees should be skidded uphill with a cable and winch. Firebreaks should be the grass type. Bare logging areas should be seeded to grass or to a grass-legume mixture. Machinery should be used only when the soil is firm enough to support the equipment. The seedling mortality rate can be reduced by selecting planting stock that is older and larger than is typical and by mulching. Some replanting may be needed. Harvesting methods that do not isolate the remaining trees or leave them widely spaced reduce the hazard of windthrow. Only high-value trees should be removed from a strip 50 feet wide along the west and south edges of the woodland. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, surface compaction, and damage to tree roots. Measures that protect the woodland from fire are needed.

If this soil is used as a site for dwellings, the seasonal high water table, the shrink-swell potential, and the slope are limitations. Installing tile drains around the base of foundations helps to lower the seasonal high water table. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. Land shaping by cutting and filling helps to overcome the slope. Erosion is a hazard during construction. It can be controlled by leaving as much vegetation on the surface as possible. Disturbed areas should be seeded or sodded as soon as possible.

The very slow permeability and the slope are limitations if this soil is used as a site for septic tank absorption fields. Effluent can seep laterally and surface on the lower part of the slopes. A septic tank system can function satisfactorily only if a sealed sand filter or an aeration unit is installed and the system is disinfected as needed.

The shrink-swell potential, low strength, and the slope are limitations on sites for local roads and streets. Strengthening or replacing the base material can help to prevent road damage. Grading may be needed during construction. Maintaining a cover of mulch until vegetation is established helps to control erosion in bare areas.

The land capability classification is VIIe.

551G—Gosport loam, 25 to 45 percent slopes. This moderately deep, very steep, moderately well drained soil is on side slopes along drainageways in the uplands. Individual areas are long and narrow or irregularly shaped and range from 4 to 100 acres in size.

Typically, the surface layer is very dark grayish brown, very friable loam about 2 inches thick. The subsurface layer is yellowish brown, friable silt loam about 2 inches thick. The subsoil is about 18 inches thick. The upper part is yellowish brown, very firm silty clay and clay. The lower part is yellowish brown and light brownish gray, very firm silty clay. The substratum is olive brown and grayish brown, mottled, very firm silty clay about 12 inches thick. Grayish brown and olive brown shale bedrock is at a depth of about 34 inches. In places the lower part of the subsoil and the substratum contain more silt and sand weathered from siltstone. In a few areas the substratum is calcareous.

Included with this soil in mapping are small areas of the well drained Hickory and Frondorf soils. These soils are in landscape positions similar to those of the Gosport soil. Hickory soils do not have bedrock within a depth of 40 inches. They are mainly on the upper part of the slopes. Frondorf soils formed in material weathered mainly from sandstone and have more sand in the subsoil than the Gosport soil. Included soils make up about 8 to 16 percent of the unit.

Water and air move through the Gosport soil at a very slow rate. Surface runoff is very rapid. The seasonal high water table is perched at a depth of 1.5 to 3.0 feet from January through April in most years. Available water capacity is moderate. Organic matter content is moderately low. Soft bedrock at depth of 20 to 40 inches restricts the rooting depth of some plants. The shrink-swell potential is high. The potential for frost action is moderate.

Most areas are used for woodland and for woodland wildlife habitat. This soil is moderately suited to woodland and to woodland wildlife habitat. It is generally unsuited to dwellings and septic tank absorption fields because of the slope and the hazard of erosion.

If this soil is used as woodland, the hazard of erosion, an equipment limitation, seedling mortality, and windthrow are management concerns. The slope causes a hazard of erosion and limits the use of equipment. Logging roads and skid trails should be established on the contour if possible. On the steeper slopes the logs or trees should be skidded uphill with a cable and winch. Firebreaks should be the grass type. Bare logging areas should be seeded to grass or to a grass-legume mixture. Machinery should be used only when the soil is firm enough to support the equipment. The seedling mortality rate can be reduced by selecting planting stock that is older and larger than is typical and by mulching. Some replanting may be needed. Harvesting methods that do not isolate the remaining trees or leave them widely spaced reduce the hazard of windthrow. Only high-value trees should be removed from a strip 50 feet wide along the west and south edges of the woodland. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, surface compaction, and damage to tree roots. Measures that protect the woodland from fire are needed.

The stands of timber provide good habitat for deer, wild turkey, squirrels, and other woodland wildlife. Adequate stands of herbaceous plants can be maintained, but the slope and a low fertility level limit the growth of grain and seed crops. Measures that protect the habitat from fire and grazing are needed.

The land capability classification is VIIe.

581B—Tamalco silt loam, 1 to 3 percent slopes. This very gently sloping, moderately well drained soil is on low ridges on loess-covered till plains. Individual areas are irregularly shaped or rounded and range from 4 to 30 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 8 inches thick. The subsoil is about 34 inches thick. The upper part is dark brown, strong brown, and yellowish brown, very firm silty clay and silty clay loam. The next part is pale brown, mottled, firm silty clay loam that has a high content of exchangeable sodium. The lower part is pale brown and brown, mottled, friable silt loam. The substratum to a depth of 60 inches or more is brown and dark yellowish brown, mottled, friable silt loam. In some areas the surface layer is thicker. In other areas the upper part of the subsoil has less clay.

Included with this soil in mapping are small areas of the somewhat poorly drained Hoyleton and Darmstadt soils on the lower part of ridges. These soils make up about 5 to 15 percent of the unit.

Water and air move through the Tamalco soil at a very slow rate. Surface runoff is medium. The seasonal high water table is 2.5 to 5.0 feet below the surface from February through April in most years. Available water capacity is moderate. Organic matter content also is moderate. The surface layer tends to crust and puddle after hard rains. The shrink-swell potential and the potential for frost action are high.

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

If this soil is used for soybeans, corn, or small grain, erosion is a hazard unless the surface is protected. A system of conservation tillage that leaves crop residue on the surface or a crop rotation that includes 1 or more years of forage crops or small grain can reduce the hazard of erosion. The high content of exchangeable sodium in the subsoil results in moisture stress during dry periods and inhibits drying after wet periods. The excess sodium also restricts the availability and uptake of some plant nutrients. Leaving crop residue on the surface and regularly adding other organic material increase the rate of water infiltration and improve tilth. Tilling when the soil is wet causes surface cloddiness and compaction and excessive runoff and erosion.

The seasonal high water table and the shrink-swell potential are limitations if this soil is used as a site for dwellings. Backfilling with sand and gravel and reinforcing footings and foundations help to prevent the structural damage caused by shrinking and swelling. Installing subsurface drains around footings, elevating the floor of dwellings without basements above the surrounding ground level, grading, and diverting surface water from the site reduce the wetness.

The seasonal high water table and the very slow permeability are limitations if this soil is used as a site for septic tank absorption fields. A septic tank system can function satisfactorily only if a sealed sand filter or an aeration unit is installed and the system is disinfected as needed. A sewage lagoon is an alternative method of waste disposal.

Low strength, the seasonal high water table, frost action, and the shrink-swell potential are limitations on sites for local roads and streets. Providing suitable subgrade material helps to prevent the damage caused by low strength, frost action, and shrinking and swelling. Installing a drainage system and then grading the roads so that they shed water help to prevent the damage caused by the seasonal high water table and by frost action.

The land capability classification is IIIe.

620A—Darmstadt silt loam, 0 to 2 percent slopes. This nearly level, somewhat poorly drained soil is on low ridges on broad, loess-covered till plains. Individual areas are irregularly shaped or rounded and range from 3 to 250 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is light brownish gray, friable silt loam about 2 inches thick. The subsoil is about 32 inches thick. The upper part is brown, mottled, very firm silty clay. The lower part is light brownish gray, mottled, firm silty clay loam and friable silt loam that has a high content of exchangeable sodium. The substratum to a depth of 60 or more inches is light gray, mottled, friable silt loam. In some areas the subsoil contains less clay. In other areas the sodium is closer to the surface. In places the surface layer is darker.

Included with this soil in mapping are small areas of the poorly drained Cisne and Huey soils on the lower flats. Also included are small areas of the somewhat poorly drained Hoyleton soils, which do not have a concentration of sodium in the subsoil and are closely intermingled with areas of the Darmstadt soil. Included soils make up about 8 to 16 percent of the unit.

Water and air move through the Darmstadt soil at a very slow rate. Surface runoff is slow. The seasonal high water table is perched at a depth of 1 to 3 feet from February through May in most years. Available water capacity is moderate. The high content of exchangeable sodium in the lower part of the subsoil restricts the rooting depth of some plants. Organic matter content is moderately low. The surface layer is friable and can be easily tilled when moist, but it tends to crust and puddle after hard rains. The shrink-swell potential is moderate in the subsoil. The potential for frost action is high.

Most areas are used for cultivated crops. This soil is moderately suited to cultivated crops and poorly suited to dwellings and septic tank absorption fields.

In the areas used for soybeans, corn, or small grain, the wetness delays planting in some years. It can be reduced, however, by a system of random surface drains. The high content of exchangeable sodium in the lower part of the subsoil results in moisture stress during dry periods and inhibits drying after wet periods. Also, the excess sodium restricts the availability and uptake of some plant nutrients. Erosion is a hazard in some areas. A system of conservation tillage that leaves crop residue on the surface after planting helps to control erosion. Tilling during wet periods causes surface cloddiness and compaction. Minimizing tillage, leaving crop residue on the surface, and regularly adding other organic material increase the rate of water infiltration and improve tilth.

The seasonal high water table and the shrink-swell potential are limitations if this soil is used as a site for dwellings. Backfilling with sand and gravel and reinforcing footings and foundations help to prevent the structural damage caused by shrinking and swelling. Installing subsurface drains around footings, elevating the floor of dwellings without basements above the surrounding ground level, grading, and diverting surface water from the site reduce the wetness. Establishing or maintaining lawns is difficult because of the high content of sodium in the subsoil. Planting salt-tolerant grasses and frequently watering during dry periods improve the lawns.

The seasonal high water table and the very slow permeability are limitations if this soil is used as a site for septic tank absorption fields. A septic tank system can function satisfactorily only if a sealed sand filter or an aeration unit is installed and the system is disinfected as needed. A sewage lagoon is an alternative method of waste disposal.

Low strength, the seasonal high water table, frost action, and the shrink-swell potential are limitations on sites for local roads and streets. Providing suitable subgrade material helps to prevent the damage caused by low strength, frost action, and shrinking and swelling. Installing a drainage system and then grading the roads so that they shed water help to prevent the damage caused by the seasonal high water table and by frost action.

The land capability classification is IIIw.

620B2—Darmstadt silt loam, 3 to 6 percent slopes, eroded. This gently sloping, somewhat poorly drained soil is on side slopes along shallow drainageways on loess-covered till plains. Individual areas are long and narrow or irregularly shaped and range from 3 to 320 acres in size.

Typically, the surface layer is dark brown, friable silt loam. Erosion has reduced the thickness of this layer to about 7 inches. The subsoil extends to a depth of 60 inches or more. The upper part is yellowish brown and brown, mottled, very firm silty clay and firm silty clay loam. The lower part is grayish brown, mottled, firm silty clay loam that has a high content of exchangeable sodium. In some areas the subsoil contains less clay. In other areas it has a lower content of sodium. In places the surface layer is silty clay loam because it has been mixed by cultivation with the upper part of the subsoil.

Included with this soil in mapping are small areas of Hoyleton and Grantfork soils. These soils are closely intermingled with areas of the Darmstadt soil. Hoyleton soils have a dark surface layer and do not have a concentration of sodium. Grantfork soils contain less clay and have more sand in the upper part of the subsoil than the Darmstadt soil. Included soils make up about 8 to 16 percent of the unit.

Water and air move through the Darmstadt soil at a very slow rate. Surface runoff is medium. The seasonal high water table is perched at a depth of 1 to 3 feet from February through May in most years. Available water capacity is moderate. The high content of exchangeable sodium in the lower part of the subsoil restricts the rooting depth of some plants. Organic matter content is moderately low. The surface layer tends to crust and puddle after hard rains. The shrink-swell potential is moderate. The potential for frost action is high.

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

If this soil is used for soybeans, corn, or small grain, further erosion is a hazard. A system of conservation tillage that leaves crop residue on the surface after planting and a crop rotation that includes grasses and legumes help to control erosion. Wetness delays planting in some years. It can be reduced, however, by a system of random surface drains. The high content of exchangeable sodium in the subsoil results in moisture stress during dry periods and inhibits drying after wet periods. Also, the excess sodium restricts the availability and uptake of some plant nutrients. Tilling during wet periods causes surface cloddiness and compaction and excessive runoff and erosion. Minimizing tillage, leaving crop residue on the surface, and regularly adding other organic material improve tilth and increase the rate of water infiltration.

Growing grasses and legumes on this soil improves tilth and helps to control erosion. Establishing plants is difficult because of poor tilth and the slope. Preparing a seedbed on the contour, growing a nurse crop or mulching, and adding lime and fertilizer help to establish a stand and control erosion. Also, seeding on the contour with a no-till seeder helps to control erosion during establishment or renovation. Proper stocking rates, rotation grazing, weed control, and restricted use during wet periods help to keep the pasture in good condition.

The seasonal high water table and the shrink-swell potential are limitations if this soil is used as a site for dwellings. Backfilling with sand and gravel and reinforcing footings and foundations help to prevent the structural damage caused by shrinking and swelling. Installing subsurface drains around the footings helps to lower the water table. Establishing or maintaining lawns is difficult because of the high content of sodium in the subsoil. Planting salt-tolerant grasses and frequently watering during dry periods improve the lawns.

The seasonal high water table and the very slow permeability are limitations if this soil is used as a site for septic tank absorption fields. A septic tank system can function satisfactorily only if a sealed sand filter or an aeration unit is installed and the system is disinfected as needed. A sewage lagoon is an alternative method of waste disposal.

Low strength, the seasonal high water table, frost action, and the shrink-swell potential are limitations on sites for local roads and streets. Providing suitable subgrade material helps to prevent the damage caused by low strength, frost action, and shrinking and swelling. Installing a drainage system and then grading the roads so that they shed water help to prevent the damage caused by the seasonal high water table and by frost action.

The land capability classification is IIIe.

761G—Eleva fine sandy loam, 25 to 45 percent slopes. This moderately deep, very steep, somewhat excessively drained soil is on side slopes along drainageways in the uplands. Individual areas are long and narrow or irregularly shaped and range from 3 to 210 acres in size.

Typically, the surface layer is dark yellowish brown, very friable fine sandy loam about 4 inches thick. The subsoil is about 28 inches thick. It is yellowish brown, friable fine sandy loam in the upper part and strong brown, friable loamy fine sand in the lower part. The substratum is strong brown loamy sand about 5 inches thick. Weathered sandstone and siltstone bedrock is at a depth of about 37 inches. In areas where it has weathered mainly from siltstone, the subsoil has more clay. In some areas the soil is deeper over bedrock.

Included with this soil in mapping are soils that are shallow over bedrock. These soils are in landscape positions similar to those of the Eleva soil. Also included are the moderately well drained Ava soils on the crest of ridges above the Eleva soil and narrow areas of alluvial soils in drainageways. Included soils make up about 8 to 16 percent of the unit.

Water and air move through the Eleva soil at a moderately rapid rate. Surface runoff is very rapid. Available water capacity is low. Organic matter content is moderately low. Soft bedrock at a depth of 20 to 40 inches restricts the rooting depth of some plants. The shrink-swell potential is low. The potential for frost action is moderate.

Most areas are used as woodland. This soil is moderately suited to woodland. It is generally unsuited to dwellings and septic tank absorption fields because of the slope and the hazard of erosion.

If this soil is used as woodland, the hazard of erosion and an equipment limitation are management concerns because of the slope. Logging roads and skid trails should be established on the contour as much as possible. On the steeper slopes logs or trees should be skidded uphill with a cable and winch. Firebreaks should be the grass type. Bare areas should be seeded to grasses or to a grass-legume mixture after logging activities have been completed. Machinery should be used only during periods when the soil is firm enough to support the equipment. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, surface compaction, and damage to tree roots. Measures that protect the woodland from fire are needed.

The stands of timber provide good habitat for deer, wild turkey, squirrels, and other woodland wildlife. Adequate stands of herbaceous plants can be maintained, but the slope and a low fertility level limit the growth of grain and seed crops. Measures that protect the habitat from fire and grazing are needed.

The land capability classification is VIIe.

786D2—Frondorf silt loam, 10 to 18 percent slopes, eroded. This moderately deep, strongly sloping, well drained soil is on side slopes along drainageways in the uplands. Individual areas are long and narrow or irregularly shaped and range from 3 to 300 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 6 inches thick. The subsurface layer is yellowish brown, friable silt loam about 4 inches thick. The subsoil is about 25 inches thick. The upper part is light yellowish brown, friable silty clay loam. The lower part is yellowish brown, firm channery sandy clay loam. Yellowish brown, mottled, very firm, weathered sandstone and siltstone bedrock is at a depth of about 35 inches. In places the soil is deeper over bedrock.

Included with this soil in mapping are small areas of soils that are shallow over bedrock. These soils are on the steeper slopes below the Frondorf soil. Also included are small areas of the deep Ava soils along the crest of the slopes above the Frondorf soil. Included soils make up about 6 to 12 percent of the unit.

Water and air move through the Frondorf soil at a moderate rate. Surface runoff is rapid. Available water capacity is moderate. Organic matter content is moderately low. Soft bedrock at a depth of 20 to 40 inches restricts the rooting depth of some plants. The shrink-swell potential is low. The potential for frost action is moderate.

Most areas are used as woodland. Some areas are used as pasture. This soil is moderately suited to pasture and woodland and to dwellings. It is poorly suited to septic tank absorption fields. It is generally unsuited to cultivated crops because of the slope and the hazard of erosion.

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

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

If this soil is used as a site for dwellings, the slope is a limitation. Land shaping by cutting and filling helps to overcome the slope. Compacting the fill improves the stability of the soil. Footings installed in areas that have been filled should extend into undisturbed soil. Diverting runoff from the higher adjacent areas helps to prevent structural damage.

If this soil is used as a site for septic tank absorption fields, the moderate permeability, the depth to bedrock, and the slope are limitations. Effluent can seep laterally and surface on the lower part of the slopes. A septic tank system can function satisfactorily only if a sealed sand filter or an aeration unit is installed and the system is disinfected as needed.

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

The land capability classification is IVe.

801B—Orthents, silty, undulating. These somewhat poorly drained soils are mainly in cut and fill or borrow areas around cloverleaf interchanges, roadways, airports, industrial plants, and similar construction sites (fig. 4). The upper part of the soils typically is somewhat compacted. Slopes range mainly from 2 to 7 percent. Individual areas are irregularly shaped or rectangular and range from 3 to 125 acres in size.

Typically, the upper 60 inches or more is multicolored silty clay loam, silt loam, and silty clay. In a number of areas, the soils are undisturbed but are overlain by 2 to 3 feet of fill material. In some areas they are loamy.

Included with these soils in mapping are roadways, runways, storage tanks, and similar facilities. Also included are small areas of Cisne, Darmstadt, Bluford, and Ava soils and a few areas, mainly borrow areas, where slopes are more than 7 percent. Included areas make up about 10 to 20 percent of the unit.

Water and air move through the Orthents at a moderately slow or slow rate. Surface runoff is slow or medium. The seasonal high water table is 1 to 3 feet below the surface in spring. Available water capacity is moderate. Organic matter content is low. The shrink-swell potential is moderate or high. The potential for frost action is high.

Most areas are former construction sites that are now used for cloverleaf interchanges, roadways, airports, or industrial plants. Land uses are restricted in many areas, but open areas generally are moderately suited to picnic areas and playgrounds and poorly suited to dwellings, local roads and streets, and septic tank absorption fields.

The seasonal high water table and the shrink-swell potential are the main limitations if these soils are used as sites for dwellings. Installing subsurface tile drains near the foundations reduces the wetness. Extending the footings or reinforcing the foundations helps to prevent the structural damage caused by shrinking and swelling.

Low strength, the high potential for frost action, and the moderate or high shrink-swell potential are limitations on sites for local roads and streets. These limitations can be overcome by strengthening or replacing the base material. Removing excess water minimizes the damage caused by frost action and by shrinking and swelling. The water can be removed by grading and shaping the roadway and by ditching and banking the roadsides.

The seasonal high water table is the main limitation if these soils are used as sites for playgrounds or picnic areas. Subsurface drainage tile lowers the water table.

This map unit is not assigned a land capability classification.

810—Oil-waste land, brine damaged. This map unit consists of areas that have been damaged by oil brine. The brine is from spills and seepage. The spills are caused by overflow from shallow slush pits or other oil field activities. The seepage is from broken subsurface lines that carry the oil brine under pressure. Areas of this unit are characterized by a high or low pH, poor tilth, and a sparse plant cover or a cover of salt-tolerant grasses. The land is highly erosive. Rills or gullies have formed in many areas. Individual areas are rounded or rectangular and range from 5 to 80 acres in size.

Included in this unit in mapping are oil tanks and pipelines, slush ponds, lease roads, and oil field equipment. Included areas make up about 15 to 25 percent of the unit.

Typically, this land has a high content of sodium, chloride, sulfate, and other ions. It has become more compact and less permeable because of salt saturation. The compaction increases the amount of water that runs off the surface and allows less water to filter

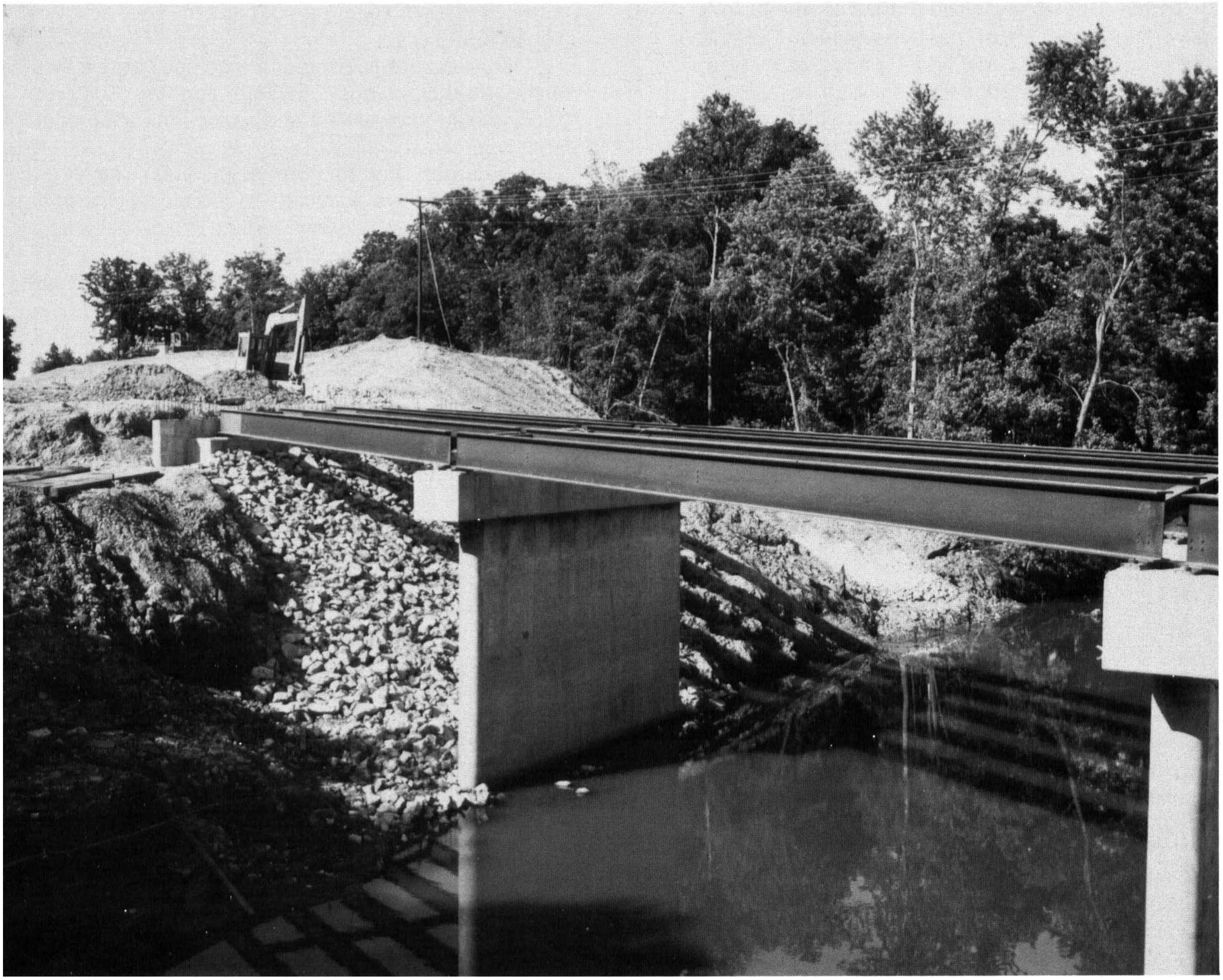


Figure 4.—An area of Orthents, silty, undulating, that has been extensively altered by bridge and road construction.

through the soil material and thus flush excess sodium. When sufficient salt is taken in by a plant, the capacity of the plant to take up and hold water is reversed. The plant withers and dies. The concentration of salt also causes dispersion of the soil structure. The soil material loses some available water capacity and natural cohesiveness.

Many areas of this unit remain barren or partly barren for several decades. Natural leaching over periods of time gradually lowers the salt concentration. Much soil material is commonly lost, however, during these periods. Also, offsite damage can occur. Reclamation has consisted mainly of adding lime or gypsum. Lime improves the pH of the land. Gypsum provides acid-forming material, which helps to remove excess salts. Adding organic material can improve soil structure. Protective measures, such as mulch and diversions, are needed to prevent excessive erosion and thus retain the lime or gypsum and the organic matter in the soil material. If tile is used to speed the removal of excess salts, the effluent from the tile can damage downstream areas. Onsite investigation is needed when the development of a specific area for any use is evaluated and planned.

This map unit is not assigned a land capability classification.

912A—Hoyleton-Darmstadt silt loams, 0 to 2 percent slopes. These nearly level, somewhat poorly drained soils are on low ridges on loess-covered till plains. The Darmstadt soil has a high content of exchangeable sodium, which affects plant growth. Individual areas are irregularly shaped or rounded and range from 3 to 140 acres in size. They are 45 to 75 percent Hoyleton soil and 20 to 50 percent Darmstadt soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the Hoyleton soil has a surface layer of dark brown, friable silt loam about 9 inches thick. The subsurface layer is brown and yellowish brown, 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, firm silty clay loam; the next part is light brownish gray, firm and friable silty clay loam; and the lower part is grayish brown, firm clay loam. In some areas the surface layer is lighter in color. In other areas the subsoil has more clay. In places the upper part of the subsoil is grayer.

Typically, the Darmstadt soil has a surface layer of dark grayish brown, friable silt loam about 6 inches thick. The subsurface layer is grayish brown and light brownish gray, friable silt loam about 8 inches thick. The subsoil is about 35 inches thick. The upper part is brown and pale brown, mottled, very firm silty clay and silty clay loam. The lower part is light brownish gray, mottled, firm silty clay loam and friable silt loam. The substratum to a depth of 60 inches or more is light brownish gray, mottled, friable silt loam. In some areas the surface layer is thinner. In a few areas it is darker. In some places the soil is deeper to sodium. In other places the subsoil has less clay.

Included with these soils in mapping are small areas of the moderately well drained Tamalco soils. These included soils are on the slightly higher ridges or knolls above the Hoyleton and Darmstadt soils. Also included are the poorly drained Cisne and Huey soils in areas below the Hoyleton and Darmstadt soils. Included soils make up about 8 to 15 percent of the unit.

Water and air move through the Hoyleton soil at a slow rate and through the Darmstadt soil at a very slow rate. Surface runoff is slow on both soils. The seasonal high water table is 1 to 3 feet below the surface from February through June in most years. Available water capacity is high in the Hoyleton soil and moderate in the Darmstadt soil. Organic matter content is moderate in the Hoyleton soil and moderately low in the Darmstadt soil. The lower part of the subsoil in the Darmstadt soil has a high content of exchangeable sodium, which restricts the rooting depth of some plants. The shrink-swell potential is high in the Hoyleton soil and moderate in the Darmstadt soil. The potential for frost action is high in both soils.

Most areas are cultivated. These soils are well suited to cultivated crops and to pasture and hay. They are poorly suited to dwellings and septic tank absorption fields.

In the areas used for corn, soybeans, or small grain, the wetness delays planting and reduces yields in some years. A system of random surface drains helps to overcome this limitation. The high content of exchangeable sodium in the subsoil of the Darmstadt soil increases moisture stress during dry periods and inhibits drying after wet periods. The excess sodium also restricts the availability and uptake of some plant nutrients. A system of conservation tillage that leaves crop residue on the surface improves tilth, minimizes crusting, and increases the rate of water infiltration.

The seasonal high water table and the shrink-swell potential are limitations if these soils are used as sites for dwellings. Backfilling with sand and gravel and reinforcing footings and foundations help to prevent the structural damage caused by shrinking and swelling. Installing subsurface drains around footings, elevating the floor of dwellings without basements above the surrounding ground level, grading, and diverting surface water from the site reduce the wetness.

The seasonal high water table and the slow or very slow permeability are limitations if these soils are used as sites for septic tank absorption fields. A septic tank system can function satisfactorily only if a sealed sand filter or an aeration unit is installed and the system is disinfected as needed. A sewage lagoon is an alternative method of waste disposal.

Low strength, the seasonal high water table, frost action, and the shrink-swell potential are limitations on sites for local roads and streets. Providing suitable subgrade material helps to prevent the damage caused by low strength, frost action, and shrinking and swelling. Installing a drainage system and then grading the roads so that they shed water help to prevent the damage caused by the seasonal high water table and by frost action.

The land capability classification is IIIw.

912B—Hoyleton-Darmstadt silt loams, 2 to 5 percent slopes. These gently sloping, somewhat poorly drained soils are on broad ridges or knolls or on side slopes along drainageways on loess-covered till plains. The Darmstadt soil has a high content of exchangeable sodium, which affects plant growth. Individual areas are irregularly shaped or rounded and range from 3 to 90 acres in size. They are 45 to 75 percent Hoyleton soil and 25 to 55 percent Darmstadt soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the Hoyleton soil has a surface layer of very dark grayish brown, friable silt loam about 8 inches thick. The subsurface layer is yellowish brown and brown, friable silt loam about 4 inches thick. The subsoil extends to a depth of 60 inches or more. It is mottled. The upper part is yellowish brown and brown, firm silty clay loam. The next part is grayish brown, very firm silty clay. The lower part is grayish brown, firm clay loam. In places the subsoil has less clay. In some areas the surface layer is lighter in color. In other areas the dark surface layer is thicker.

Typically, the Darmstadt soil has a surface layer of very dark grayish brown and dark grayish brown, friable silt loam about 9 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 brown, mottled, firm silty clay loam. The lower part is grayish brown, mottled, very firm silty clay loam and firm clay loam. In some areas the surface layer and subsurface layer are thinner and have been mixed by tillage. The surface layer is typically lighter colored in these areas. In places the subsoil has more clay.

Included with these soils in mapping are small areas of the somewhat poorly drained Blair soils. These included soils are in the more sloping areas below the Hoyleton and Darmstadt soils. Also included are small areas of the moderately well drained Richview and Tamalco soils on slight rises above the Hoyleton and Darmstadt soils. Included soils make up about 10 to 20 percent of the unit.

Water and air move through the Hoyleton soil at a slow rate and through the Darmstadt soil at a very slow rate. Surface runoff is medium on both soils. The seasonal high water table is 1 to 3 feet below the surface from February through June in most years. Available water capacity is high in the Hoyleton soil and moderate in the Darmstadt soil. Organic matter content is moderate in the Hoyleton soil and moderately low in the Darmstadt soil. The lower part of the subsoil in the Darmstadt soil has a high content of exchangeable sodium, which restricts the rooting depth of some plants. The shrink-swell potential is high in the Hoyleton soil and moderate in the Darmstadt soil. The potential for frost action is high in both soils.

Most areas are cultivated. These soils are well suited to cultivated crops and to pasture and hay. They are poorly suited to dwellings and septic tank absorption fields.

In the areas used for corn, soybeans, or small grain, erosion is a hazard unless the surface is protected. Also, the seasonal wetness delays planting in some years. It can be reduced, however, by a system of random surface drains. Erosion can be controlled by a system of conservation tillage that leaves crop residue on the surface after planting, by contour farming, or by terraces. The high content of exchangeable sodium in the subsoil of the Darmstadt soil increases moisture stress during dry periods and inhibits drying after wet periods. The excess sodium also restricts the availability and uptake of some plant nutrients. Minimizing tillage, leaving crop residue on the surface, and regularly adding other organic material improve tilth, minimize crusting, and increase the rate of water infiltration.

The seasonal high water table and the shrink-swell potential are limitations if these soils are used as sites for dwellings. Backfilling with sand and gravel and reinforcing footings and foundations help to prevent the structural damage caused by shrinking and swelling. Installing subsurface drains around footings, elevating the floor of dwellings without basements above the surrounding ground level, grading, and diverting surface water from the site reduce the wetness.

The seasonal high water table and the slow or very slow permeability are limitations if these soils are used as sites for septic tank absorption fields. A septic tank system can function satisfactorily only if a sealed sand filter or an aeration unit is installed and the system is disinfected as needed. A sewage lagoon is an alternative method of waste disposal.

Low strength, the seasonal high water table, frost action, and the shrink-swell potential are limitations on sites for local roads and streets. Providing suitable subgrade material helps to prevent the damage caused by low strength, frost action, and shrinking and swelling. Installing a drainage system and then grading the roads so that they shed water help to prevent the damage caused by the seasonal high water table and by frost action.

The land capability classification is IIIe.

929D2—Ava-Hickory silt loams, 10 to 18 percent slopes, eroded. These strongly sloping soils are on side slopes along drainageways in the uplands above flood plains. The moderately well drained Ava soil is on the upper part of most slopes and on a few nose slopes. The well drained Hickory soil is on the lower part of most slopes. Individual areas are long and narrow or irregularly shaped and range from 3 to 90 acres in size. They are 40 to 75 percent Ava soil and 25 to 60 percent Hickory soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the Ava soil has a surface layer of dark brown, friable silt loam. Erosion has reduced the thickness of this layer to about 5 inches. The subsoil extends to a depth of 60 inches or more. The upper part is yellowish brown, friable silty clay loam and pale brown silt. The next part is yellowish brown, firm silty clay loam. The lower part is yellowish brown, mottled, very firm, brittle clay loam. In some areas the lower part of the subsoil has less clay.

Typically, the Hickory soil has a surface layer of dark brown, friable loam. Erosion has reduced the thickness of this layer to about 4 inches. The subsoil to a depth of 60 inches or more is clay loam. The upper part is yellowish brown and firm, and the lower part is brown, mottled, and very firm. In some areas the upper part of the subsoil has less sand. In some places the lower part of the subsoil has less clay and is loam or sandy loam. In other places the surface layer is silty clay loam or clay loam because it has been mixed by cultivation with the upper part of the subsoil.

Included with these soils in mapping are small areas of somewhat poorly drained soils. These included soils have more clay in the subsoil than the Ava and Hickory soils. They are on the lower part of the slopes at the head of drainageways. Also included are narrow areas of alluvial soils along drainageways that are subject to flooding and small areas of soils that are shallow over bedrock or have slopes of more than 18 percent. The shallow and steeper soils are commonly near streams. Included soils make up 5 to 10 percent of the unit.

Water and air move through the Hickory soil and the upper part of the Ava soil at a moderate rate and through the lower part of the Ava soil at a very slow rate. Surface runoff is rapid on both soils. The seasonal high water table is perched at a depth of 1.5 to 3.5 feet in the Ava soil from March through June in most years. Available water capacity is moderate in Ava soil and high in Hickory soil. The surface layer of both soils tends to crust after heavy rains. The shrink-swell potential is moderate in both soils. The potential for frost action is high in the Ava soil and moderate in the Hickory soil.

Most areas are used for cultivated crops. These soils are poorly suited to cultivated crops. They are moderately suited to pasture and hay and to dwellings without basements. They are poorly suited to dwellings with basements and to septic tank absorption fields.

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

Establishing pasture plants or hay on these soils helps to control erosion. Preparing a seedbed is difficult in areas on side slopes where the subsoil is exposed. A no-till method of seeding or pasture renovation helps to establish forage species and control erosion. The plants should not be grazed or clipped until they are sufficiently established. Proper stocking rates, rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition and prevent surface compaction and excessive runoff.

If these soils are used as sites for dwellings, the seasonal high water table, the shrink-swell potential, and the slope are limitations. Installing tile drains around the base of foundations helps to lower the seasonal high water table. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. Land shaping by cutting and filling helps to overcome the slope. Erosion is a hazard during construction. It can be controlled by leaving as much vegetation on the surface as possible. Disturbed areas should be seeded or sodded as soon as possible.

The seasonal high water table, the restricted permeability, and the slope are limitations if these soils are used as sites for septic tank absorption fields. A septic tank system can function satisfactorily only if a sealed sand filter or an aeration unit is installed and the system is disinfected as needed. Sewage lagoons function satisfactorily if the site is leveled.

On sites for local roads and streets, frost action is a hazard and the slope and low strength are limitations. Strengthening or replacing the base material helps to prevent road damage. Grading helps to overcome the slope. Maintaining a cover of mulch until vegetation is established helps to control erosion in bare areas.

The land capability classification is IIIe.

934C2—Blair-Grantfork silt loams, 4 to 12 percent slopes, eroded. These moderately sloping, somewhat poorly drained soils are on side slopes along drainageways in the uplands. The Blair soil is at the upper end of drainageways and on the upper part of the slopes. The Grantfork soil is on the lower part of the slopes and on the steeper slopes. It has a high content of exchangeable sodium, which affects plant growth. Individual areas are long and narrow or irregularly shaped and range from 3 to 240 acres in size. They are about 40 to 55 percent Blair soil and 20 to 40 percent Grantfork soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the Blair soil has a surface layer of dark grayish brown, friable silt loam. Erosion has reduced the thickness of this layer to about 6 inches. The subsoil extends to a depth of 60 inches or more. The upper part is brown and grayish brown, mottled, friable and firm silt loam. The lower part is grayish brown and light brownish gray, mottled, firm loam. In some places the upper part of the subsoil has more sand. In other places the subsoil has less clay. In some areas the surface layer is silty clay loam because it has been mixed by cultivation with the upper part of the subsoil.

Typically, the Grantfork soil has a surface layer of dark brown, friable silt loam. Erosion has reduced the thickness of this layer to about 4 inches. The subsurface layer is brown, mottled, friable silt loam about 5 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is brown, mottled, firm loam. The next part is light brownish gray, mottled, firm silt loam. The lower part is light brownish gray and gray, mottled, firm loam. In some areas the subsoil has more clay. In some places the surface layer is silty clay loam or clay loam because it has been mixed by cultivation with the upper part of the subsoil. In other places the subsoil contains less sand.

Included with these soils in mapping are small areas of Atlas soils. These included soils have more clay in the subsoil than the Blair and Grantfork soils and are very slowly permeable. They make up about 10 to 15 percent of the unit.

Water and air move through the Blair soil at a moderately slow rate and through the Grantfork soil at a slow rate. Surface runoff is medium on both soils. Available water capacity is moderate. In most years the seasonal high water table is 1.5 to 3.5 feet below the surface of the Blair soil from March through June and is perched 1.0 to 3.0 feet below the surface of the Grantfork soil from January through May. The lower part of the subsoil in the Grantfork soil has a high content of exchangeable sodium, which restricts the rooting depth of some plants. Organic matter content is low in the Grantfork soil and moderately low in the Blair soil. The surface layer of both soils is firm when moist and hard and cloddy when dry. The soils dry slowly in spring. The shrink-swell potential is moderate. The potential for frost action is high.

Most areas are used for pasture or hay. Some areas are cultivated. A few areas are idle. These soils are poorly suited to cultivated crops. They are moderately suited to pasture and hay and to habitat for openland wildlife. They generally are poorly suited to dwellings and septic tank absorption fields, but the Blair soil is moderately suited to dwellings without basements.

Unless the surface is protected, further erosion is a severe hazard in the areas used for soybeans, corn, or small grain. The high content of exchangeable sodium in the subsoil of the Grantfork soil increases moisture stress during dry periods and inhibits drying after wet periods. The excess sodium also restricts the availability and uptake of some plant nutrients. A system of conservation tillage that leaves crop residue on the surface after planting, contour farming, and a crop rotation that is dominated by forage crops help to control erosion. Tilling during wet periods causes surface cloddiness and compaction and excessive runoff and erosion. Leaving crop residue on the surface and regularly adding other organic material help to maintain tilth and increase the rate of water infiltration.

Growing grasses and legumes on these soils improves tilth and helps to control erosion. Establishing plants is difficult because of poor tilth and the slope. Preparing a seedbed on the contour, growing a nurse crop or mulching, and adding lime and fertilizer help to establish a stand and control erosion. Also, seeding on the contour with a no-till seeder helps to control erosion during establishment or renovation. Proper stocking rates, rotation grazing, weed control, and restricted use during wet periods help to keep the pasture in good condition.

The seasonal high water table, the shrink-swell potential, and the slope are limitations if these soils are used as sites for dwellings. Reinforcing footings and foundations help to prevent the structural damage caused by shrinking and swelling. Installing subsurface drains around footings lowers the water table. Land shaping by cutting and filling helps to overcome the slope. Compacting the fill improves the stability of the soils. Footings installed in areas that have been filled should extend into undisturbed soil. Diverting the runoff from upslope areas helps to stabilize the footings. Establishing or maintaining lawns is difficult because of the high content of sodium in the Grantfork soil. Planting salt-tolerant grasses and frequently watering during dry periods improve the lawns.

The seasonal high water table and the moderately slow or slow permeability are limitations if these soils are used as sites for septic tank absorption fields. Also, excess sodium causes the Grantfork soil to disperse when saturated. The dispersion reduces the absorption rate. A septic tank system can function satisfactorily only if a sealed sand filter or an aeration unit is installed and the system is disinfected as needed. Sewage lagoons function satisfactorily only if the site is leveled.

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

The land capability classification is IVe.

967F—Hickory-Gosport complex, 18 to 30 percent slopes. These steep soils are on side slopes along drainageways in strongly dissected areas. The well drained Hickory soil is generally on the less sloping, upper part of the slopes. The moderately well drained Gosport soil is generally on the steeper, lower part of the slopes, in areas where siltstone and shale bedrock is within a depth of 40 inches. Individual areas are long and narrow or irregularly shaped and range from 3 to 110 acres in size. They are 55 to 75 percent Hickory soil and 25 to 45 percent Gosport soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the Hickory soil has a surface layer of dark brown, friable loam about 3 inches thick. The subsurface layer is yellowish brown, friable silt loam about 4 inches thick. The subsoil is about 42 inches thick. The upper part is strong brown, friable silt loam; the next part is strong brown and yellowish brown, firm and very firm clay loam and clay; and the lower part is brown, firm clay loam. The substratum to a depth of 60 inches or more is brown, firm clay loam. Till pebbles are common throughout the soil. In places the surface layer is loam. In a few places the soil is calcareous within a depth of 40 inches. In some areas the subsoil has less clay.

Typically, the Gosport soil has a surface layer of dark brown, friable silt loam about 3 inches thick. The subsurface layer is brown, friable silt loam about 3 inches thick. The subsoil is about 25 inches thick. The upper part is yellowish brown, firm silty clay loam and silty clay, and the lower part is light brownish gray, very firm clay and firm silty clay loam. Grayish brown and yellowish brown shale bedrock is at a depth of about 31 inches. In some places the soil is deeper over bedrock. In other places it is underlain by layers of sandstone and has more sand. In some areas it is underlain by calcareous material.

Included with these soils in mapping are small areas of sandstone outcrops, generally on the lower part of the slopes or along drainageways, where bedrock has been exposed by the cutting action of creeks. Also included are small areas of the silty Ava soils on the upper part of the slopes near the crest of ridges. Included soils make up about 8 to 12 percent of the unit.

Water and air move through the Hickory soil at a moderate rate and through the Gosport soil at a very slow rate. Surface runoff is rapid on both soils. The seasonal high water table is perched at a depth of 1.5 to 3.5 feet in the Gosport soil from January through April in most years. Available water capacity is moderate in both soils. Organic matter content is moderately low. Soft bedrock at a depth of 20 to 40 inches in the Gosport soil restricts the rooting depth of some plants. The shrink-swell potential is moderate in the Hickory soil and high in the Gosport soil. The potential for frost action is moderate in both soils.

Most areas are used as pasture or woodland. These soils are moderately suited to woodland, pasture, and woodland wildlife habitat. They are poorly suited to dwellings and septic tank absorption fields. They are generally unsuited to cultivated crops because of the slope and the hazard of erosion.

Erosion control is needed when grasses and legumes are becoming established in the pastured areas. In areas where the pasture is established, seeding legumes on the contour improves the quality of the forage and helps to control erosion. A permanent cover of pasture plants helps to control erosion and maintains tilth. Selection of suitable species for planting, proper stocking rates, rotation grazing, timely deferment of grazing, and applications of fertilizer help to keep the pasture in good condition.

If these soils are used as woodland, the hazard of erosion, an equipment limitation, seedling mortality, and windthrow are management concerns. The slope and the clayey subsoil cause a hazard of erosion and limit the use of equipment. Logging roads and skid trails should be established on the contour if possible. On the steeper slopes the logs or trees should be skidded uphill with a cable and winch. Firebreaks should be the grass type. Bare logging areas should be seeded to grass or to a grass-legume mixture. Machinery should be used only when the soils are firm enough to support the equipment. The seedling mortality rate can be reduced by selecting planting stock that is older and larger than is typical and by mulching. Some replanting may be needed. Harvesting methods that do not isolate the remaining trees or leave them widely spaced reduce the hazard of windthrow. Only high-value trees should be removed from a strip 50 feet wide along the west and south edges of the woodland. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, surface compaction, and damage to tree roots. Measures that protect the woodland from fire are needed.

The seasonal high water table, the shrink-swell potential, and the slope are limitations on sites for dwellings. Reinforcing foundations helps to prevent the structural damage caused by shrinking and swelling. Installing subsurface drains around foundations helps to remove excess water. Land shaping by cutting and filling helps to overcome the slope. Erosion and sedimentation are hazards during construction. Bare areas should be seeded and mulched or sodded as soon as possible. Sediment basins on the construction sites minimize offsite sedimentation.

The restricted permeability, seepage, and the slope are limitations if these soils are used as sites for septic tank absorption fields. Effluent can seep laterally and surface on the lower part of the slopes.

The shrink-swell potential, low strength, and the slope are limitations on sites for local roads and streets. Strengthening or replacing the base material can help to prevent road damage. Grading may be needed during construction. Maintaining a cover of mulch until vegetation is established helps to control erosion in bare areas.

The land capability classification is VIIe.

987C2—Atlas-Grantfork Variant silt loams, 4 to 12 percent slopes, eroded. These moderately sloping, somewhat poorly drained soils are on side slopes along drainageways in dissected areas on till plains. The Atlas soil is on the upper part of the slopes, and the Grantfork Variant soil is on the lower part of the slopes and on the steeper slopes. Gullies have formed in a number of areas. Individual areas are long and narrow or irregularly shaped and range from 5 to 40 acres in size. They are 40 to 60 percent Atlas soil and 30 to 50 percent Grantfork Variant soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the Atlas soil has a surface layer of dark brown silt loam. Erosion has reduced the thickness of this layer to about 4 inches. The subsoil extends to a depth of 60 inches or more. The upper part is brown, light brownish gray, and gray, mottled, very firm clay, and the lower part is light brownish gray, mottled, very firm clay loam. In some areas the subsoil has less clay. In other areas it has more sand. In places the surface layer is silty clay loam because it has been mixed by cultivation with the upper part of the subsoil.

Typically, the Grantfork Variant soil has a surface layer of dark brown, friable silt loam. Erosion has reduced the thickness of this layer to about 6 inches. The subsoil extends to a depth of 60 inches or more. The upper part is brown, grayish brown, and light brownish gray, mottled, very firm silty clay and clay loam. The lower part is grayish brown and light brownish gray, mottled, very firm silty clay loam and clay loam having a high content of sodium. In some areas the subsoil has less clay. In other areas the sodium is closer to the surface. In places the surface layer is silty clay loam or clay loam because it has been mixed by cultivation with the upper part of the subsoil.

Included with these soils in mapping are small areas of Hoyleton and Blair soils at the upper ends of the drainageways. Also included are scald spots where the surface layer has a high content of sodium, a few areas of hillside seeps, and areas of alluvial soils in small drainageways. Included soils make up 5 to 10 percent of the unit.

Water and air move through the Atlas and Grantfork Variant soils at a very slow rate. Surface runoff is rapid. The seasonal high water table is perched 1 to 2 feet below the surface from April through June in most years. Available water capacity is moderate. Organic matter content is low. The surface layer tends to crust and puddle after hard rains. The shrink-swell potential and the potential for frost action are high.

Most areas are used for cultivated crops or for hay or pasture. Some areas are used as woodland. These soils are generally unsuited to cultivated crops because of a severe hazard of further erosion. They are moderately suited to hay and pasture and are poorly suited to dwellings and septic tank absorption fields.

Unless the surface is protected, further erosion is a severe hazard in the areas used for soybeans, corn, or small grain. The high content of exchangeable sodium in the subsoil of the Atlas Variant soil increases moisture stress during dry periods and inhibits drying after wet periods. The excess sodium also restricts the availability and uptake of some plant nutrients. A system of conservation tillage that leaves crop residue on the surface after planting, contour farming, and a crop rotation that is dominated by forage crops help to control erosion. Tilling during wet periods causes surface cloddiness and compaction and excessive runoff and erosion. Leaving crop residue on the surface and regularly adding other organic material help to maintain tilth and increase the rate of water infiltration.

Growing grasses and legumes on these soils improves tilth and helps to control erosion. Establishing plants is difficult because of poor tilth and the slope. Preparing a seedbed on the contour, growing a nurse crop or mulching, and adding lime and fertilizer help to establish a stand and control erosion. Also, seeding on the contour with a no-till seeder helps to control erosion during establishment or renovation. Proper stocking rates, rotation grazing, weed control, and restricted use during wet periods help to keep the pasture in good condition.

The seasonal high water table, the shrink-swell potential, and the slope are limitations if these soils are used as sites for dwellings. Backfilling with sand and gravel and reinforcing footings and foundations help to prevent the structural damage caused by shrinking and swelling. Installing subsurface drains around footings lowers the water table. Land shaping by cutting and filling helps to overcome the slope. Footings installed in areas that have been filled should extend into undisturbed soil. Diverting the runoff from upslope areas helps to stabilize the footings. Establishing or maintaining lawns is difficult because of the high content of sodium in the Grantfork Variant soil. Planting salt-tolerant grasses and frequently watering during dry periods improve the lawns.

The seasonal high water table and the very slow permeability are limitations if these soils are used as sites for septic tank absorption fields. Also, excess sodium causes the Grantfork Variant soil to disperse when saturated. The dispersion reduces the absorption rate. A septic tank system can function satisfactorily only if a sealed sand filter or an aeration unit is installed and the system is disinfected as needed. Sewage lagoons function satisfactorily if the site is leveled.

The shrink-swell potential and low strength are limitations on sites for local roads and streets. Providing suitable subgrade material helps to prevent the damage caused by low strength and by shrinking and swelling.

The land capability classification is IVe.

991—Cisne-Huey silt loams. These nearly level and slightly depressional, poorly drained soils are on broad, loess-covered till plains. Individual areas are irregular in shape and range from 5 to more than 200 acres in size. They are 50 to 60 percent Cisne soil and 20 to 45 percent Huey soil. The two soils occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the Cisne soil has a surface layer of very dark grayish brown, friable silt loam about 7 inches thick. The subsurface layer is dark grayish brown and light brownish gray, mottled, friable silt loam about 9 inches thick. The subsoil extends to a depth of 60 inches or more. It has reddish mottles and dark coatings. The upper part is dark grayish brown, very firm silty clay; the next part is grayish brown, very firm silty clay loam that has a high content of clay; and the lower part is light brownish gray, firm silty clay loam and silt loam. In some areas the soil has a thinner subsurface layer and contains less clay in the upper part of the subsoil. In some places the dark surface layer is thicker. In other places the surface layer is lighter in color.

Typically, the Huey soil has a surface layer of dark grayish brown, friable silt loam about 7 inches thick. The subsoil to a depth of 60 inches or more is grayish brown, mottled, friable silty clay loam that is slightly calcareous and has a high content of exchangeable sodium. In places the soil has a subsurface layer of silt loam. In some areas the lower part of the subsoil is silt loam. Included soils make up about 5 percent of the unit.

Water and air move through the Cisne and Huey soils at a very slow rate. Surface runoff is slow on the Cisne soil and very slow or ponded on the Huey soil. In most years the seasonal high water table is perched within a depth of 2.0 feet from February through June in the Cisne soil and is 0.5 foot above to 2.0 feet below the surface of the Huey soil from March through June. Available water capacity is high in the Cisne soil and moderate in the Huey soil. Organic matter content is moderate in the Cisne soil and moderately low in the Huey soil. The surface layer of both soils is friable and can be easily tilled when moist. The surface layer of the Huey soil, however, tends to crust after hard rains. The shrink-swell potential is high in the subsoil of the Cisne soil and moderate in the subsoil of the Huey soil. The potential for frost action is high in both soils.

Most areas are used for cultivated crops. Some areas are used for pasture or hay. The Cisne soil is moderately suited to cultivated crops, and the Huey soil is poorly suited. Both soils are moderately suited to pasture and hay. They are poorly suited to dwellings and septic tank absorption fields.

In the areas used for soybeans, corn, or small grain, the wetness of both soils and the high content of sodium in the Huey soil are limitations. The sodium in the subsoil of the Huey soil results in moisture stress during dry periods and excess moisture during wet periods. Also, it restricts the availability and uptake of some plant nutrients. A system of shallow ditches reduces the wetness. Tilling during wet periods causes surface compaction and cloddiness and decreases the rate of water infiltration. Leaving crop residue on the surface, adding other organic material, and minimizing tillage increase the rate of water infiltration and improve tilth and fertility.

The seasonal high water table and the shrink-swell potential are limitations if these soils are used as sites for dwellings. Backfilling with sand and gravel and reinforcing footings and foundations help to prevent the structural damage caused by shrinking and swelling. Installing subsurface drains around footings, elevating the floor of dwellings without basements above the surrounding ground level, grading, and diverting surface water from the site reduce the wetness. Establishing or maintaining lawns is difficult because of the high content of sodium in the Huey soil. Planting salt-tolerant grasses and frequently watering during dry periods improve the lawns.

The seasonal high water table and the very slow permeability are limitations if these soils are used as sites for septic tank absorption fields. Also, excess sodium causes the Huey soil to disperse when saturated. The dispersion reduces the absorption rate. A septic tank system can function satisfactorily only if a sealed sand filter or an aeration unit is installed. Sewage lagoons function very well on these soils.

Low strength, the seasonal high water table, frost action, and the shrink-swell potential are limitations on sites for local roads and streets. Providing suitable subgrade material helps to prevent the damage caused by low strength, frost action, and shrinking and swelling. Installing a drainage system and then grading the roads so that they shed water help to prevent the damage caused by the seasonal high water table and by frost action.

The land capability classification is IVw.

1288—Petrolia silty clay loam, wet. This nearly level, very poorly drained soil is in slight depressions on broad flood plains. It is frequently flooded and is ponded for long periods from March through June in most years. Individual areas are irregular in shape and range from 10 to 50 acres in size.

Typically, the surface layer is dark grayish brown and dark gray, firm silty clay loam about 17 inches thick. The substratum to a depth of 60 inches or more is mottled, firm silty clay loam. The upper part is dark gray and gray, and the lower part is light brownish gray. In some places the surface layer is silt loam. In other places it is darker. In some areas the substratum has less clay.

Water and air move through the Petrolia soil at a moderately slow rate. Surface runoff is very slow or ponded. The seasonal high water table is 0.5 foot above to 1.0 foot below the surface from April through June in most years. Available water capacity is high. Organic matter content is moderate. The surface layer tends to become hard and cloddy if it is tilled when too wet. The shrink-swell potential is moderate. The potential for frost action is high.

Most areas are wooded. Some areas are used intermittently for cultivated crops. This soil is poorly suited to cultivated crops. It is moderately suited to hay and pasture if the forage species that are tolerant of wetness are selected for planting. It is well suited to woodland and to habitat for openland, woodland, and wetland wildlife. It is generally unsuitable as a site for dwellings and septic tank absorption fields because of the flooding and the ponding.

Grain and seed crops and wild herbaceous plants used as food and cover by wetland wildlife grow well on this soil. When the soil is flooded or ponded, it furnishes temporary feed and resting sites for waterfowl. Shallow water areas can be developed easily. Measures that protect the habitat from fire and grazing are needed.

The land capability classification is Vw.

2002—Cisne-Urban land complex. This nearly level map unit occurs as areas of a poorly drained Cisne soil intermingled with areas of Urban land. It is in broad areas on loess-covered till plains. It is occasionally ponded for brief periods. Individual areas range from 5 to more than 400 acres in size. They are 45 to 75 percent Cisne soil and 25 to 40 percent Urban land. The Cisne soil and Urban land occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the Cisne soil has a surface layer of dark grayish brown, friable silt loam about 9 inches thick. The subsurface layer is grayish brown, mottled, friable silt loam about 8 inches thick. The subsoil extends to a depth of 60 inches or more. It has reddish mottles and dark coatings. The upper part is light brownish gray, friable silt loam; the next part is grayish brown and light brownish gray, firm silty clay and silty clay loam; and the lower part is gray, firm silty clay. Some areas have been filled or leveled during construction. In some places the lower part of the subsoil has less clay. In other places the surface layer is darker. In some areas the lower part of the subsoil has a concentration of sodium.

The Urban land is covered by streets, parking lots, buildings, and other structures. The soils are so obscured or modified that they cannot be identified.

Included with the Cisne soil in mapping are small, closely intermingled areas of Huey soils. These soils have a high content of sodium in the subsoil. Also included are small areas of the somewhat poorly drained Hoyleton and Darmstadt soils. These soils are on knobs or ridges above the Cisne soil. Included soils make up 10 to 15 percent of the unit.

Water and air move through the Cisne soil at a very slow rate. Surface runoff is slow. In most areas excess surface water is drained through storm sewers and gutters and to a lesser extent through surface ditches. The seasonal high water table is perched within a depth of 2 feet from February through June in most years. Available water capacity is high. Organic matter content is moderate. The shrink-swell potential and the potential for frost action are high.

The Cisne soil is used for parks, building site development, lawns, or gardens. It is poorly suited to dwellings, septic tank absorption fields, and local roads and streets. Because of the seasonal wetness, it is poorly suited to lawns, vegetable and flower gardens, trees, and recreational uses. Lowering the water table with subsurface drains and installing surface drains reduce the wetness.

If the Cisne soil is used as a site for dwellings, the seasonal high water table and the shrink-swell potential are limitations. Backfilling with sand and gravel and reinforcing footings and foundations help to prevent the structural damage caused by shrinking and swelling. Installing subsurface drains around footings, elevating the floor of dwellings without basements above the surrounding ground level, grading, and diverting surface water from the site reduce the wetness.

In most areas of this unit, municipal sanitary treatment facilities are available. If septic tank absorption fields are installed in areas that are not served by sanitary sewers, the seasonal high water table and the very slow permeability are limitations. A septic tank system can function satisfactorily only if a sealed sand filter or an aeration unit is installed and the system is disinfected as needed.

Low strength, the seasonal high water table, frost action, and the shrink-swell potential are limitations on sites for local roads and streets. Providing suitable subgrade material helps to prevent the damage caused by low strength, frost action, and shrinking and swelling. Installing a drainage system and then grading the roads so that they shed water help to prevent the damage caused by the seasonal high water table and by frost action.

This map unit is not assigned a land capability classification.

2012—Wynoose-Urban land complex. This nearly level map unit occurs as areas of a poorly drained Wynoose soil intermingled with areas of Urban land. It is in broad areas on loess-covered till plains. It is occasionally ponded for brief periods. Individual areas range from 5 to more than 50 acres in size. They are 45 to 75 percent Wynoose soil and 25 to 40 percent Urban land. The Wynoose soil and Urban land occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the Wynoose soil has a surface layer of dark gray, friable silt loam about 6 inches thick. The subsurface layer is grayish brown and light brownish gray, mottled, friable silt loam about 7 inches thick. The subsoil is about 43 inches thick. The upper part is light brownish gray and grayish brown, mottled, very firm silty clay, and the lower part is grayish brown, firm silty clay loam. The substratum to a depth of 60 inches or more is light brownish gray, firm silty clay loam. Some areas have been filled or leveled during construction. In places the subsoil has less clay.

The Urban land is covered by streets, parking lots, buildings, and other structures. The soils are so obscured or modified that they cannot be identified.

Included with the Wynoose soil in mapping are small areas of the somewhat poorly drained Hoyleton and Bluford soils. These soils are on knobs or ridges above the Wynoose soil. They make up 10 to 15 percent of the unit.

Water and air move through the Wynoose soil at a very slow rate. Surface runoff is slow. In most areas excess surface water is drained through storm sewers and gutters and to a lesser extent through surface ditches. The seasonal high water table is perched within a depth of 2 feet from March through June in most years. Available water capacity is moderate. Organic matter content is low. Reaction is extremely acid to strongly acid in the subsoil. The shrink-swell potential and the potential for frost action are high.

The Wynoose soil is used for parks, building site development, lawns, or gardens. It is poorly suited to dwellings, septic tank absorption fields, and local roads and streets. Because of the seasonal wetness, it is poorly suited to lawns, vegetable and flower gardens, trees, and recreational uses. Lowering the water table with subsurface drains and installing surface drains reduce the wetness.

If the Wynoose soil is used as a site for dwellings, the seasonal high water table and the shrink-swell potential are limitations. Backfilling with sand and gravel and reinforcing footings and foundations help to prevent the structural damage caused by shrinking and swelling. Installing subsurface drains around footings, elevating the floor of dwellings without basements above the surrounding ground level, grading, and diverting surface water from the site reduce the wetness.

In most areas of this unit, municipal sanitary treatment facilities are available. If septic tank absorption fields are installed in areas that are not served by sanitary sewers, the seasonal high water table and the very slow permeability are limitations. A septic tank system can function satisfactorily only if a sealed sand filter or an aeration unit is installed and the system is disinfected as needed.

Low strength, the seasonal high water table, frost action, and the shrink-swell potential are limitations on sites for local roads and streets. Providing suitable subgrade material helps to prevent the damage caused by low strength, frost action, and shrinking and swelling. Installing a drainage system and then grading the roads so that they shed water help to prevent the damage caused by the seasonal high water table and by frost action.

This map unit is not assigned a land capability classification.

2013B—Bluford-Urban land complex, 1 to 5 percent slopes. This gently sloping map unit occurs as areas of a somewhat poorly drained Bluford soil intermingled with areas of Urban land. It is on low ridges and broad ridgetops or on short side slopes along drainageways on loess-covered till plains. Individual areas range from 10 to 200 acres in size. They are 40 to 75 percent Bluford soil and 15 to 45 percent Urban land. The Bluford soil and Urban land occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the Bluford soil has a surface layer of dark brown and grayish brown, friable silt loam about 7 inches thick. The subsurface layer is light brownish gray and pale brown, friable silt loam about 9 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is yellowish brown, mottled, firm silty clay; the next part is brown and grayish brown, mottled, firm silty clay; and the lower part is light brownish gray and grayish brown, mottled, firm and very firm, brittle silty clay loam. In a few places the surface layer is darker. Some areas have been filled or leveled during construction. In places the lower part of the subsoil has less clay.

The Urban land is covered by streets, parking lots, buildings, and other structures. The soils are so obscured or modified that they cannot be identified.

Included with the Bluford soil in mapping are small areas of the poorly drained Wynoose and Racoon soils and the moderately well drained Ava soils. Ava soils are on slight rises above the Bluford soil or adjacent to hillsides. Wynoose and Racoon soils are in slight depressions or in drainageways below the Bluford soil. Included soils make up 5 to 15 percent of the unit.

Water and air move through the Bluford soil at a slow rate. Surface runoff is slow or medium. In most areas excess surface water is drained through sewer systems and gutters and to a lesser extent through surface ditches. The seasonal high water table is perched 1 to 3 feet below the surface from March through June in most years. Available water capacity is high. Organic matter content is moderately low. The subsoil is very strongly acid or strongly acid. The shrink-swell potential is moderate. The potential for frost action is high.

The Bluford soil is used for parks, building site development, lawns, or gardens. It is moderately suited to lawns and landscaping, flower and vegetable gardens, and trees and shrubs. It is poorly suited to dwellings, most recreational uses, septic tank absorption fields, and local roads and streets.

If the Bluford soil is used for lawns, gardens, or ornamental trees and shrubs, the seasonal high water table is a limitation. Lowering the water table with subsurface drains and installing surface drains reduce the wetness.

If the Bluford soil is used as a site for dwellings, the seasonal high water table and the shrink-swell potential are limitations. Backfilling with sand and gravel and reinforcing footings and foundations help to prevent the structural damage caused by shrinking and swelling. Installing subsurface drains around footings, elevating the floor of dwellings without basements above the surrounding ground level, grading, and diverting surface water from the site reduce the wetness.

In most areas of this unit, municipal sanitary facilities are available. If septic tank absorption fields are installed in areas that are not served by sanitary sewers, the seasonal high water table and the slow permeability are limitations. A septic tank system can function satisfactorily only if a sealed sand filter or an aeration unit is installed and the system is disinfected as needed.

Low strength, the seasonal high water table, frost action, and the shrink-swell potential are limitations on sites for local roads and streets. Providing suitable subgrade material helps to prevent the damage caused by low strength, frost action, and shrinking and swelling. Installing a drainage system and then grading the roads so that they shed water help to prevent the damage caused by the seasonal high water table and by frost action.

This map unit is not assigned a land capability classification.

2912A—Hoyleton-Darmstadt-Urban land complex, 0 to 3 percent slopes. This gently sloping map unit occurs as areas of somewhat poorly drained Hoyleton and Darmstadt soils intermingled with areas of Urban land. It is on low ridges on loess-covered till plains. Individual areas range from 10 to 200 acres in size. They are 25 to 40 percent Hoyleton soil, 15 to 35 percent Darmstadt soil, and 15 to 45 percent Urban land. The Hoyleton and Darmstadt soils and Urban land occur as areas so closely intermingled or so small that mapping them separately is not practical.

Typically, the Hoyleton soil has a surface layer of very dark grayish brown, friable silt loam about 7 inches thick. The subsurface layer is dark grayish brown and brown, friable silt loam about 9 inches thick. The subsoil is about 26 inches thick. It has reddish mottles and dark coatings. The upper part is brown, friable silty clay loam; the next part is yellowish brown and brown, firm silty clay; and the lower part is pale brown, friable silty clay loam. The substratum to a depth of 60 inches or more is grayish brown and light brownish gray, mottled, friable silty clay loam. In a few places the surface layer is lighter in color. In some areas the lower part of the subsoil has less clay and more sand. Some areas been filled or leveled during construction.

Typically, the Darmstadt soil has a surface layer of very dark grayish brown and dark grayish brown, friable silt loam about 12 inches thick. The subsurface layer is grayish brown, friable silt loam about 4 inches thick. The subsoil is about 24 inches thick. It is mottled. The upper part is brown, firm silty clay, and the lower part is grayish brown, friable silty clay loam that has a high content of exchangeable sodium. The substratum to a depth of 60 inches or more is gray and grayish brown, mottled, friable silt loam. In a few places the subsoil is thicker. Some areas have been cut, filled, or leveled during construction.

The Urban land is covered by streets, parking lots, buildings, and other structures. The soils are so obscured or modified that they cannot be identified.

Included with the Hoyleton and Darmstadt soils in mapping are small areas of the poorly drained Cisne soils and the light colored Bluford soils. Bluford soils are in landscape positions similar to those of the Hoyleton and Darmstadt soils. Cisne soils are in slight depressions or in drainageways below the Hoyleton and Darmstadt soils. Included soils make up 5 to 15 percent of the unit.

Water and air move through the Hoyleton soil at a slow rate and through the Darmstadt soil at a very slow rate. Surface runoff is slow on the Hoyleton soil and slow or medium on the Darmstadt soil. In most areas excess surface water is drained through sewer systems and gutters and to a lesser extent through surface ditches. In most years the seasonal high water table is 1 to 3 feet below the surface of the Hoyleton soil from March through June and is perched 1 to 3 feet below the surface of the Darmstadt soil from February through May. Available water capacity is high in the Hoyleton soil and moderate in the Darmstadt soil. Organic matter content is moderate in the Hoyleton soil and moderately low in the Darmstadt soil. The shrink-swell potential is high in the Hoyleton soil and moderate in the Darmstadt soil. The potential for frost action is high in both soils.

The Hoyleton and Darmstadt soils are used for parks, building site development, lawns, or gardens. They are moderately suited to lawns and landscaping, flower and vegetable gardens, and trees and shrubs. They are poorly suited to dwellings, most recreational uses, septic tank absorption fields, and local roads and streets.

If the Hoyleton and Darmstadt soils are used for lawns, gardens, or ornamental trees and shrubs, the seasonal high water table is a limitation. Lowering the water table with subsurface drains and installing surface drains reduce the wetness.

If the Hoyleton and Darmstadt soils are used as sites for dwellings, the seasonal high water table and the shrink-swell potential are limitations. Backfilling with sand and gravel and reinforcing footings and foundations help to prevent the structural damage caused by shrinking and swelling. Installing subsurface drains around footings, elevating the floor of dwellings without basements above the surrounding ground level, grading, and diverting surface water from the site reduce the wetness.

In most areas of this unit, municipal sanitary facilities are available. If septic tank absorption fields are installed in areas that are not served by sanitary sewers, the seasonal high water table and the slow or very slow permeability are limitations. A septic tank system can function satisfactorily only if a sealed sand filter or an aeration unit is installed and the system is disinfected as needed.

Low strength, the seasonal high water table, frost action, and the shrink-swell potential are limitations on sites for local roads and streets. Providing suitable subgrade material helps to prevent the damage caused by low strength, frost action, and shrinking and swelling. Installing a drainage system and then grading the roads so that they shed water help to prevent the damage caused by the seasonal high water table and by frost action.

This map unit is not assigned a land capability classification.

3072—Sharon silt loam, frequently flooded. This nearly level, moderately well drained, nearly level soil is on natural levees along stream channels and on slight rises on broad flood plains along the major streams. It is frequently flooded for brief periods from March through June in most years. Individual areas are long and narrow or irregularly shaped and range from 10 to 50 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 10 inches thick. The substratum extends to a depth of 60 inches or more. The upper part is dark brown, friable silt loam, and the lower part is dark brown and yellowish brown, mottled, friable, stratified silt loam and loam. In some areas the soil has a higher content of sand throughout. In other areas it has a weakly expressed subsoil. In places the upper part of the substratum is neutral or mildly alkaline.

Included with this soil in mapping are small areas of the somewhat poorly drained Belknap soils in swales. These soils make up 5 to 10 percent of the unit.

Water and air move through the Sharon soil at a moderate rate. Surface runoff is slow. The seasonal high water table is 3 to 6 feet below the surface from March through June in most years. Available water capacity is very high. Organic matter content is moderately low. The surface layer is friable and can be easily tilled when moist. The potential for frost action is high.

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

Flooding normally does not interfere with crop growth, but it damages the crops in some years. Scouring, sedimentation, and streambank cutting are hazards. Timely fieldwork and selection of proper crop varieties reduce these hazards. Leaving crop residue on the surface and regularly adding other organic material help to maintain tilth and increase the rate of water infiltration.

In areas used as pasture, overgrazing causes surface compaction and poor tilth. Proper stocking rates, rotation grazing, and restricted use during wet periods help to keep the pasture in good condition. Seeding a grass-legume mixture improves the quality of the forage. In areas used for hay, the flooding delays harvesting during some years.

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

The land capability classification is IIw.

3108—Bonnie silt loam, frequently flooded. This nearly level, poorly drained soil is in low areas on broad flood plains. It is frequently flooded for long periods from January through June in most years. Individual areas are irregular in shape and range from 10 to 100 acres in size.

Typically, the surface layer is grayish brown and gray, mottled, friable silt loam about 10 inches thick. The substratum to a depth of 60 inches or more is mottled, friable silt loam. The upper part is light brownish gray and grayish brown, and the lower part is light brownish gray. In some areas layers of silty clay loam are below a depth of 40 inches. In other areas the depth to a seasonal high water table is more than 1 foot.

Included with this soil in mapping are small areas of the somewhat poorly drained Belknap soils on slight rises, mainly near overflow channels. These soils make up 6 to 12 percent of the unit.

Water and air move through the Bonnie soil at a moderately slow rate. Surface runoff is slow to ponded. The seasonal high water table is 0.5 foot above to 1.0 foot below the surface from January through June in most years. Available water capacity is very high. Organic matter content is moderately low. The surface layer is friable and can be easily tilled when moist, but it tends to crust or puddle after hard rains. The potential for frost action is high.

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

The crops commonly grown in the county can be grown in most areas of this soil because a drainage system has been installed. In most years, however, the seasonal wetness and the flooding delay planting. In some years overflow damages the crops. A system of surface drains or tile can help to remove excess surface water if suitable outlets are available. Minimizing tillage, leaving crop residue on the surface, and regularly adding other organic material improve tilth and increase the rate of water infiltration.

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

The land capability classification is IIIw.

3225—Holton loam, frequently flooded. This nearly level, somewhat poorly drained soil is on narrow flood plains and along tributary streams on broad flood plains. It is frequently flooded for brief periods from November through June in most years. Most areas are dissected by stream channels. Individual areas are long and narrow or irregularly shaped and range from 10 to 60 acres in size.

Typically, the surface layer is about 9 inches of very dark grayish brown and dark grayish brown, friable loam and silt loam. The subsoil is about 17 inches thick. It is brown and grayish brown, mottled, friable silt loam and loam. The substratum to a depth of 60 inches or more is grayish brown and dark yellowish brown, mottled, friable, stratified loam and fine sandy loam. In some places the substratum is acid. In other places the soil is mainly silt loam that has a high content of sand. In some areas a dark buried soil is below a depth of 20 inches.

Included with this soil in mapping are small areas of the moderately well drained Wirt soils along streambanks. Also included are areas of Banlic soils on the higher parts of the flood plains and small areas of the poorly drained Birds soils in low swales. Banlic soils have a firm, brittle subsoil. Included soils make up 10 to 15 percent of the unit.

Water and air move through the Holton soil at a moderate rate. Surface runoff is slow. The seasonal high water table is 1 to 3 feet below the surface from November through June in most years. Available water capacity is high. Organic matter content is moderately low. The surface layer is friable and can be easily tilled throughout a fairly wide range in moisture content. The potential for frost action is high.

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

Corn and soybeans can be grown on this soil because a drainage system has been installed. In some years, however, planting is delayed by wetness or flooding. Scouring, deposition, and streambank cutting are hazards. In some years overflow damages the crops. A system of surface drains or tile can help to remove excess water if suitable outlets are available. Leaving crop residue on the surface and regularly adding other organic material help to maintain good tilth and increase the rate of water infiltration.

In the areas used for pasture or hay, the flooding is a hazard and the seasonal wetness is a limitation. Subsurface tile drains can lower the water table. Overgrazing causes surface compaction and poor tilth. Proper stocking rates, rotation grazing, restricted use during wet periods, and applications of fertilizer help to keep the pasture in good condition. In the areas used for hay, the flooding delays harvesting during some years.

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

The land capability classification is IIIw.

3226—Wirt silt loam, frequently flooded. This nearly level, well drained soil is on narrow flood plains or on natural levees along tributary streams on broad flood plains. It is frequently flooded for brief periods from November through June in most years (fig. 5). Most areas are dissected by stream channels. Individual areas are long and narrow or irregularly shaped and range from 5 to 35 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 3 inches thick. The subsurface layer is dark brown, friable loam about 9 inches thick. The subsoil is dark brown, friable silt loam about 24 inches thick. The upper part of the substratum is brown, friable, stratified silt loam and loam. The lower part to a depth of 60 inches or more is yellowish brown, very friable sandy loam. In some places the surface layer contains more sand. In other places the subsoil is more acid. In a few areas a dark buried soil is below a depth of 40 inches.

Included with this soil in mapping are small areas of sandy stream sediments. Also included are small areas of the acid, silty Sharon soils in the same landscape positions as the Wirt soil and the somewhat poorly drained Holton soils on the lower parts of the landscape. Included soils make up 10 to 15 percent of the unit.

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

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

Flooding normally does not interfere with crop growth, but it damages the crops in some years. Scouring, sedimentation, and streambank cutting are hazards. Timely fieldwork and selection of proper crop varieties reduce these hazards. Leaving crop residue on the surface and regularly adding other organic material help to maintain tilth and increase the rate of water infiltration.

In the areas used as pasture, overgrazing causes surface compaction and poor tilth. Proper stocking rates, rotation grazing, and restricted use during wet periods help to keep the pasture in good condition. Seeding a grass-legume mixture improves the quality of the forage. In areas used for hay, the flooding delays harvesting during some years.

If this soil is used as woodland, plant competition is a management concern. It hinders the survival of desirable seedlings. The competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Excluding livestock from the woodland helps to prevent destruction of the

Figure 5.—An area of Wirt silt loam, frequently flooded, where floodwater has deposited sandy material on the surface.

leaf mulch and of desirable young trees, surface compaction, and damage to tree roots. Measures that protect the woodland from fire are needed.

The land capability classification is IIw.

3333—Wakeland silt loam, frequently flooded. This nearly level, somewhat poorly drained soil is on flood plains. It is frequently flooded for brief periods from January through May in most years. Individual areas are long and narrow or irregularly shaped and range from 10 to 50 acres in size.

Typically, the surface layer is dark brown, friable silt loam about 13 inches thick. The substratum extends to a depth of 60 inches or more. The upper part is brown, dark brown and grayish brown, mottled, friable silt loam, and the lower part is grayish brown, mottled, friable, stratified silt loam and loam. In some areas the surface layer is darker. In some places the soil contains more clay. In other places it has thin layers of strongly acid silt loam.

Included with this soil in mapping are small areas of the well drained Wirt soils on natural levees along streams and small areas of the poorly drained Birds soils on the lower parts of the landscape. Included soils make up 5 to 10 percent of the unit.

Water and air move through the Wakeland soil at a moderate rate. Surface runoff is slow. The seasonal high water table is at a depth of 1 to 3 feet from

January through April in most years. Available water capacity is very high. Organic matter content is moderately low. The surface layer is friable and can be easily tilled when moist. The potential for frost action is high.

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

Corn and soybeans can be grown on this soil because a drainage system has been installed. In some years, however, planting is delayed by wetness or flooding. Scouring, deposition, and streambank cutting are hazards. In some years overflow damages the crops. A system of surface drains or tile can help to remove excess water if suitable outlets are available. Leaving crop residue on the surface and regularly adding other organic material help to maintain good tilth and increase the rate of water infiltration.

In the areas used for pasture or hay, the flooding is a hazard and the seasonal wetness is a limitation. Subsurface tile drains can lower the water table. Overgrazing causes surface compaction and poor tilth. Proper stocking rates, rotation grazing, restricted use during wet periods, and applications of fertilizer help to keep the pasture in good condition. In the areas used for hay, the flooding delays harvesting during some years.

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

The land capability classification is IIw.

3334—Birds silt loam, frequently flooded. This nearly level, poorly drained soil is in low areas on flood plains. It is frequently flooded for long periods from March through June in most years. Individual areas are irregular in shape and range from 5 to 20 acres in size.

Typically, the surface layer is very dark grayish brown and dark gray, friable silt loam about 10 inches thick. The substratum to a depth of 60 inches or more is grayish brown and gray, mottled, friable silt loam. In some places the substratum contains more sand. In other places it is more acid.

Included with this soil in mapping are the somewhat poorly drained Wakeland soils on slight rises. Also included, in slight depressions, are soils that are ponded for extended periods. Included soils make up 5 to 10 percent of the unit.

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

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

The crops commonly grown in the county can be grown in most areas of this soil because a drainage system has been installed. In most years, however, the seasonal wetness and the flooding delay planting. In some years overflow damages the crops (fig. 6). A system of surface drains or tile can help to remove excess surface water if suitable outlets are available. Minimizing tillage, leaving crop residue on the surface, and regularly adding other organic material improve tilth and increase the rate of water infiltration.

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

The land capability classification is IIIw.

Figure 6.—Soybeans damaged by floodwater in an area of Birds silt loam, frequently flooded.

3382—Belknap silt loam, frequently flooded. This nearly level, somewhat poorly drained soil is in the slightly higher areas on broad flood plains. It is frequently flooded for brief or long periods from January through June in most years. Individual areas are irregularly shaped or long and wide and range from 10 to 75 acres in size.

Typically, the surface layer is dark brown and brown, mottled, friable silt loam about 17 inches thick. The substratum to a depth of 60 inches or more is grayish brown, light brownish gray, and gray, mottled, friable silt loam. In some areas the substratum has medium acid layers. In other areas the soil is browner throughout. In a few areas the surface layer is grayer. In places the substratum contains more sand.

Included with this soil in mapping are small areas of the somewhat poorly drained Banlic soils and the poorly drained Bonnie soils. Banlic soils are on low terraces. They have a firm and brittle layer. Bonnie soils are in slight depressions. Included soils make up 6 to 12 percent of the unit.

Water and air move through the Belknap soil at a moderate or moderately slow rate. Surface runoff is slow. The seasonal high water table is 1 to 3 feet below the surface from January through June in most years. Available water capacity is very high. Organic matter content is moderately low. The potential for frost action is high.

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

Corn and soybeans can be grown on this soil because a drainage system has been installed. In some years, however, planting is delayed by wetness or flooding. Scouring, deposition, and streambank cutting are hazards. In some years overflow damages the crops. A system of surface drains or tile can help to remove excess water if suitable outlets are available. Leaving crop residue on the surface and regularly adding other organic material help to maintain good tilth and increase the rate of water infiltration.

In areas used for pasture or hay, the flooding is a hazard and the seasonal wetness is a limitation. Subsurface tile drains can lower the water table. Overgrazing causes surface compaction and poor tilth. Proper stocking rates, rotation grazing, restricted use during wet periods, and applications of fertilizer help to keep the pasture in good condition. In areas used for hay, the flooding delays harvesting during some years.

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

The land capability classification is IIw.

3415—Orion silt loam, frequently flooded. This nearly level, somewhat poorly drained soil is on flood plains along small streams that drain mainly from former prairie areas on loess-covered till plains. It is frequently flooded for brief periods from March through May in most years. Most areas are dissected by stream channels. Individual areas are long and narrow or irregularly shaped and range from 5 to 30 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 7 inches thick. The substratum is dark brown and dark grayish brown, mottled silt loam about 17 inches thick. Below this to a depth of 60 inches or more is a buried soil of mottled silt loam. The upper part of the buried soil is very dark gray and very dark grayish brown and is friable, and the lower part is grayish brown and very dark gray and is firm. In some areas the buried soil is not so close to the surface. In other areas the surface layer is thicker and darker. In places the content of sand is higher.

Included with this soil in mapping are small areas of the moderately well drained Wirt soils and the poorly drained Birds soils. Wirt soils are nearer the streams than the Orion soil. They are in the slightly higher landscape positions. Birds soils are in old oxbows in the lower areas. Included soils make up 10 to 15 percent of the unit.

Water and air move through the Orion soil at a moderate rate. Surface runoff is slow. The seasonal high water table is 1 to 3 feet below the surface from November through May in most years. Available water capacity is very high. Organic matter content is moderately low. The potential for frost action is high.

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

Corn and soybeans can be grown on this soil because a drainage system has been installed. In some years, however, planting is delayed by wetness or flooding. Scouring, deposition, and streambank cutting can occur during periods of flooding. In some years overflow damages the crops. A system of surface drains or tile can help to remove excess water if suitable outlets are available. Leaving crop residue on the surface and regularly adding other organic material help to maintain good tilth and increase the rate of water infiltration.

In areas used for pasture or hay, the flooding is a hazard and the seasonal wetness is a limitation. Subsurface tile drains can lower the water table. Overgrazing causes surface compaction and poor tilth. Proper stocking rates, rotation grazing, restricted use during wet periods, and applications of fertilizer help to keep the pasture in good condition. In areas used for hay, the flooding delays harvesting during some years.

If this soil is used as woodland, an equipment limitation is a management concern. Plant competition also is a management concern. It hinders the survival of desirable seedlings. The competition in openings where timber has been harvested can be controlled by chemical or mechanical means. Machinery should be used only when the soil is firm enough to support the equipment. Excluding livestock from the woodland helps to prevent destruction of the leaf mulch and of desirable young trees, surface compaction, and damage to tree roots. Measures that protect the woodland from fire are needed.

The land capability classification is IIw.

8787—Banlic silt loam, occasionally flooded. This nearly level, somewhat poorly drained soil is on low stream terraces above flood plains. It is occasionally flooded for brief periods from March through June in most years. Individual areas are irregularly shaped or oval and range from 5 to 40 acres in size.

Typically, the surface layer is dark grayish brown, friable silt loam about 9 inches thick. The subsurface layer is brown, friable silt loam about 10 inches thick. The subsoil extends to a depth of 60 inches or more. The upper part is pale brown, mottled, friable silt loam; the next part is pale brown and light brownish gray, mottled, firm and very firm, brittle silt loam; and the lower part is light brownish gray, mottled, firm, slightly brittle silty clay loam. In some areas the brittle layers are thinner. In a few areas the depth to a seasonal high water table is more than 3 feet. In places the subsoil has more sand.

Included with this soil in mapping are small areas of the poorly drained Bonnie and Birds soils in slight depressions, commonly below seepy uplands. Also included are some areas of soils that are frequently flooded. Included soils make up 10 to 15 percent of the unit.

Water and air move through the Banlic soil at a slow rate. Surface runoff is slow. The seasonal high water table is perched at a depth of 1 to 3 feet from January through June in most years. Available water capacity is moderate. Organic matter content is low. The potential for frost action is high.

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

The crops commonly grown in the county can be grown in most areas of this soil because a drainage system has been installed. In most years, however, wetness delays planting. Flooding is a hazard, but it occurs only rarely during the growing season. A system of surface drains reduces the wetness. Tilling when the soil is wet causes surface compaction and cloddiness. Keeping tillage to a minimum, leaving crop residue on the surface, and regularly adding other organic material help to maintain good tilth and increase the rate of water infiltration.

In areas used for pasture or hay, the flooding is a hazard and the seasonal wetness is a limitation. Subsurface tile drains can lower the water table. Overgrazing causes surface compaction and poor tilth. Proper stocking rates, rotation grazing, restricted use during wet periods, and applications of fertilizer help to keep the pasture in good condition. In areas used for hay, the flooding delays harvesting during some years.

The land capability classification is IIw.

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.

A recent trend in land use in some parts of the county has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

The map units in Marion County that are considered prime farmland are listed in table 5. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Some soils that have a seasonal high water table and all soils that are frequently flooded during the growing season qualify 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. A drainage system has been installed in most of the naturally wet soils in Marion County.

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other 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 very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the 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.

Water erosion is a major problem on the cropland and pasture in Marion County. Soils that have a slope of 2 percent or more are susceptible to excessive erosion. Some soils are so eroded that little or no surface soil remains. Blair silt loam, 4 to 10 percent slopes, severely eroded, is an example. Sheet erosion, or loss of the surface layer, is damaging for three reasons. First, the productivity of most soils is reduced as the surface layer is eroded away and the subsoil is incorporated into the plow layer. Loss of the surface layer is especially damaging on soils that have a clayey or unfavorable subsoil or have a root-restricting layer near the surface. Such layers include the bedrock underlying Eleva, Frondorf, and Gosport soils. Darmstadt, Huey, Grantfork, and Tamalco soils have an unfavorable subsoil that is high in content of exchangeable sodium. Ava soils have an unfavorable subsoil that is so firm and brittle that it cannot be penetrated by roots.

Second, erosion results in the deterioration of tilth in the surface soil and reduces the rate of water intake. In severely eroded areas preparing a seedbed is difficult because the more clayey surface soil tends to be cloddy if worked when wet. Also, severely eroded soils tend to crust after hard rains. The crust is hard when dry. As a result, the rate of water infiltration is decreased and runoff and erosion are excessive.

The third damaging effect of erosion is the pollution that occurs when the sediments and nutrients from eroding farmland enter streams. Erosion control helps to prevent this pollution and improves the quality of water for municipal use, recreation, and fish and wildlife.

Conservation practices provide a protective plant cover, increase the rate of water intake, reduce the runoff rate, and help to control erosion. On much of the cropland in Marion County, a combination of suitable conservation practices is needed to control erosion. The combination needed depends on the soil characteristics and the topography.

A conservation cropping system that keeps a plant cover on the surface for extended periods can hold soil losses to an amount that will not reduce the productive capacity of the soil. It is a combination of a cropping system and the needed cultural and management measures. Grasses and legumes commonly are included in the cropping sequence. A protective cover of these plants reduces the runoff rate, helps to control erosion, and provides nitrogen and improves tilth for the following crop. The grasses and legumes also provide feed for livestock or can be sold.

Terraces are most effective in controlling erosion on the more sloping soils. They help to control erosion by intercepting surface runoff and conducting it to a stable outlet at a nonerosive velocity. Terraces are a series of embankments or of ridges and channels that are properly spaced and have a proper grade. Outlets may be grassed waterways or tile outlets. In areas of Darmstadt, Tamalco, and other soils that have a high content of sodium in the subsoil, the depth to sodium adversely affects the suitability for terraces because the subsoil is more erosive and less productive than the surface soil. Atlas, Blair, and other soils in areas where the topography is irregular and slopes commonly are short and steep may not be suitable for terracing. Conversion to other uses, such as pasture, hay, or woodland, may be needed to control erosion on these soils.

Grassed waterways in drainageways safely dispose of surface runoff. They help to prevent gully erosion and provide outlets for terraces. Other conservation practices are contour farming and conservation tillage. Contour farming is planting and tilling on the contour of the land. It is most effective in areas where the slope is 7 percent or less. It is commonly used in combination with terraces. Conservation tillage is a system of tillage that retains protective amounts of crop residue on the surface throughout the year. It helps to control erosion by maintaining good soil structure, by preventing the formation of tillage pans, and by increasing the rate of water infiltration. It includes no-tillage (fig. 7), strip tillage, stubble mulching, and similar types of tillage.

Information about the design of conservation practices is available at the office of the Marion County Soil and Water Conservation District.

Some areas of the nearly level soils in the county are susceptible to soil blowing. A plant cover, surface mulch, and tillage methods that leave the surface rough help to control blowing. Windbreaks also are effective in controlling soil blowing.

A drainage system is needed on much of the more nearly level farmland in the county. Unless the very poorly drained to somewhat poorly drained soils are drained, the wetness can damage crops or delay planting in most years. These include Bonnie, Birds, Wakeland, and Holton soils on bottom land and Bluford, Cisne, Darmstadt, Hoyleton, Huey, Newberry, and Wynoose soils on uplands.

The design of drainage systems differs from soil to soil. Tile lines function well in the soils on bottom land if suitable outlets are available. Surface ditches are needed in some areas of these soils. Also, measures that reduce the hazard of flooding are needed in areas that are subject to damaging overflow during the growing season. Standard tile lines do not function well in slowly permeable or very slowly permeable soils on uplands. Surface ditches or a combination of scattered tile lines and surface inlets is needed in these soils. In some areas land smoothing is needed to fill in depressions.

Natural fertility is low in soils that have a high content of sodium in the subsoil. Excess sodium in Darmstadt, Huey, Tamalco, and Grantfork soils restricts the availability and uptake of some plant nutrients. Returning crop residue to the soils and regularly adding manure and other organic material improve fertility.

Natural fertility generally is high in Cisne, Hoyleton, and other dark soils that formed under prairie grasses and in Holton, Wirt, and other soils that formed in recently deposited loamy sediments. These soils have a deep root zone and a high or very high available water capacity. Plants on these soils respond well to applications of fertilizer and lime.

Natural fertility is medium in Ava, Bluford, Wynoose, and other soils that formed under forest vegetation and have a light colored surface layer. The subsoil of these soils ranges from extremely acid to strongly acid, and the supply of available phosphorus and potassium commonly is low. Applications of lime are needed to raise the pH level. Soil tests are needed to determine the proper amounts of lime and fertilizer to be applied.

Tilth has important effects on seed germination and water intake. It is generally best in soils that have granular structure, a surface layer of loam or silt loam, and a moderate content of organic matter. Richview and Wakeland are examples of soils in which tilth is good.

Soils that have a low content of organic matter or have a high content of sodium typically have weak structure in the surface layer. Examples of soils that

Figure 7.—An area of no-till corn where a cover of crop residue helps to control erosion.

have a low content of organic matter are Wynoose soils and the severely eroded Ava soils. Huey and Tamalco soils have a high content of sodium. Returning crop residue to the soils and adding manure or other organic material improve tilth. A conservation cropping system that is dominated by hay and pasture also improves tilth.

The need for an adequate amount of soil moisture during dry years is a management concern in soils that have an unfavorable or root-restricting subsoil. Examples of soils that have a moderate or low available water capacity are Ava, Atlas, Eleva, and Gosport soils.

If properly managed, the hayland and pasture in Marion County can be productive. Selection of suitable species for planting, applications of fertilizer, proper stocking rates, and rotation grazing help to keep the stand productive. Overgrazing or grazing when the soil is wet reduces productivity and causes surface compaction and excessive runoff and erosion. Assistance in managing specific tracts is available from the local office of 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 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. Available yield data from nearby counties and results of field trials and demonstrations also are 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 *(7)*. 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 table 6.

Woodland Management and Productivity

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 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 through 39, extremely high. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *R* indicates steep slopes; *X*, stoniness or rockiness; *W*, excess water in or on the soil; *T*, toxic substances in the soil; *D*, restricted rooting depth; *C*, clay in the upper part of the soil; *S*, sandy texture; and *F*, a high content of rock fragments in the soil. The letter *A* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: R, X, W, T, D, C, S, and F.

In table 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 may 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 also are subject to erosion. Ratings of the erosion hazard are based on the percent of the slope. A rating *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 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 kinds of soil, soil wetness, or topographic conditions. The factors used to rate 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 to provide 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 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 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 also are 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 by a combination of these measures.

The information in table 9 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 12 and interpretations for dwellings without basements and for local roads and streets in table 11.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

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

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

Wildlife Habitat

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 also are considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

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

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flooding. Soil temperature and soil moisture also are considerations. Examples of wild herbaceous plants are bluestem, goldenrod, beggarweed, wheatgrass, and grama.

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

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

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

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

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

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

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

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. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of absorbed cations. Estimates were made for erodibility, permeability, corrosivity, the 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, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and 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 or to a cemented pan, large stones, slope, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 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. The depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), the shrink-swell potential, the potential for frost action, and depth to a high water table affect the traffic-supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 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, and flooding affect absorption of the effluent. Large stones interfere with installation.

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

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

Table 12 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage 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 can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground-water pollution. Ease of excavation and revegetation 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 or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

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

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

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as 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 the 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, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is as much as 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 (fig. 8). Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

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

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

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

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and the potential for frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts,

Figure 8.—A pond reservoir in an area of Atlas silt loam, 4 to 10 percent slopes, eroded.

sodium, and sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

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

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

Soil Properties

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

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics. These results are reported in table 18.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help 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 *(3)* and the system adopted by the American Association of State Highway and Transportation Officials *(2)*.

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest. The AASHTO classification for soils tested, with group index numbers in parentheses, is given in table 18.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an 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 content of clay in 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 ⅓-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 and the amount of soil lost. 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 rock 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, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 17 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions (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 about flooding 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 *(8)*. 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 Alfisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udalf (*Ud*, meaning humid, plus *alf*, from Alfisol).

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

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

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. 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-loamy, mixed, mesic Typic Hapludalfs.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series. The Hickory series is an example of fine-loamy, mixed, mesic Typic Hapludalfs.

Soil Series and Their Morphology

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

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" *(9)*. Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" *(8)*. 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

The Atlas series consists of somewhat poorly drained, very slowly permeable soils on side slopes along drainageways. These soils formed mainly in accretion gley or glacial till that has a strongly developed paleosol. Slope ranges from 4 to 18 percent.

Atlas soils are commonly adjacent to Blair, Bluford, and Grantfork Variant soils. Blair soils are on side slopes above the Atlas soils. Bluford soils are on low ridges, on broad ridgetops, or on short side slopes above the Atlas soils. Grantfork Variant soils are on the lower or more truncated parts of the slopes.

Typical pedon of Atlas silt loam, 4 to 10 percent slopes, eroded, 1,320 feet south and 140 feet west of the northeast corner of sec. 36, T. 1 N., R. 1 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 in the upper part and weak medium platy structure in the lower part; friable; many fine and medium roots; very few distinct white (10YR 8/1) silt coatings on faces of peds and in pores; about 24 percent sand; medium acid; abrupt smooth boundary.

BE—7 to 10 inches; brown (10YR 5/3) silt loam; few fine faint light brownish gray (10YR 6/2) mottles; moderate fine subangular blocky structure; friable; many fine and medium roots; few distinct light gray (10YR 7/2) silt coatings and common distinct yellowish brown (10YR 5/4) clay films on faces of peds; strongly acid; abrupt smooth boundary.

2Btg1—10 to 13 inches; dark grayish brown (10YR 4/2) silty clay; few fine distinct yellowish brown (10YR 5/6) mottles; moderate medium angular blocky structure; very firm; common fine roots; few distinct light gray (10YR 7/2) silt coatings on faces of peds; very strongly acid; abrupt smooth boundary.

2Btg2—13 to 29 inches; light brownish gray (10YR 6/2) silty clay loam; common medium prominent yellowish brown (10YR 5/6) and common medium prominent brownish yellow (10YR 6/8) mottles; moderate medium prismatic structure; firm; common fine roots; few distinct gray (10YR 5/1) clay films on faces of peds and few distinct white (10YR 8/1) and brownish yellow (10YR 6/8) silt coatings on faces of peds and in pores; about 5 percent fine gravel; very strongly acid; gradual smooth boundary.

2Btg3—29 to 41 inches; olive gray (5Y 5/2) clay loam; common medium faint gray (5Y 5/1) and common medium prominent yellowish brown (10YR 5/6), brownish yellow (10YR 6/8), and light gray (10YR 6/1) mottles; moderate medium prismatic structure; very firm; common fine roots; few distinct white (10YR 8/1) and brownish yellow (10YR 6/8) silt coatings on faces of peds and in pores; common fine and medium irregular dark accumulations and stains of iron and manganese oxide; about 5 percent fine gravel; slightly acid; gradual smooth boundary.

2Btg4—41 to 51 inches; olive gray (5Y 5/2) silty clay loam; common medium prominent gray (10YR 5/1) and light gray (10YR 6/1) and common medium prominent brownish yellow (10YR 6/8) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; very firm; many fine and medium roots; few distinct white (10YR 8/1) and brownish yellow (10YR 6/8) silt coatings on faces of peds and in pores; common fine and medium irregular dark accumulations and stains of iron and manganese oxide; about 5 percent fine and medium gravel; neutral; clear smooth boundary.

2BC—51 to 60 inches; strong brown (7.5YR 5/6) clay loam; many medium prominent light gray (10YR 6/1) and common medium prominent brownish yellow (10YR 6/8) and distinct dark yellowish brown (10YR 4/6) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; very firm; few distinct white (10YR 8/1) and brownish yellow (10YR 6/8) silt coatings on faces of peds and in pores; common medium irregular dark stains of iron and manganese oxide; about 5 percent medium gravel; neutral.

The solum ranges from 42 to more than 60 inches in thickness. Some pedons have a mantle of loess or silty sediments that is 20 or less inches thick. The control section ranges from 35 to 45 percent clay and from 10 to 35 percent fine sand or coarser sand.

The Ap horizon has value of 4 or 5 and chroma of 2 to 4. It is typically silt loam, but the range includes silty clay loam and clay loam in severely eroded areas. Some pedons do not have a BE horizon. Some pedons have a Bt or 2Bt horizon, which has value of 4 to 6 and chroma of 3 or 4. The Btg or 2Btg horizon has hue of 10YR, 2.5Y, or 5Y or is neutral in hue. It has value of 4 to 6 and chroma of 0 to 3. It is very strongly acid to neutral in the upper part and can be mildly alkaline in the lower part. It is silty clay, clay, clay loam, or silty clay loam.

Ava Series

The Ava series consists of moderately well drained soils on side slopes, the crest of prominent ridges, and narrow ridgetops on the Illinoian till plain. These soils are moderately permeable in the upper part and very slowly permeable in the lower part. They formed in loess and in the underlying silty or loamy sediments. Slope ranges from 1 to 10 percent.

Ava soils are commonly adjacent to Bluford, Hickory, and Eleva soils. Bluford soils are on low ridges and broad ridgetops below the Ava soils. Hickory and Eleva soils are on the steeper side slopes below the Ava soils.

Typical pedon of Ava silt loam, 5 to 10 percent slopes, eroded, 340 feet north and 1,485 feet west of the southeast corner of sec. 23, T. 1 N., R. 3 E.

Ap—0 to 7 inches; dark brown (10YR 4/3) silt loam, very pale brown (10YR 7/3) dry; moderate medium granular structure; friable; common fine roots; common fine rounded dark nodules of iron and manganese oxide; slightly acid; abrupt smooth boundary.

Bt1—7 to 17 inches; strong brown (7.5YR 5/6) silty clay loam; moderate fine subangular blocky structure; friable; common fine roots; common distinct dark brown (7.5YR 4/4) and few distinct brown (7.5YR 5/4) clay films on faces of peds; few fine rounded dark nodules of iron and manganese oxide; very strongly acid; clear smooth boundary.

Bt2—17 to 20 inches; strong brown (7.5YR 5/6) silt loam; moderate fine subangular blocky structure; firm; few fine roots; common distinct pinkish gray (7.5YR 6/2) silt coatings and few distinct dark brown (7.5YR 4/4) clay films on faces of peds; common fine and medium irregular dark accumulations of iron and manganese oxide; very strongly acid; clear smooth boundary.

2Bx—20 to 44 inches; brown (7.5YR 5/4) loam; common medium distinct strong brown (7.5YR 5/6) mottles; moderate very coarse prismatic structure; firm; slightly brittle; few fine roots on horizontal faces of peds; few distinct brown (7.5YR 5/2) clay films on faces of peds; common fine and medium irregular dark accumulations of iron and manganese oxide; very strongly acid; gradual wavy boundary.

2C—44 to 60 inches; dark brown (7.5YR 4/4) loam; massive; firm; common fine and medium irregular dark accumulations of iron and manganese oxide; strongly acid.

The solum ranges from 40 to more than 60 inches in thickness. The loess ranges from 20 to 45 inches in thickness. Depth to the fragipan ranges from 20 to 35 inches. The fragipan is 10 to 36 inches thick. The control section ranges from 24 to 35 percent clay and has less than 15 percent fine sand or coarser sand.

The Ap or A horizon has value of 4 or 5 and chroma of 2 or 3. Some pedons have an E horizon. The Bt horizon has hue of 7.5YR or 10YR and chroma of 4 to 6. It is very strongly acid or strongly acid. The Bx or 2Bx horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 2 to 6. It is loam, clay loam, silty clay loam, or silt loam. It is strongly acid or very strongly acid. The 2C horizon is loam, silt loam, or clay loam.

Ava silt loam, 1 to 5 percent slopes, does not have the coarseness of structure or degree of brittleness that is definitive for the series. These differences, however, do not significantly affect the use or behavior of the soil.

Banlic Series

The Banlic series consists of somewhat poorly drained, slowly permeable soils on low stream terraces above flood plains. These soils formed in silty alluvium. Slope ranges from 0 to 2 percent.

Banlic soils are commonly adjacent to Belknap, Bonnie, and Wakeland soils. The adjacent soils are on flood plains below the Banlic soils.

Typical pedon of Banlic silt loam, occasionally flooded, 1,190 feet south and 1,310 feet west of the center of sec. 24, T. 2 N., R. 2 E.

A—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure in the upper part and weak thin platy structure in the lower part; friable; many very fine and fine roots; very few distinct dark gray (10YR 4/1) organic coatings and very few distinct white (10YR 8/1 dry) silt coatings on faces of peds; common medium irregular and few fine rounded dark nodules of iron and manganese oxide; neutral; clear smooth boundary.

E—9 to 19 inches; brown (10YR 5/3 and 4/3) silt loam; common medium faint pale brown (10YR 6/3) mottles; weak fine and medium prismatic structure; friable; common fine roots; few distinct dark grayish brown (10YR 4/2) organic coatings and few distinct white (10YR 8/1 dry) silt coatings on faces of peds; common fine and medium irregular dark nodules and few fine irregular dark accumulations of iron and manganese oxide; neutral; clear wavy boundary.

Bw—19 to 25 inches; pale brown (10YR 6/3) silt loam; few fine and medium faint light brownish gray (10YR 6/2) and few fine distinct yellowish brown (10YR 5/6) mottles; weak fine and medium prismatic structure; friable; common very fine roots; few distinct grayish brown (10YR 5/2) clay films and few distinct white (10YR 8/1 dry) silt coatings on faces of peds; common fine and medium irregular dark nodules and accumulations of iron and manganese oxide; strongly acid; abrupt smooth boundary.

Bx1—25 to 31 inches; light brownish gray (10YR 6/2) silt loam; common medium distinct yellowish brown (10YR 5/4) mottles; weak medium and coarse prismatic structure; very firm; brittle; few very fine roots between peds; many distinct white (10YR 8/1 dry) silt coatings on faces of peds; common fine and medium irregular dark nodules and accumulations of iron and manganese oxide; very strongly acid; abrupt smooth boundary.

Bx2—31 to 40 inches; pale brown (10YR 6/3) silt loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak coarse prismatic structure; firm; slightly brittle; few distinct grayish brown (10YR 5/2) clay films and common distinct white (10YR 8/1 dry) silt coatings on faces of peds; common fine and medium irregular dark nodules and accumulations of iron and manganese oxide; very strongly acid; clear smooth boundary.

Bx3—40 to 53 inches; light brownish gray (10YR 6/2) silt loam; many medium prominent strong brown (7.5YR 4/6) mottles; weak coarse prismatic structure; firm; slightly brittle; common distinct brown (10YR 5/3) and grayish brown (10YR 5/2) clay films and few distinct white (10YR 8/1 dry) silt coatings on faces of peds; common fine and medium irregular dark nodules and accumulations of iron and manganese oxide; very strongly acid; gradual smooth boundary.

BCg—53 to 60 inches; light brownish gray (10YR 6/2) silt loam; common medium faint light gray (10YR 6/1) and many medium prominent strong brown (7.5YR 5/6 and 4/6) mottles; weak medium prismatic structure; firm; few distinct grayish brown (10YR 5/2) clay films in pores; common fine irregular dark nodules and accumulations of iron and manganese oxide; medium acid.

The solum ranges from 45 to more than 60 inches in thickness. Depth to the Bx horizon ranges from 15 to 36 inches. The 10- to 40-inch control section ranges from 12 to 18 percent clay.

The Ap or A horizon has value of 4 or 5 and chroma of 2 or 3. The E horizon has chroma of 2 or 3. It is neutral to very strongly acid. The Bw and Bx horizons have value of 5 or 6. They are medium acid to very strongly acid.

Belknap Series

The Belknap series consists of somewhat poorly drained, moderately permeable or moderately slowly permeable soils on flood plains. These soils formed in silty alluvium. Slope ranges from 0 to 2 percent.

Belknap soils are commonly adjacent to Banlic, Bonnie, and Sharon soils. Banlic soils are on low stream terraces above the Belknap soils. Bonnie soils are slightly lower on the landscape than the Belknap soils. Sharon soils are slightly higher on the landscape than the Belknap soils. They are on natural levees along stream channels.

Typical pedon of Belknap silt loam, frequently flooded, 370 feet south and 2,145 feet east of the northwest corner of sec. 18, T. 3 N., R. 1 E.

Ap—0 to 7 inches; dark brown (10YR 4/3) silt loam, light brownish gray (10YR 6/2) dry; weak fine and medium granular structure; friable; slightly acid; abrupt smooth boundary.

AC—7 to 17 inches; brown (10YR 5/3) silt loam; common fine and medium faint grayish brown (10YR 5/2) mottles; weak thin platy and medium granular structure; friable; few fine rounded dark accumulations of iron and manganese oxide; strongly acid; clear smooth boundary.

Cg1—17 to 26 inches; grayish brown (10YR 5/2) and light brownish gray (10YR 6/2) silt loam; common medium distinct yellowish brown (10YR 5/6) mottles; appears massive but has weak bedding planes; friable; common fine rounded dark accumulations of iron and manganese oxide; very strongly acid; gradual smooth boundary.

Cg2—26 to 44 inches; grayish brown (10YR 5/2) and gray (10YR 6/1) silt loam; many medium and coarse distinct dark yellowish brown (10YR 4/4) mottles; massive; friable; common fine rounded dark accumulations of iron and manganese oxide; very strongly acid; gradual smooth boundary.

Cg3—44 to 60 inches; gray (10YR 6/1) and light brownish gray (10YR 6/2) silt loam; massive; friable; common distinct light gray (10YR 7/2 dry) silt coatings in pores; common fine rounded dark accumulations of iron and manganese oxide; very strongly acid.

The combined thickness of the A and AC horizons ranges from 6 to 19 inches. The 10- to 40-inch control section averages less than 18 percent clay and less than 15 percent fine sand or coarser sand. It is strongly acid or very strongly acid.

The Ap or A horizon has value of 4 or 5 and chroma of 2 or 3. The Cg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 4. It is dominantly silt loam, but some pedons have thin strata of loam or silty clay loam below a depth of 40 inches.

Birds Series

The Birds series consists of poorly drained, moderately slowly permeable soils on flood plains. These soils formed in silty alluvium. Slope ranges from 0 to 2 percent.

Birds soils are commonly adjacent to Petrolia and Wakeland soils. The very poorly drained Petrolia soils are in slightly depressional areas. They have more clay in the control section than the Birds soils. Wakeland soils are slightly higher on the landscape than the Birds soils.

Typical pedon of Birds silt loam, frequently flooded, 110 feet north and 460 feet west of the southeast corner of sec. 29, T. 2 N., R. 1 E.

A—0 to 5 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; many very fine and fine roots; very few distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; strongly acid; abrupt smooth boundary.

ACg—5 to 10 inches; dark gray (10YR 4/1) silt loam; moderate fine angular blocky structure; friable; common very fine roots; very few distinct light gray (10YR 7/2 dry) silt coatings and few distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds; few fine irregular dark accumulations of iron and manganese oxide; medium acid; abrupt smooth boundary.

Cg1—10 to 19 inches; gray (10YR 5/1) silt loam; common fine distinct grayish brown (10YR 5/2) and common fine prominent yellowish brown (10YR 5/6) mottles; friable; common very fine roots; few distinct light gray (10YR 7/2 dry) silt coatings and very few distinct very dark grayish brown (10YR 3/2) organic coatings in pores; few fine irregular dark accumulations of iron and manganese oxide; medium acid; clear smooth boundary.

Cg2—19 to 29 inches; gray (10YR 5/1) silt loam; common fine distinct grayish brown (10YR 5/2) and common fine prominent yellowish brown (10YR 5/6) mottles; massive; friable; few very fine roots; common distinct light gray (10YR 7/2 dry) silt coatings in pores; few fine irregular dark accumulations of iron and manganese oxide; medium acid; clear smooth boundary.

Cg3—29 to 42 inches; gray (10YR 5/1) silt loam; few fine prominent yellowish brown (10YR 5/6) and few fine distinct light brownish gray (10YR 6/2) mottles; massive; friable; few very fine roots; few distinct light gray (10YR 7/2 dry) silt coatings in pores; common fine irregular dark accumulations of iron and manganese oxide; medium acid; gradual wavy boundary.

Cg4—42 to 60 inches; light gray (10YR 6/1) silt loam; few fine prominent yellowish brown (10YR 5/6) and many medium faint grayish brown (10YR 5/2) mottles; massive; friable; few very fine roots; very few distinct light gray (10YR 7/2 dry) silt coatings, very few distinct dark gray (10YR 4/1) organic coatings, and few distinct very dark gray (10YR 3/1) coatings in pores; few fine irregular dark accumulations of iron and manganese oxide; neutral.

The solum ranges from 5 to 30 inches in thickness. The 10- to 40-inch control section ranges from 18 to 27 percent clay and has less than 15 percent fine sand or coarser sand. It ranges from strongly acid to mildly alkaline.

The Ap or A horizon has value of 4 or 5 and chroma of 1 or 2. The Cg horizon is typically silt loam or silty clay loam, but some pedons have strata of loam or sandy loam.

Blair Series

The Blair series consists of somewhat poorly drained, moderately slowly permeable soils on side slopes along drainageways on the dissected parts of the Illinoian till plain. These soils formed in silty sediments and in the underlying till. Slope ranges from 4 to 18 percent.

Blair soils are commonly adjacent to Atlas, Bluford, and Grantfork soils. Atlas and Grantfork soils are on side slopes below the Blair soils. Bluford soils are on ridgetops or side slopes above the Blair soils.

Typical pedon of Blair silt loam, 4 to 10 percent slopes, severely eroded, 1,775 feet north and 315 feet west of the southeast corner of sec. 2, T. 1 N., R. 1 E.

Ap—0 to 4 inches; dark brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; common fine distinct yellowish brown (10YR 5/6) mottles; weak medium and fine angular blocky structure; firm; common fine and very fine roots; few distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds; common fine rounded dark nodules of iron and manganese oxide; neutral; abrupt wavy boundary.

Bt1—4 to 11 inches; yellowish brown (10YR 5/4) silt loam; common fine distinct gray (10YR 6/1), common fine distinct grayish brown (10YR 5/2), and many fine distinct yellowish brown (10YR 5/6) mottles; moderate medium platy structure; friable; few fine and very fine roots; few distinct dark brown (10YR 4/3) clay films on faces of peds; few fine and few medium rounded dark nodules of iron and manganese oxide; very strongly acid; clear wavy boundary.

Bt2—11 to 25 inches; light yellowish brown (10YR 6/4) loam; few fine distinct gray (10YR 6/1), common fine distinct grayish brown (10YR 5/2), and common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium and fine prismatic structure parting to moderate medium angular blocky; friable; few very fine roots; few distinct dark brown (10YR 4/3) clay films on faces of peds; few fine rounded dark nodules and few medium irregular dark accumulations of iron and manganese oxide; about 3 percent fine and medium gravel; very strongly acid; clear wavy boundary.

Bt3—25 to 40 inches; grayish brown (10YR 5/2) loam; common fine faint gray (10YR 6/1) and common fine prominent strong brown (7.5YR 4/6) mottles; moderate medium and fine prismatic structure parting to moderate medium and fine angular blocky; firm; few very fine roots; common distinct dark grayish brown (10YR 4/2) and few distinct dark brown (10YR 4/3) clay films on faces of peds; few fine rounded dark nodules and few medium irregular dark accumulations of iron and manganese oxide; about 4 percent fine, medium, and coarse gravel; medium acid; gradual wavy boundary.

Bt4—40 to 54 inches; grayish brown (10YR 5/2) loam; many fine faint gray (10YR 6/1), common fine distinct yellowish brown (10YR 5/6), and common fine prominent strong brown (7.5YR 4/6) mottles; moderate medium and fine prismatic structure parting to moderate medium and fine angular blocky; firm; few very fine roots; few distinct dark grayish brown (10YR 4/2) clay films on faces of peds and in pores; few fine rounded dark nodules and few medium irregular dark accumulations of iron and manganese oxide; about 4 percent fine, medium, and coarse gravel; neutral; clear wavy boundary.

Btg—54 to 60 inches; gray (10YR 6/1) loam; many medium prominent yellowish brown (10YR 5/6) mottles; weak medium and fine prismatic structure parting to weak medium angular blocky; firm; common distinct dark grayish brown (10YR 4/2) and few distinct dark gray (10YR 4/1) clay films on faces of peds and in pores; common medium rounded dark concretions and common medium irregular dark accumulations of iron and manganese oxide; about 4 percent fine, medium, and coarse gravel; neutral.

The solum ranges from 50 to more than 60 inches in thickness. The Ap horizon has value of 4 or 5 and chroma of 2 to 4. It is typically silt loam but is silty clay loam or clay loam in some pedons. The Bt or 2Btg horizon has value of 4 to 6. It has chroma of 2 to 4 in the upper part and chroma of 1 or 2 in the lower part. It is silty clay loam, loam, silt loam, or clay loam. It is very strongly acid to medium acid in the upper part and strongly acid to mildly alkaline in the lower part.

The Blair soils in this survey area are taxadjuncts because they have more sand and less clay in the control section than is definitive for the series. They are classified as fine-loamy, mixed, mesic Aquic Hapludalfs. This difference does not significantly affect the use or behavior of the soils.

Bluford Series

The Bluford series consists of somewhat poorly drained, slowly permeable soils on low ridges, broad ridgetops, or short side slopes along drainageways on the Illinoian till plain. These soils formed in loess and in the underlying silty sediments. Slope ranges from 0 to 7 percent.

Bluford soils are commonly adjacent to Atlas, Ava, and Blair soils. Atlas and Blair soils are on side slopes below the Bluford soils. Ava soils are on side slopes and narrow ridgetops above the Bluford soils.

Typical pedon of Bluford silt loam, 2 to 5 percent slopes, 1,090 feet north and 1,120 feet west of the southeast corner of sec. 36, T. 1 N., R. 2 E.

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; common fine prominent strong brown (7.5YR 4/6) mottles; weak very fine and fine granular structure; friable; common fine and common medium rounded dark nodules of iron and manganese oxide; neutral; abrupt smooth boundary.

E—8 to 13 inches; pale brown (10YR 6/3) silt loam; many fine distinct yellowish brown (10YR 5/6) and few fine faint dark brown (10YR 4/3) mottles; weak medium and thin platy structure; friable; few medium and common fine rounded nodules of iron and manganese oxide; very strongly acid; clear smooth boundary.

Bt1—13 to 19 inches; brown (10YR 5/3) silty clay loam; common fine prominent strong brown (7.5YR 4/6) and many fine distinct yellowish brown (10YR 5/6) mottles; moderate medium and fine prismatic structure parting to moderate coarse and medium subangular blocky; firm; common distinct grayish brown (10YR 5/2) clay films on faces of peds and many distinct white (10YR 8/1 dry) silt coatings on faces of peds and in pores; few fine rounded dark nodules of iron and manganese oxide; very strongly acid; clear smooth boundary.

Bt2—19 to 26 inches; brown (10YR 5/3) silty clay; few fine prominent reddish brown (5YR 4/4) and many fine prominent strong brown (7.5YR 4/6) mottles; strong medium prismatic structure parting to strong fine prismatic and medium angular blocky; firm; many distinct dark grayish brown (10YR 4/2) clay films on faces of peds and common distinct white (10YR 8/1 dry) silt coatings on faces of peds and in pores; few fine rounded dark nodules of iron and manganese oxide; extremely acid; clear smooth boundary.

Bt3—26 to 37 inches; brown (10YR 5/3) silty clay; common fine prominent strong brown (7.5YR 4/6 and 5/6) mottles; strong medium prismatic structure parting to strong fine prismatic and coarse angular blocky; very firm; many distinct dark grayish brown (10YR 4/2) clay films on faces of peds and very few distinct white (10YR 8/1 dry) silt coatings on faces of peds and in pores; common fine rounded dark nodules of iron and manganese oxide; extremely acid; clear smooth boundary.

Bt4—37 to 44 inches; brown (10YR 5/3) silty clay loam; common fine distinct yellowish brown (10YR 5/6) and common fine prominent strong brown (7.5YR 4/6) mottles; moderate medium prismatic structure; firm; many distinct dark grayish brown (10YR 4/2) clay films on faces of peds and few distinct white (10YR 8/1 dry) silt coatings on faces of peds and in pores; common fine and few medium rounded dark nodules of iron and manganese oxide; extremely acid; abrupt smooth boundary.

2Btx—44 to 52 inches; brown (10YR 5/3) silt loam; many fine prominent strong brown (7.5YR 4/6), common fine distinct yellowish brown (10YR 5/6), and few fine faint light brownish gray (10YR 6/2) mottles; weak thick platy structure; firm; slightly brittle; many distinct dark grayish brown (10YR 4/2) and very few distinct very dark grayish brown (10YR 3/2) clay films on faces of peds and very few distinct white (10YR 8/1 dry) silt coatings in pores; common fine and few medium rounded dark nodules of iron and manganese oxide; very strongly acid; clear smooth boundary.

2BC—52 to 60 inches; grayish brown (10YR 5/2) silt loam; few fine faint light gray (10YR 6/1) and many fine prominent strong brown (7.5YR 4/6) and distinct yellowish brown (10YR 5/6) mottles; weak thick and thin platy structure; firm; common distinct dark grayish brown (10YR 4/2) and few distinct very dark grayish brown (10YR 3/2) clay films on faces of peds and very few distinct white (10YR 8/1 dry) silt coatings in pores; common fine and few medium rounded dark nodules of iron and manganese oxide; very strongly acid.

The solum ranges from 40 to more than 60 inches in thickness. The loess ranges from 30 to 45 inches in thickness. A Btx or 2Btx horizon is at a depth of 35 to 48 inches. It is 8 to 30 inches thick. The control section ranges from 35 to 42 percent clay and has less than 15 percent fine sand or coarser sand.

The Ap or A horizon has value of 4 or 5 and chroma of 2 or 3. The E horizon, if it occurs, has value of 5 or 6 and chroma of 2 to 4. The Bt horizon has value of 5 or 6 and chroma of 2 to 4. It is strongly acid or very strongly acid. The Btx or 2Btx horizon has value 5 or 6 and chroma of 2 to 4. It is silty clay loam, silt loam, or loam. It is very strongly acid to medium acid.

Bluford silt loam, 3 to 7 percent slopes, eroded, is a taxadjunct because it has less clay in the control section than is definitive for the series. In this survey area it is classified as a fine-silty, mixed, mesic Aeric Ochraqualf. This difference does not significantly affect the use or behavior of the soil.

Bonnie Series

The Bonnie series consists of poorly drained, moderately slowly permeable soils on broad flood plains. These soils formed in silty alluvium. Slope ranges from 0 to 2 percent.

Bonnie soils are commonly adjacent to Banlic and Belknap soils. Banlic soils are on low stream terraces above the Bonnie soils. Belknap soils are in the slightly higher areas on flood plains.

Typical pedon of Bonnie silt loam, frequently flooded, 945 feet south and 1,485 feet east of the center of sec. 3, T. 1 N., R. 4 E.

Ap1—0 to 5 inches; grayish brown (10YR 5/2) silt loam, light gray (10YR 7/2) dry; common fine prominent strong brown (7.5YR 5/8) mottles; weak medium granular structure; friable; few faint light gray (10YR 7/2 dry) silt coatings on faces of peds; medium acid; abrupt smooth boundary.

Ap2—5 to 10 inches; gray (10YR 6/1) silt loam; mixed with pockets of dark brown (10YR 4/3) material; many fine and medium prominent strong brown (7.5YR 4/6) mottles; weak fine and medium subangular blocky structure; friable; few faint light gray (10YR 7/2 dry) silt coatings on faces of peds; few medium rounded dark accumulations and stains of iron and manganese oxide; strongly acid; abrupt smooth boundary.

Cg1—10 to 17 inches; light brownish gray (10YR 6/2) silt loam; common medium faint brown (10YR 5/3) and common fine prominent strong brown (7.5YR 5/6) mottles; massive; friable; few faint light gray (10YR 7/2 dry) silt coatings in pores; few medium rounded dark accumulations and stains of iron and manganese oxide; strongly acid; clear smooth boundary.

Cg2—17 to 27 inches; light brownish gray (10YR 6/2) silt loam; many coarse faint brown (10YR 5/3) and common fine prominent strong brown (7.5YR 5/6 and 5/8) mottles; massive; friable; few medium rounded dark accumulations and stains of iron and manganese oxide; very strongly acid; clear smooth boundary.

Cg3—27 to 43 inches; light brownish gray (10YR 6/2) and grayish brown (10YR 5/2) silt loam; many coarse faint brown (10YR 5/3) and common fine prominent strong brown (7.5YR 5/8) mottles; massive; friable; few medium rounded dark accumulations and stains of iron and manganese oxide; very strongly acid; abrupt smooth boundary.

Cg4—43 to 60 inches; light brownish gray (10YR 6/2) silt loam; common medium prominent brownish yellow (10YR 6/8) and common fine prominent strong brown (7.5YR 5/8) mottles; appears massive but has weak bedding planes; friable and firm; few medium rounded dark accumulations and stains of iron and manganese oxide; strongly acid.

The A or Ap horizon ranges from 6 to 10 inches in thickness. The 10- to 40-inch control section ranges from 18 to 27 percent clay and has less than 15 percent fine sand or coarser sand.

The Ap or A horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 3. The Cg horizon has hue of 10YR or 2.5Y and chroma of 1 or 2. In some pedons it is silty clay loam below a depth of 40 inches.

Cisne Series

The Cisne series consists of poorly drained, very slowly permeable soils on the broad, nearly level parts of the Illinoian till plain. These soils formed in loess and in the underlying loamy sediments. Slope ranges from 0 to 2 percent.

Cisne soils are commonly adjacent to Hoyleton and Wynoose soils. Hoyleton soils are on low ridges above the Cisne soils or on short side slopes along drainageways below the Cisne soils. Wynoose soils have a surface layer that is lighter colored than that of the Cisne soils. They are in landscape positions similar to those of the Cisne soils.

Typical pedon of Cisne silt loam (fig. 9), 100 feet south and 1,160 feet west of the northeast corner of sec. 36, T. 4 N., R. 3 E.

Figure 9.—Profile of Cisne silt loam, which has distinct horizons. Depth is marked in inches.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak medium platy structure; friable; neutral; clear smooth boundary.

E1—8 to 11 inches; grayish brown (10YR 5/2) silt loam; mixed with pockets of very dark grayish brown (10YR 3/2) and dark brown (10YR 3/3) surface material; common fine distinct dark yellowish brown (10YR 4/6) mottles; weak fine granular and weak medium platy structure; friable; few medium rounded dark accumulations of iron and manganese oxide; strongly acid; abrupt smooth boundary.

E2—11 to 16 inches; light brownish gray (10YR 6/2) silt loam; common medium distinct dark yellowish brown (10YR 4/6) and yellowish brown (10YR 5/6) mottles; moderate thin and medium platy structure parting to weak fine granular; friable; many distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; few medium rounded dark accumulations of iron and manganese oxide; very strongly acid; abrupt smooth boundary.

Btg1—16 to 21 inches; grayish brown (10YR 5/2) silty clay; common medium prominent strong brown (7.5YR 4/6) and yellowish brown (10YR 5/8) mottles; strong fine prismatic structure; very firm; common distinct very dark grayish brown (10YR 3/2) and many distinct dark grayish brown (10YR 4/2) clay films on faces of peds and very few distinct light gray (10YR 7/2 dry) silt coatings in pores; common fine and medium rounded dark accumulations of iron and manganese oxide; very strongly acid: clear smooth boundary.

Btg2—21 to 30 inches; grayish brown (10YR 5/2) silty clay loam; common medium prominent yellowish brown (10YR 5/8) and few fine prominent strong brown (7.5YR 5/8) mottles; strong medium prismatic structure; very firm; few distinct very dark grayish brown (10YR 3/2) and common distinct dark grayish brown (10YR 4/2) clay films on faces of peds; common fine and medium rounded dark accumulations of iron and manganese oxide; very strongly acid; clear smooth boundary.

Btg3—30 to 42 inches; grayish brown (10YR 5/2) silty clay loam; common medium prominent strong brown (7.5YR 4/6) and few medium distinct dark yellowish brown (10YR 4/6) mottles; moderate coarse prismatic structure; firm; very few distinct very dark grayish brown (10YR 3/2) clay films in pores and few distinct dark grayish brown (10YR 4/2) clay films on faces of peds; very strongly acid; clear smooth boundary.

2Btg4—42 to 50 inches; light brownish gray (2.5Y 6/2) silty clay loam; few fine prominent dark yellowish brown (10YR 4/6) mottles; weak coarse prismatic structure; firm; very few distinct grayish brown (10YR 5/2) clay films on faces of peds; strongly acid; clear smooth boundary.

2BCg—50 to 55 inches; grayish brown (2.5Y 5/2) silty clay loam; common medium prominent strong brown (7.5YR 4/6) mottles; weak coarse subangular blocky structure; firm; very few distinct gray (10YR 5/1) clay films on faces of peds; many medium and coarse rounded dark nodules and irregular dark accumulations of iron and manganese oxide in pores; about 10 percent sand; strongly acid; abrupt smooth boundary.

2Cg—55 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam; few fine prominent strong brown (7.5YR 4/6) mottles; massive; firm; many medium and coarse rounded dark nodules and irregular dark accumulations of iron and manganese oxide in pores; neutral.

The solum ranges from 40 to more than 60 inches in thickness. The loess ranges from 30 to 55 inches in thickness. The control section ranges from 35 to 45 percent clay and has less than 15 percent fine sand or coarser sand.

The Ap horizon has value and chroma of 2 or 3. The E horizon has value of 4 to 7 and chroma of 1 or 2. The Btg horizon has value of 4 to 6 and chroma of 1 or 2. It is very strongly acid or strongly acid in the upper part and ranges to medium acid in the lower part. The 2Btg and 2BCg horizons have hue of 10YR or 2.5Y, value of 4 to 6, and chroma generally of 1 or 2. Pedons having an Ab horizon have value of 3 at the top of the paleosol. The 2Btg and 2BCg horizons are silty clay loam or silt loam. They are strongly acid to slightly acid.

Creal Series

The Creal series consists of somewhat poorly drained, moderately slowly permeable soils on foot slopes and low stream terraces above flood plains. These soils formed in a mixture of loess and silty local alluvium. Slope ranges from 1 to 5 percent.

Creal soils are commonly adjacent to Ava, Belknap, and Bluford soils. Ava soils are on the side slopes and crest of prominent ridges above the Creal soils. Belknap soils are on flood plains below the Creal soils. Bluford soils are on broad ridgetops above the Creal soils.

Typical pedon of Creal silt loam, 1 to 5 percent slopes, 1,485 feet north and 2,350 feet west of the southeast corner of sec. 13, T. 1 N., R. 4 E.

Ap—0 to 6 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; common fine distinct dark yellowish brown (10YR 4/6) and common fine faint gray (10YR 5/1) mottles; weak very fine and fine granular structure; friable; few medium and common fine rounded dark nodules of iron and manganese oxide; neutral; abrupt smooth boundary.

E1—6 to 9 inches; pale brown (10YR 6/3) silt loam; common fine distinct dark yellowish brown (10YR 4/6), common fine faint gray (10YR 5/1), and many fine distinct yellowish brown (10YR 5/6) mottles; weak fine and medium granular structure; friable; few medium and common fine rounded dark nodules of iron and manganese oxide; medium acid; clear smooth boundary.

E2—9 to 20 inches; brown (10YR 5/3) silt loam; few fine distinct dark yellowish brown (10YR 4/6), common fine distinct gray (10YR 6/1), and many fine distinct yellowish brown (10YR 5/6) mottles; weak medium angular blocky structure parting to weak fine and very fine angular blocky; friable; common medium and fine rounded dark nodules of iron and manganese oxide; strongly acid; clear smooth boundary.

EB—20 to 27 inches; grayish brown (10YR 5/2) silt loam; common fine distinct dark yellowish brown (10YR 4/6) mottles; moderate fine and very fine prismatic structure; friable; few medium and common fine rounded dark nodules of iron and manganese oxide; strongly acid; abrupt smooth boundary.

Bt—27 to 44 inches; light brownish gray (10YR 6/2) silty clay loam; many fine prominent strong brown (7.5YR 5/6) mottles; moderate medium and fine prismatic structure; friable; common distinct light gray (10YR 7/2 dry) silt coatings and many distinct grayish brown (10YR 5/2) clay films on faces of peds and in pores; few medium and common fine rounded dark nodules of iron and manganese oxide; strongly acid; gradual smooth boundary.

BC—44 to 60 inches; mottled yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) silty clay loam; common fine prominent gray (10YR 6/1) mottles; weak coarse prismatic structure; firm; very few distinct white (10YR 8/1 dry) silt coatings and few distinct dark grayish brown (10YR 4/2) clay films in pores; few medium and common fine rounded dark nodules of iron and manganese oxide; strongly acid.

The solum ranges from 50 to more than 60 inches in thickness. Depth to the Bt horizon ranges from 24 to 36 inches. The control section ranges from 25 to 35 percent clay and has less than 15 percent fine sand or coarser sand.

The Ap or A horizon has value of 4 or 5 and chroma of 2 or 3. The E horizon has chroma of 3 or 4. The Bt horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 4. It is very strongly acid to slightly acid.

Darmstadt Series

The Darmstadt series consists of somewhat poorly drained, very slowly permeable soils on low ridges or on short side slopes along drainageways on the Illinoian till plain. These soils formed in loess and in the underlying loamy sediments. Slope ranges from 0 to 6 percent.

Darmstadt soils are commonly adjacent to Cisne, Hoyleton, Huey, and Tamalco soils. Cisne soils are on the broad, nearly level parts of the till plain. They are lower on the landscape than the Darmstadt soils. Hoyleton soils are in landscape positions similar to those of the Darmstadt soils. They commonly are closely intermingled with areas of the Darmstadt soils. They do not have a natric horizon. Huey soils are in nearly level or slightly depressional areas below the Darmstadt soils. Tamalco soils are slightly higher on the landscape than the Darmstadt soils.

Typical pedon of Darmstadt silt loam, 3 to 6 percent slopes, eroded, 2,310 feet south and 390 feet west of the northeast corner of sec. 16, T. 2 N., R. 1 E.

Ap—0 to 7 inches; dark brown (10YR 3/3) silt loam, pale brown (10YR 6/3) dry; mixed with common fine pockets of yellowish brown (10YR 5/4) and strong brown (7.5YR 5/6) subsoil material; weak fine granular structure in the upper part and weak thin platy structure in the lower part; friable; common very fine and fine roots; common fine and medium rounded dark nodules of iron and manganese oxide; medium acid; clear wavy boundary.

Bt1—7 to 14 inches; yellowish brown (10YR 5/4) silty clay; few fine prominent strong brown (7.5YR 5/6) and common fine distinct grayish brown (10YR 5/2) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; very firm; few very fine and fine roots; common distinct dark brown (10YR 4/3) clay films on faces of peds; few fine rounded dark nodules of iron and manganese oxide; medium acid; abrupt smooth boundary.

Bt2—14 to 20 inches; brown (10YR 5/3) silty clay loam; few medium prominent strong brown (7.5YR 4/6), many medium and coarse faint yellowish brown (10YR 5/4), and many medium faint grayish brown (10YR 5/2) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; firm; few very fine roots; common faint grayish brown (10YR 5/2) clay films on faces of peds; common fine and medium rounded and irregular dark nodules and accumulations of iron and manganese oxide; mildly alkaline; clear smooth boundary.

2Bt3—20 to 35 inches; dark yellowish brown (10YR 4/4) and gray (10YR 5/1) silty clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate coarse angular blocky; firm; few very fine roots; few faint brown (10YR 5/3) clay films on faces of peds; common medium and coarse irregular dark accumulations of iron and manganese oxide and few fine irregular nodules and accumulations of calcium carbonate; about 1 percent fine gravel; slight effervescence; strongly alkaline; clear smooth boundary.

2Btg1—35 to 46 inches; grayish brown (2.5YR 5/2) silt loam; few fine prominent strong brown (7.5YR 4/6) and many medium and coarse prominent yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate coarse angular blocky; firm; common distinct gray (10YR 5/1) clay films on faces of peds; common medium and coarse irregular dark accumulations of iron and manganese oxide and common medium irregular nodules and accumulations of calcium carbonate; about 2 percent fine and medium gravel; slight effervescence; moderately alkaline; gradual wavy boundary.

2Btg2—46 to 60 inches; grayish brown (2.5YR 5/2) silty clay loam; few fine prominent strong brown (7.5YR 4/6) and many medium and coarse prominent yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate coarse angular blocky; firm; common distinct gray (10YR 5/1) and brown (10YR 5/3) clay films on faces of peds; common medium and coarse irregular dark accumulations of iron and manganese oxide and common medium irregular nodules and accumulations of calcium carbonate; about 2 percent fine and medium gravel; slight effervescence; moderately alkaline.

The solum ranges from 45 to 60 inches in thickness. Depth to the natric horizon ranges from 16 to 30 inches. The control section ranges from 27 to 35 percent clay and has less than 15 percent fine sand or coarser sand.

The Ap horizon has value of 3 to 5 and chroma of 2 or 3. The E horizon, if it occurs, has hue of 10YR, value of 5 or 6, and chroma of 2. The Bt horizon has hue of 10YR or 2.5Y and value of 4 to 6. It is very strongly acid to neutral. The Btg or 2Btg horizon has hue of 10YR or 2.5Y and value of 5 or 6. It is neutral to strongly alkaline.

Darmstadt silt loam, 0 to 2 percent slopes, is a taxadjunct because it has more clay in the control section than is definitive for the series. In this survey area it is classified as a fine, montmorillonitic, mesic Typic Natraqualf. This difference does not significantly affect the use or behavior of the soil.

Eleva Series

The Eleva series consists of moderately deep, somewhat excessively drained, moderately permeable or moderately rapidly permeable soils on side slopes along drainageways in strongly dissected areas. These soils formed in material weathered from interbedded siltstone and sandstone. Slope ranges from 25 to 45 percent.

Eleva soils are commonly adjacent to Ava, Gosport, and Hickory soils. Ava soils are on narrow ridgetops and side slopes above the Eleva soils. Gosport and Hickory soils are on side slopes at the upper reaches of drainageways or are on the upper part of side slopes above the Eleva soils.

Typical pedon of Eleva fine sandy loam, 25 to 45 percent slopes, 1,130 feet south and 1,100 feet east of the northwest corner of sec. 22, T. 1 N., R. 4 E.

Ap—0 to 4 inches; dark brown (10YR 4/3) fine sandy loam, pale brown (10YR 6/3) dry; weak medium subangular blocky structure parting to weak medium and fine granular; friable; common very fine and fine roots; few fine rounded dark nodules of iron and manganese oxide; neutral; abrupt smooth boundary.

Bt1—4 to 10 inches; yellowish brown (10YR 5/6) fine sandy loam; weak medium and fine prismatic structure parting to moderate medium angular blocky; friable; common very fine and fine roots; many distinct dark brown (10YR 4/3 and 3/3) clay films on faces of peds; common fine and medium rounded dark nodules of iron and manganese oxide; strongly acid; clear smooth boundary.

Bt2—10 to 20 inches; yellowish brown (10YR 5/6) fine sandy loam; moderate medium subangular blocky structure; friable; common prominent dark brown (7.5YR 4/4) clay films on faces of peds; strongly acid; clear smooth boundary.

Bt3—20 to 27 inches; yellowish brown (10YR 5/6) fine sandy loam; weak coarse prismatic and moderate medium and coarse subangular blocky structure; common distinct brown (7.5YR 4/4) clay films on faces of peds; strongly acid; clear smooth boundary.

Bt4—27 to 32 inches; strong brown (7.5YR 5/6) loamy sand; common fine faint strong brown (7.5YR 4/6) and many fine prominent light gray (10YR 6/1) mottles; weak coarse prismatic and moderate medium angular blocky structure; firm; common distinct brown (7.5YR 4/4) clay films on faces of peds; about 5 percent channers; strongly acid; clear smooth boundary.

C—32 to 37 inches; strong brown (7.5YR 5/6) loamy sand; common fine faint strong brown (7.5YR 4/6) and many fine prominent light gray (10YR 6/1) mottles; weak medium and coarse subangular blocky structure; firm; common distinct brown (7.5YR 4/4) clay films on faces of peds; about 10 percent channers; strongly acid; clear wavy boundary.

Cr—37 to 42 inches; thinly bedded sandstone and siltstone.

The thickness of the solum and the depth to weathered bedrock range from 20 to 40 inches.

The Ap or A horizon has value of 3 to 5 and chroma of 2 to 4. It is fine sandy loam or loam. The E horizon, if it occurs, has value of 4 or 5 and chroma of 3 or 4. The Bt horizon is sandy loam or loam. It is very strongly acid to medium acid. The C horizon has chroma or 4 to 6. It is strongly acid or medium acid.

The Eleva soils in this survey area are taxadjuncts because they do not have an argillic horizon and have less clay in the textural control section than is definitive for the series. They are classified as coarse-loamy, mixed, mesic Typic Dystrochrepts. These differences do not significantly affect the use or behavior of the soils.

Frondorf Series

The Frondorf series consists of moderately deep, well drained, moderately permeable soils on side slopes along drainageways in strongly dissected areas. These soils formed in material weathered from interbedded siltstone and sandstone. Slope ranges from 10 to 50 percent.

Frondorf soils are commonly adjacent to Ava, Blair, and Hickory soils. Ava soils are on narrow ridgetops and side slopes above the Frondorf soils. Blair and Hickory soils are on side slopes at the upper reaches of drainageways or are on the upper part of side slopes above the Frondorf soils.

Typical pedon of Frondorf silt loam, 10 to 18 percent slopes, eroded, 400 feet south and 1,750 feet east of the northwest corner of sec. 29, T. 1 N., R. 3 E.

Ap—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; mixed with few fine pockets of yellowish brown (10YR 5/4) material; moderate very fine and fine granular structure; friable; common very fine and fine roots; neutral; abrupt smooth boundary.

E—6 to 10 inches; yellowish brown (10YR 5/4) silt loam; mixed with few fine medium pockets of light yellowish brown (10YR 6/4) subsoil material; weak medium platy structure; friable; common very fine and fine roots; few distinct very dark gray (10YR 3/1) organic coatings on faces of peds; slightly acid; clear smooth boundary.

Bt1—10 to 24 inches; light yellowish brown (10YR 6/4) silty clay loam; common fine prominent red (2.5YR 4/6) mottles; moderate medium angular blocky structure parting to moderate fine angular blocky; friable; common very fine and fine roots; few distinct white (10YR 8/1 dry) silt coatings and common distinct brown (10YR 4/3) clay films on faces of peds; very strongly acid; abrupt smooth boundary.

2Bt2—24 to 35 inches; yellowish brown (10YR 5/6) channery sandy clay loam; few medium prominent gray (10YR 6/1) pockets and strata; moderate medium prismatic structure; firm; few distinct brown (10YR 4/3) clay films on faces of peds; few prominent very dark gray (10YR 3/1) organic coatings in channels; about 20 percent weathered sandstone fragments; strongly acid; abrupt smooth boundary.

2Cr—35 to 60 inches; yellowish brown (10YR 5/6), weathered sandstone and siltstone; few medium prominent gray (10YR 6/1) pockets and strata; massive; very firm; few medium irregular accumulations of iron and manganese oxide; medium acid.

The thickness of the solum and the depth to weathered bedrock range from 20 to 40 inches. The control section ranges from 20 to 35 percent clay and has more than 15 percent fine sand or coarser sand.

The Ap or A horizon has value of 3 to 5 and chroma of 2 to 4. It is silt loam or silty clay loam. The E horizon has value of 5 or 6 and chroma of 3 or 4. The 2Bt horizon is clay loam, sandy loam, loam, silty clay loam, or the channery analogs of those textures. It is very strongly acid to medium acid. The Cr horizon has chroma of 3 to 6. It is very strongly acid to medium acid.

Gosport Series

The Gosport series consists of moderately deep, moderately well drained, very slowly permeable soils on side slopes along drainageways in strongly dissected areas. These soils formed in material weathered from shale bedrock. Slope ranges from 10 to 45 percent.

Gosport soils are commonly adjacent to Ava, Hickory, and Eleva soils. Ava soils are on narrow ridgetops and side slopes above the Gosport soils. The well drained Hickory soils formed in glacial till. They are in landscape positions similar to those of the Gosport soils or are on the higher side slopes. Eleva soils are on side slopes below the Gosport soils.

Typical pedon of Gosport loam, 10 to 18 percent slopes, eroded, 1,815 feet south and 420 feet west of the northeast corner of sec. 31, T. 4 N., R. 4 E.

Ap—0 to 5 inches; dark brown (10YR 3/3) loam, pale brown (10YR 6/3) dry; moderate fine granular structure; friable; many fine roots; about 5 percent weathered shale fragments; strongly acid; abrupt smooth boundary.

Bw1—5 to 10 inches; brown (10YR 5/3) silty clay; weak very fine subangular blocky structure; firm; many fine roots; about 10 percent weathered clay shale fragments; very strongly acid; clear smooth boundary.

Bw2—10 to 14 inches; yellowish brown (10YR 5/4) silty clay; common fine prominent yellowish red (5YR 5/8) mottles; moderate fine subangular blocky structure; firm; common fine roots; common faint brown (10YR 5/3) clay films on faces of peds; about 25 percent weathered clay shale fragments; very strongly acid; gradual smooth boundary.

Bw3—14 to 27 inches; pale brown (10YR 6/3) silty clay loam; common medium distinct light gray (10YR 6/1) and few medium prominent strong brown (7.5YR 5/8) mottles; moderate fine subangular blocky structure; firm; common fine roots; common faint grayish brown (10YR 5/2) clay films on faces of peds; about 35 percent weathered shale fragments; strongly acid; gradual smooth boundary.

Cr1—27 to 46 inches; light gray (10YR 6/1), weathered silt loam shale; common medium distinct yellowish brown (10YR 5/4) mottles; gradual smooth boundary.

Cr2—46 to 60 inches; gray (10YR 5/1) shale bedrock.

The thickness of the solum and the depth to weathered bedrock range from 20 to 40 inches. The 10-

to 40-inch control section ranges from 35 to 55 percent clay.

The Ap horizon has value of 3 or 4 and chroma of 1 to 3. It is typically loam but is silt loam or silty clay loam in some pedons. The E horizon, if it occurs, has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. It is silt loam or loam. The Bw horizon is clay, silty clay, or silty clay loam. It is strongly acid to extremely acid. The Cr horizon has hue of 7.5YR or 10YR and chroma of 1 to 6.

Grantfork Series

The Grantfork series consists of somewhat poorly drained, slowly permeable soils on side slopes along drainageways on the dissected parts of the Illinoian till plain. These soils formed in loamy erosional sediments and in the underlying glacial till. Slope ranges from 4 to 12 percent.

Grantfork soils are commonly adjacent to Blair, Darmstadt, Grantfork Variant, and Hoyleton soils. Blair soils are on the higher or less truncated parts of the slopes above the Grantfork soils. Darmstadt and Hoyleton soils are on low ridges or on short side slopes above the Grantfork soils. Grantfork Variant soils have more clay in the control section than the Grantfork soils. They are in landscape positions similar to those of the Grantfork soils.

Typical pedon of Grantfork silt loam, in an area of Blair-Grantfork silt loams, 4 to 12 percent slopes, eroded, 1,360 feet south and 205 feet west of the center of sec. 23, T. 3 N., R. 2 E.

Ap—0 to 4 inches; dark brown (10YR 3/3) silt loam, pale brown (10YR 6/3) dry; mixed with few fine pockets of brown (10YR 5/3) subsurface material; weak very fine granular structure; friable; common very fine and fine roots; few fine rounded dark nodules of iron and manganese oxide; about 1 percent fine and medium gravel; very strongly acid; abrupt smooth boundary.

E—4 to 9 inches; brown (10YR 5/3) silt loam; common fine faint light brownish gray (10YR 6/2) mottles; weak medium and thin platy and weak medium subangular blocky structure; friable; common very fine and fine roots; common fine and medium rounded dark nodules of iron and manganese oxide; about 1 percent fine and medium gravel; strongly acid; clear smooth boundary.

Bt—9 to 16 inches; brown (10YR 5/3) loam; common fine distinct yellowish brown (10YR 5/6) and few fine faint light brownish gray (10YR 6/2) mottles; moderate fine and medium prismatic structure parting to moderate medium angular blocky; firm; common very fine and fine roots; common distinct dark gray (10YR 4/1) clay films on faces of peds; common fine and medium irregular dark accumulations and nodules of iron and manganese oxide; about 1 percent fine and medium gravel; medium acid; clear wavy boundary.

Btg1—16 to 30 inches; light brownish gray (10YR 6/2) silt loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate coarse angular blocky; firm; common very fine and fine roots; common distinct dark gray (10YR 4/1) clay films on faces of peds; common fine and medium irregular dark accumulations and nodules of iron and manganese oxide; about 3 percent fine and medium gravel; moderately alkaline; clear smooth boundary.

2Btg2—30 to 42 inches; light brownish gray (10YR 6/2) loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate coarse angular blocky; firm; common very fine and fine roots; many prominent dark gray (10YR 4/1) clay films on faces of peds; common medium irregular dark accumulations and nodules of iron and manganese oxide; about 5 percent fine, medium, and coarse gravel; strongly alkaline; clear wavy boundary.

2Btg3—42 to 53 inches; gray (10YR 6/1) loam; many medium and coarse prominent strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to weak coarse angular blocky; firm; few very fine roots; common distinct dark gray (10YR 4/1) and gray (10YR 5/1) clay films on faces of peds; common medium irregular dark accumulations and nodules of iron and manganese oxide; about 5 percent fine, medium, and coarse gravel; strongly alkaline; gradual wavy boundary.

2BCg—53 to 60 inches; gray (10YR 6/1) loam; many medium and coarse prominent strong brown (7.5YR 5/6) mottles; weak medium prismatic structure; firm and friable; few distinct gray (10YR 5/1) and dark gray (10YR 4/1) clay films on faces of peds; common medium irregular dark accumulations and nodules of iron and manganese oxide; about 5 percent fine, medium, and coarse gravel; strongly alkaline.

The solum ranges from 45 to more than 60 inches in thickness. The depth to till generally ranges from 30 to 45 inches. In some pedons, however, the till is at the surface. An exchangeable sodium concentration of 10 to 15 percent is in one or more subhorizons within a depth of 40 inches. The control section ranges from 25 to 35 percent clay and from 15 to 25 percent fine sand or coarser sand.

The Ap horizon has value of 3 or 4 and chroma of 2 to 4. The E horizon has value of 4 or 5 and chroma of 2 to 4. The Bt or 2Bt horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 4. It is loam, silt loam, or clay loam. It ranges from strongly acid to strongly alkaline in the upper part and from mildly alkaline to strongly alkaline in the lower part.

Grantfork Variant

The Grantfork Variant consists of somewhat poorly drained, very slowly permeable soils on side slopes along drainageways on the dissected parts of the Illinoian till plain. These soils formed mainly in accretion gley or glacial till that has a strongly developed paleosol. Slope ranges from 4 to 12 percent.

Grantfork Variant soils are commonly adjacent to Atlas, Darmstadt, and Hoyleton soils. Atlas soils are mainly on the higher or less truncated parts of the slopes above the Grantfork Variant soils. They commonly are closely intermingled with areas of the Grantfork Variant soils. Darmstadt and Hoyleton soils are on low ridges or short side slopes above the Grantfork Variant soils.

Typical pedon of Grantfork Variant silt loam, in an area of Atlas-Grantfork Variant silt loams, 4 to 12 percent slopes, eroded, 575 feet south and 1,115 feet west of the northeast corner of sec. 19, T. 2 N., R. 2 E.

Ap—0 to 6 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak medium and fine subangular blocky structure parting to weak medium and fine granular; friable; common very fine and fine roots; few fine and medium irregular dark accumulations of iron and manganese oxide; about 2 percent fine and medium gravel; neutral; abrupt smooth boundary.

Bt—6 to 12 inches; brown (10YR 5/3) silty clay; common fine faint light gray (10YR 6/1) and common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate coarse and medium angular blocky; very firm; few very fine roots; common fine and medium irregular dark accumulations of iron and manganese oxide; about 1 percent fine gravel; medium acid; clear smooth boundary.

Btg1—12 to 19 inches; grayish brown (10YR 5/2) clay loam; common fine faint light gray (10YR 6/1) and common fine distinct yellowish brown (10YR 5/6) mottles; moderate medium prismatic structure parting to moderate coarse angular blocky; very firm; few very fine roots; common distinct dark grayish brown (10YR 4/2) and few distinct dark gray (10YR 4/1) clay films on faces of peds; common fine and medium irregular dark accumulations of iron and manganese oxide; about 2 percent fine and medium gravel; neutral; clear smooth boundary.

Btg2—19 to 26 inches; light brownish gray (10YR 6/2) silty clay; common fine faint light gray (10YR 6/1) and many fine distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure; very firm; few very fine roots; few distinct gray (10YR 5/1) and few distinct grayish brown (10YR 5/2) clay films on faces of peds and very few distinct white (10YR 8/1 dry) silt coatings in pores; common fine and medium irregular dark accumulations of iron and manganese oxide; about 2 percent fine and medium gravel; neutral; abrupt smooth boundary.

Btg3—26 to 31 inches; grayish brown (10YR 5/2) silty clay loam; common fine prominent gray (7.5YR 6/1), few fine prominent strong brown (7.5YR 4/6), and many fine distinct yellowish brown (10YR 5/6) mottles; moderate medium and fine prismatic structure parting to moderate medium and coarse angular blocky; very firm; few very fine roots; few distinct dark grayish brown (10YR 4/2) and common distinct dark gray (10YR 4/1) clay films and very few distinct light gray (10YR 7/2 dry) silt coatings on faces of peds; few fine and medium irregular dark accumulations of iron and manganese oxide and common medium and coarse irregular accumulations and nodules of calcium carbonate; about 3 percent fine gravel; neutral; abrupt smooth boundary.

2Btg4—31 to 42 inches; light brownish gray (10YR 6/2) silty clay loam; common fine prominent gray (7.5YR 6/1) and many fine prominent strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to moderate medium and coarse angular blocky; very firm; few very fine roots; common distinct gray (10YR 5/1) and common distinct grayish brown (10YR 5/2) clay films and few distinct light gray (10YR 7/2 dry) silt coatings on faces of peds and in pores; common fine and medium irregular dark accumulations of iron and manganese oxide and common medium irregular accumulations of calcium carbonate; about 1 percent fine gravel; mildly alkaline; clear smooth boundary.

2BCg1—42 to 52 inches; light brownish gray (2.5Y 6/2) silty clay loam; common fine distinct light gray (10YR 6/1) and common fine prominent yellowish brown (10YR 5/6) mottles; strong medium and coarse prismatic and coarse angular blocky structure; very firm; few very fine roots; few distinct gray (10YR 5/1) and common distinct brown (10YR 5/3) clay films on faces of peds and few distinct dark grayish brown (10YR 4/2) clay films on faces of peds and in pores; common fine and medium irregular dark accumulations of iron and manganese oxide and common medium irregular accumulations and nodules of calcium carbonate; about 1 percent fine gravel; neutral; abrupt smooth boundary.

2BCg2—52 to 60 inches; light brownish gray (2.5Y 6/2) clay loam; common fine prominent yellowish brown (10YR 5/6) mottles; strong medium and coarse prismatic and coarse angular blocky structure; very firm; very few distinct gray (10YR 5/1) clay films on faces of peds and common distinct dark brown (10YR 4/3) clay films on faces of peds and in pores; many fine and medium irregular dark accumulations of iron and manganese oxide and common medium and coarse irregular accumulations and nodules of calcium carbonate; about 2 percent fine and medium gravel; neutral.

The solum ranges from 40 to more than 60 inches in thickness. Some pedons have a mantle of erosional sediments that is 20 or less inches thick. An exchangeable sodium concentration of 10 to 15 percent is in one or more subhorizons within a depth of 40 inches. The control section ranges from 35 to 45 percent clay and from 10 to 35 percent fine sand or coarser sand.

The Ap horizon has value of 3 or 4 and chroma of 2 or 3. It is silty clay loam or silt loam. The Bt or 2Bt horizon has hue of 10YR or 2.5Y and chroma of 1 to 3. It is silty clay loam, clay loam, silty clay, or clay. It ranges from strongly acid to mildly alkaline in the upper part and from mildly alkaline to strongly alkaline in the lower part.

Hickory Series

The Hickory series consists of well drained, moderately permeable soils on side slopes along drainageways in strongly dissected areas on the Illinoian till plain. These soils formed in glacial till. Slope ranges from 10 to 50 percent.

Hickory soils are commonly adjacent to Ava, Blair, and Eleva soils. Ava soils are on narrow ridgetops and side slopes above the Hickory soils. Blair soils are on side slopes along drainageways above the Hickory soils. Eleva soils are on the upper part of side slopes below the Hickory soils.

Typical pedon of Hickory loam, 18 to 35 percent slopes, 7,300 feet north and 1,535 feet east of the southwest corner of sec. 13, T. 1 N., R. 1 E.

A—0 to 5 inches; dark brown (10YR 3/3) loam; strong fine granular structure; very friable; many fine and medium roots; about 5 percent fine gravel; strongly acid; abrupt smooth boundary.

E—5 to 11 inches; yellowish brown (10YR 5/4) loam; weak medium subangular blocky structure; friable; many medium and fine roots; about 5 percent fine and medium gravel; strongly acid; abrupt smooth boundary.

Bt1—11 to 14 inches; yellowish brown (10YR 5/6) loam; moderate medium subangular blocky structure; firm; common medium and fine roots; common distinct dark yellowish brown (10YR 4/6) clay films on faces of peds; about 5 percent fine and medium gravel; strongly acid; clear smooth boundary.

Bt2—14 to 31 inches; yellowish brown (10YR 5/6) clay loam; moderate and strong fine and medium angular blocky structure; very firm; common medium roots; many prominent dark yellowish brown (10YR 4/6) clay films on faces of peds; common medium dark accumulations of iron and manganese oxide; about 5 percent fine and medium gravel; very strongly acid; gradual smooth boundary.

Bt3—31 to 39 inches; yellowish brown (10YR 5/6) clay loam; few medium distinct brown (10YR 5/3) mottles; moderate medium angular blocky structure; firm; few medium roots; many prominent dark yellowish brown (10YR 4/6) clay films on faces of peds; common medium dark accumulations of iron and manganese oxide; about 10 percent medium gravel; very strongly acid; gradual smooth boundary.

BC—39 to 45 inches; yellowish brown (10YR 5/6) loam; weak very coarse subangular blocky structure; firm; few fine roots; common prominent brown (10YR 4/3) clay films on vertical faces of peds; many medium accumulations of iron and manganese oxide; about 15 percent medium gravel; slightly acid; clear wavy boundary.

C—45 to 60 inches; yellowish brown (10YR 5/4) loam; massive; very firm; about 10 percent medium gravel; violent effervescence; moderately alkaline.

The solum ranges from 40 to more than 60 inches in thickness. Some pedons have a mantle of erosional loess as much as 20 inches thick. The depth to free carbonates is more than 40 inches. The control section ranges from 27 to 35 percent clay and from 15 to 45 percent fine sand or coarser sand.

The A or Ap horizon has value of 3 or 4 and chroma of 2 or 3. It is loam or silt loam. The Bt horizon has value of 4 to 6 and chroma of 3 to 6. It is clay loam, loam, silty clay loam, or gravelly clay loam. It is very strongly acid to medium acid. The C horizon has value of 5 or 6 and chroma of 3 to 6. It is sandy loam, loam, clay loam, or the gravelly analogs of those textures. It is strongly acid to moderately alkaline.

Holton Series

The Holton series consists of somewhat poorly drained, moderately permeable soils on narrow flood plains and along tributary streams on broad flood plains. These soils formed in loamy alluvium. Slope ranges from 0 to 2 percent.

Holton soils are similar to Wakeland soils and are commonly adjacent to Birds, Wakeland, and Wirt soils. Birds soils are slightly lower on the landscape than the Holton soils. Wakeland soils have less sand in the control section than the Holton soils. They are in landscape positions similar to those of the Holton soils. Wirt soils are on natural levees slightly above the Holton soils.

Typical pedon of Holton loam, frequently flooded, 1,125 feet north and 160 feet west of the center of sec. 33, T. 1 N., R. 2 E.

A1—0 to 2 inches; very dark grayish brown (10YR 3/2) loam, grayish brown (10YR 5/2) dry; weak medium granular structure; friable; many very fine and fine roots; common fine rounded dark nodules of iron and manganese oxide; neutral; abrupt smooth boundary.

A2—2 to 9 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; few fine prominent dark brown (7.5YR 3/4) and common fine faint light brownish gray (10YR 6/2) mottles; weak medium and coarse granular structure; friable; common very fine and fine roots; common fine and medium rounded dark nodules of iron and manganese oxide; about 36 percent sand; about 1 percent fine gravel; neutral; clear smooth boundary.

Bw1—9 to 14 inches; brown (10YR 5/3) silt loam; common fine distinct dark yellowish brown (10YR 3/4) and many fine faint grayish brown (10YR 5/2) mottles; weak medium and coarse angular blocky structure; friable; common very fine and fine roots; common distinct dark grayish brown (10YR 4/2) organic coatings on faces of peds; common medium rounded dark nodules of iron and manganese oxide; about 1 percent fine gravel; neutral; abrupt smooth boundary.

Bw2—14 to 26 inches; grayish brown (10YR 5/2) loam; common fine distinct dark yellowish brown (10YR 4/4 and 4/6) and many medium faint light brownish gray (10YR 6/2) mottles; weak medium prismatic structure parting to weak coarse angular blocky; friable; common very fine and fine roots; few coarse and many medium rounded dark nodules of iron and manganese oxide; about 2 percent fine gravel; mildly alkaline; clear smooth boundary.

C1—26 to 33 inches; grayish brown (10YR 5/2) loam; few fine distinct dark yellowish brown (10YR 4/6) and many medium faint light brownish gray (10YR 6/2) mottles; weak coarse prismatic structure; friable; common very fine and fine roots; common medium irregular dark accumulations and common medium and coarse rounded dark nodules of iron and manganese oxide; about 2 percent fine gravel; mildly alkaline; clear smooth boundary.

C2—33 to 53 inches; grayish brown (10YR 5/2) loam; common medium distinct light brownish gray (10YR 6/2) and light gray (10YR 7/1) mottles; weak medium and coarse prismatic structure; friable; common very fine and fine roots; many medium and coarse rounded and irregular dark nodules and accumulations of iron and manganese oxide; about 5 percent fine gravel; mildly alkaline; clear wavy boundary.

C3—53 to 60 inches; dark yellowish brown (10YR 4/4) fine sandy loam; common medium prominent dark brown (7.5YR 3/4) and common coarse distinct light brownish gray (10YR 6/2) mottles; massive; friable; few very fine and fine roots; many coarse and very coarse rounded and irregular dark nodules of iron and manganese oxide; about 5 percent fine gravel; mildly alkaline.

The solum ranges from 24 to 35 inches in thickness. The 10- to 40-inch control section ranges from 5 to 18 percent clay and has 15 percent or more fine sand or coarser sand.

The Ap or A horizon has value of 3 to 5. The Bw horizon has value of 4 or 5 and chroma of 2 to 4. It is silt loam, loam, or fine sandy loam. The C horizon has chroma of 1 to 4. It is loam, fine sandy loam, sandy clay loam, or loamy sand.

Hoyleton Series

The Hoyleton series consists of somewhat poorly drained, slowly permeable soils on knolls and low ridges or on short side slopes along drainageways on the Illinoian till plain. These soils formed in loess and erosional sediments. Slope ranges from 0 to 7 percent.

Hoyleton soils are similar to Bluford soils and commonly are adjacent to Bluford, Cisne, and Darmstadt soils. Bluford soils have a surface layer that is lighter colored than that of the Hoyleton soils. They are in landscape positions similar to those of the Hoyleton soils. The poorly drained Cisne soils are on the broad, nearly level parts of the till plain. Darmstadt soils have a natric horizon. They are in landscape positions similar to those of the Hoyleton soils. They commonly are closely intermingled with areas of the Hoyleton soils.

Typical pedon of Hoyleton silt loam, 0 to 2 percent slopes, 575 feet south and 2,475 feet east of the center of sec. 30, T. 2 N., R. 3 E.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular and thick platy structure; friable; neutral; abrupt smooth boundary.

E—8 to 12 inches; brown (10YR 5/3) silt loam; weak medium and thick platy structure; friable; neutral; abrupt smooth boundary.

Bt1—12 to 21 inches; brown (10YR 5/3) silty clay loam; many medium prominent yellowish red (5YR 4/6) mottles; strong fine and medium subangular blocky structure; firm; many distinct light brownish gray (10YR 6/2) silt coatings and many distinct dark grayish brown (10YR 4/2) clay films on faces of peds; very strongly acid; abrupt smooth boundary.

Bt2—21 to 30 inches; brown (10YR 5/3) silty clay; many medium prominent strong brown (7.5YR 5/6) and common medium prominent yellowish red (5YR 4/6) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; very firm; many distinct dark grayish brown (10YR 4/2) and very dark grayish brown (10YR 3/2) clay films on faces of peds; very strongly acid; clear smooth boundary.

Bt3—30 to 39 inches; pale brown (10YR 6/3) silty clay loam; many medium distinct yellowish brown (10YR 5/6) mottles; weak medium and coarse subangular blocky structure; firm; common faint grayish brown (10YR 5/2) clay films on faces of peds; common medium irregular dark stains of iron and manganese oxide; strongly acid; gradual smooth boundary.

2BC—39 to 50 inches; brown (10YR 5/3) silt loam; many medium and coarse distinct dark yellowish brown (10YR 4/6) mottles; weak medium and coarse subangular blocky structure; friable; common medium irregular dark stains of iron and manganese oxide; about 13 percent sand; about 1 percent fine gravel; medium acid; gradual smooth boundary.

2C—50 to 60 inches; brown (10YR 5/3) silty clay loam; many coarse distinct dark yellowish brown (10YR 4/6) mottles; massive; about 15 percent sand; friable; about 1 percent fine gravel; neutral.

The solum ranges from 36 to more than 60 inches in thickness. The loess ranges from 30 to 50 inches in thickness. The control section ranges from 35 to 45 percent clay and has less than 15 percent fine sand or coarser sand.

The Ap horizon has value and chroma of 2 or 3. The E horizon, if it occurs, has value of 4 to 6 and chroma of 3 or 4. The Bt horizon has hue of 10YR or 7.5YR and chroma of 2 to 4. The 2Bt or 2BC horizon has value of 4 to 6 and chroma of 2 or 3. It is silt loam or silty clay loam. It is slightly acid to strongly acid.

Huey Series

The Huey series consists of poorly drained, very slowly permeable soils in nearly level or slightly depressional areas on the Illinoian till plain. These soils formed in loess and erosional sediments. Slope ranges from 0 to 2 percent.

Huey soils commonly are adjacent to Cisne, Darmstadt, Hoyleton, and Wynoose soils. Cisne soils have a surface layer that is darker than that of the Huey soils and do not have a natric horizon. They are in nearly level areas. They commonly are closely intermingled with areas of the Huey soils. The somewhat poorly drained Darmstadt and Hoyleton soils are on low ridges above the Huey soils or on short side slopes along drainageways below the Huey soils. Darmstadt soils have a natric horizon at a depth of more than 16 inches. Hoyleton and Wynoose soils do not have a natric horizon. Wynoose soils have more clay in the control section than the Huey soils. They are on the nearly level parts of the till plain.

Typical pedon of Huey silt loam, 380 feet north and 1,080 feet east of the southwest corner of sec. 3, T. 2 N., R. 1 E.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak very fine and fine granular structure; friable; many distinct very dark gray (10YR 3/1) organic coatings on faces of peds; few fine and medium rounded dark nodules of iron and manganese oxide; neutral; abrupt smooth boundary.

Btg1—7 to 15 inches; dark grayish brown (10YR 4/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure; firm; few distinct white (10YR 8/1 dry) silt coatings in pores and many distinct dark gray (10YR 4/1) clay films on faces of peds; few fine rounded dark nodules of iron and manganese oxide; neutral; clear smooth boundary.

Btg2—15 to 23 inches; light brownish gray (10YR 6/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure; firm; common distinct dark gray (10YR 4/1) clay films on faces of peds; few fine and medium rounded dark nodules of iron and manganese oxide; neutral; clear smooth boundary.

Btg3—23 to 36 inches; light brownish gray (10YR 6/2) silty clay loam; common fine distinct yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to weak coarse angular blocky; firm; common distinct gray (10YR 5/1) and grayish brown (10YR 5/2) clay films on faces of peds and very few distinct dark gray (10YR 4/1) and dark grayish brown (10YR 4/2) clay films in pores; common fine and medium rounded dark nodules of iron and manganese oxide; neutral; clear smooth boundary.

Btg4—36 to 52 inches; light brownish gray (2.5Y 6/2) silty clay loam; common fine prominent yellowish brown (10YR 5/6) and common fine prominent strong brown (7.5YR 4/6) mottles; moderate fine and medium prismatic structure parting to weak medium and coarse angular blocky; firm; few distinct dark gray (10YR 4/1) and common distinct gray (10YR 5/1) clay films on faces of peds and very few distinct dark grayish brown (10YR 4/2) clay films in pores; common fine and medium rounded dark nodules of iron and manganese oxide; mildly alkaline; abrupt smooth boundary.

2BCg—52 to 60 inches; light brownish gray (10YR 6/2) silty clay loam; common fine distinct light brownish gray (2.5Y 6/2) and common fine prominent strong brown (7.5YR 4/6 and 5/6) mottles; weak medium prismatic structure parting to weak thick and very thick platy; firm; many distinct dark gray (10YR 4/1) clay films on faces of peds; common fine and medium rounded dark nodules of iron and manganese oxide; about 1 percent fine gravel; slight effervescence; mildly alkaline.

The solum ranges from 40 to more than 60 inches in thickness. The loess ranges from 40 to 60 inches in thickness. Depth to the natric horizon is less than 16 inches. The control section ranges from 20 to 35 percent clay and has less than 15 percent fine sand or coarser sand.

The Ap horizon has value of 4 or 5. The E horizon, if it occurs, has hue of 10YR, value of 4 to 7, and chroma of 2. It is silt loam. The Btg horizon has chroma of 1 to 3. It is silty clay loam, silty clay, or silt loam. It is medium acid to moderately alkaline in the upper part and neutral to moderately alkaline in the lower part.

Newberry Series

The Newberry series consists of very poorly drained, slowly permeable soils in slightly depressional areas on the Illinoian till plain. These soils formed in loess and erosional sediments. Slope ranges from 0 to 2 percent.

Newberry soils are commonly adjacent to Cisne, Hoyleton, Huey, and Racoon soils. Cisne soils have more have more clay in the control section than the Newberry soils and typically have a thinner subsurface layer. They are in nearly level areas above the Newberry soils. The somewhat poorly drained Hoyleton soils are on knolls and low ridges above the Newberry soils or on short side slopes along drainageways below the Newberry soils. Huey soils have a natric horizon. They are in landscape positions similar to those of the Newberry soils or are in the higher nearly level areas. Racoon soils have a surface layer that is lighter colored than that of the Newberry soils. They are in landscape positions similar to those of the Newberry soils.

Typical pedon of Newberry silt loam, 2,390 feet north and 50 feet west of the southeast corner of sec. 5, T. 2 N., R. 2 E.

Ap—0 to 9 inches; very dark brown (10YR 3/2) silt loam, brown (10YR 5/3) dry; common fine distinct gray (10YR 5/1) mottles; weak fine and very fine granular structure in the upper part and weak medium and thin platy structure in the lower part; friable; common very fine roots; common fine and medium rounded dark nodules of iron and manganese oxide; neutral; clear smooth boundary.

Eg1—9 to 15 inches; grayish brown (10YR 5/2) silt loam; common fine faint light gray (10YR 6/1) mottles; weak thick platy structure; friable; common very fine roots; few distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds; common fine and medium dark rounded nodules of iron and manganese oxide; strongly acid; clear smooth boundary.

Eg2—15 to 21 inches; grayish brown (10YR 5/2) silt loam; common fine distinct dark yellowish brown (10YR 4/6) mottles; weak medium prismatic and thick platy structure; friable; few very fine roots; few distinct white (10YR 8/1 dry) silt coatings in pores and few distinct dark grayish brown (10YR 4/2) clay films on faces of peds and in pores; common fine and medium rounded nodules of iron and manganese oxide; very strongly acid; clear smooth boundary.

BEg—21 to 24 inches; grayish brown (10YR 5/2) silt loam; common fine distinct dark yellowish brown (10YR 4/6) mottles; weak fine and medium prismatic structure; friable; few very fine roots; very few distinct white (10YR 8/1 dry) silt coatings in pores and common distinct dark gray (10YR 4/1) clay films on faces of peds; common fine and medium rounded dark nodules of iron and manganese oxide; very strongly acid; clear smooth boundary.

Btg1—24 to 39 inches; grayish brown (10YR 5/2) silty clay loam; common fine prominent strong brown (7.5YR 4/6) mottles; moderate fine and medium prismatic structure parting to moderate medium angular blocky; firm; few very fine roots; very few distinct white (10YR 8/1 dry) silt coatings in pores and common distinct dark gray (10YR 4/1) and common distinct very dark gray (10YR 3/1) clay films on faces of peds and in pores; common fine and medium rounded nodules of iron and manganese oxide; very strongly acid; clear smooth boundary.

Btg2—39 to 45 inches; grayish brown (10YR 5/2) silty clay loam; common fine prominent strong brown (7.5YR 4/6) mottles; moderate medium prismatic structure; firm; few distinct very dark gray (10YR 3/1) and common distinct dark gray (10YR 4/1) clay films on faces of peds and in pores; few fine and medium rounded dark nodules of iron and manganese oxide; very strongly acid; clear smooth boundary.

BC—45 to 60 inches; grayish brown (10YR 5/2) silty clay loam; few fine faint gray (10YR 5/1) and common fine prominent strong brown (7.5YR 4/6) mottles; moderate very thick and thick platy structure; few fine and medium rounded dark nodules of iron and manganese oxide; about 1 percent fine gravel; very strongly acid.

The solum ranges from 50 to more than 60 inches in thickness. The loess ranges from 30 to 55 inches in thickness. The control section ranges from 27 to 35 percent clay and has less than 15 percent fine sand or coarser sand.

The Ap horizon has value of 2 or 3. The Eg horizon has value of 4 to 6. The Btg horizon has value of 4 to 6 and chroma of 1 or 2. It is silty clay loam or silt loam. It is strongly acid or very strongly acid in the upper part and ranges to medium acid in the lower part. The 2Btg or 2BCg horizon has value of 5 or 6. It is silty clay loam. It is very strongly acid to slightly acid.

Orion Series

The Orion series consists of somewhat poorly drained, moderately permeable soils on flood plains along small streams that drain mainly from areas of former prairies. These soils formed in light colored, recently deposited silty alluvium over a dark, silty buried soil. Slope ranges from 0 to 3 percent.

Orion soils are similar to Wakeland soils and commonly are adjacent to Atlas, Blair, Holton, and Wakeland soils. Atlas and Blair soils formed in glacial material and have more clay in the control section than the Orion soils. They are on side slopes in the uplands. Holton and Wakeland soils are in landscape positions similar to those of the Orion soils. They do not have a dark buried soil within a depth of 40 inches. Also, Holton soils have more sand in the control section than the Orion soils.

Typical pedon of Orion silt loam, frequently flooded, 160 feet north and 455 feet east of the center of sec. 1, T. 1 N., R. 1 E.

Ap—0 to 7 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; weak fine and very fine granular structure; friable; few very fine and fine roots; few distinct very dark gray (10YR 3/1) organic coatings on faces of peds; few fine rounded dark nodules of iron and manganese oxide; about 14 percent sand; medium acid; clear smooth boundary.

C1—7 to 19 inches; dark brown (10YR 4/3) silt loam; common fine faint dark grayish brown (10YR 4/2) and common fine faint gray (10YR 5/1) mottles; weak medium and thick platy structure parting to weak medium granular; friable; few very fine and fine roots; few distinct very dark gray (10YR 3/1) organic coatings on faces of peds; common fine rounded dark nodules of iron and manganese oxide; about 12 percent sand; slightly acid; gradual smooth boundary.

C2—19 to 24 inches; dark grayish brown (10YR 4/2) silt loam; common fine faint dark gray (10YR 4/1) and common fine faint yellowish brown (10YR 5/4) mottles; weak medium subangular blocky structure; friable; few very fine roots; few distinct very dark gray (10YR 3/1) organic coatings on faces of peds; common fine rounded dark nodules and common fine irregular dark stains of iron and manganese oxide; about 21 percent sand; medium acid; abrupt wavy boundary.

Ab1—24 to 35 inches; very dark gray (10YR 3/1) silt loam; many fine distinct grayish brown (10YR 5/2) and few fine distinct yellowish brown (10YR 5/4) mottles; weak medium and fine prismatic structure parting to weak fine and medium subangular blocky; friable; few very fine roots; common fine and few medium rounded dark nodules of iron and manganese oxide; about 1 percent fine gravel; about 23 percent sand; medium acid; clear smooth boundary.

Ab2—35 to 42 inches; mixed very dark gray (10YR 3/1) and very dark grayish brown (10YR 3/2) silt loam; common fine distinct grayish brown (10YR 5/2) and few fine distinct yellowish brown (10YR 5/4) mottles; moderate medium and fine prismatic structure; friable; few very fine roots; common fine and few medium rounded dark nodules of iron and manganese oxide; about 2 percent fine and medium gravel; about 34 percent sand; medium acid; clear smooth boundary.

ACb—42 to 60 inches; mixed grayish brown (10YR 5/2) and very dark gray (10YR 3/1) silt loam; common fine distinct yellowish brown (10YR 5/6) mottles;

weak medium prismatic structure; firm; few very fine roots; common fine and few medium rounded dark nodules of iron and manganese oxide; about 2 percent fine and medium gravel; about 35 percent sand; neutral.

The thickness of the solum ranges from 5 to 10 inches. It is the same as the thickness of the A horizon. The 10- to 40-inch control section ranges from 10 to 18 percent clay and has 15 percent fine sand or coarser sand. It ranges from medium acid to mildly alkaline.

The Ap or A horizon has value of 4 or 5 and chroma of 2 or 3. The C horizon has value of 4 or 5. The Ab horizon has value of 2 or 3. It is silt loam or silty clay loam.

The Orion soils in this survey area are taxadjuncts because they have slightly more sand in the control section than is definitive for the series. They are classified as coarse-loamy, mixed, nonacid, mesic Aeric Fluvaquents. This difference does not significantly affect the use or behavior of the soils.

Parke Series

The Parke series consists of well drained, moderately permeable soils on the side slopes and crest of prominent ridges and on narrow ridgetops on the Illinoian till plain. These soils formed in loess and glacial drift. Slope ranges from 3 to 7 percent.

Parke soils are similar to Richview soils and commonly are adjacent to Ava and Bluford soils. The moderately well drained Richview soils have a surface layer that is darker than that of the Parke soils. The moderately well drained Ava soils are in the slightly lower or less sloping areas. They have a fragipan. The somewhat poorly drained Bluford soils are on low ridges or broad ridgetops below the Parke soils. They have more clay in the control section than the Parke soils.

Typical pedon of Parke silt loam, 3 to 7 percent slopes, eroded, 235 feet north and 1,155 feet east of the southwest corner of sec. 26, T. 4 N., R. 2 E.

Ap1—0 to 3 inches; dark brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; mixed with common pockets of yellowish brown (10YR 5/6) subsoil material; weak medium subangular blocky structure parting to weak very fine and fine granular; friable; common very fine and fine roots; few fine rounded dark nodules of iron and manganese oxide; slightly acid; abrupt smooth boundary.

Ap2—3 to 6 inches; dark brown (10YR 4/3) silty clay loam, light yellowish brown (10YR 6/4) dry; mixed with common pockets of yellowish brown (10YR 5/6) subsoil material; weak fine prismatic structure parting to weak medium subangular blocky; firm; common very fine and fine roots; few fine and medium rounded dark nodules of iron and manganese oxide; slightly acid; abrupt smooth boundary.

Bt1—6 to 11 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium and fine prismatic structure parting to moderate medium angular blocky; firm; common very fine roots; few distinct pale brown (10YR 6/3) silt coatings in pores and many distinct dark yellowish brown (10YR 4/4) clay films on faces of peds; few fine rounded dark nodules of iron and manganese oxide; slightly acid; clear smooth boundary.

Bt2—11 to 18 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium and fine prismatic structure parting to moderate medium and coarse angular blocky; firm; common very fine roots; few distinct dark brown (7.5YR 4/4) and many distinct dark yellowish brown (10YR 4/4) clay films on faces of peds and few distinct pale brown (10YR 6/3) silt coatings in pores; common fine rounded dark nodules of iron and manganese oxide; medium acid; clear smooth boundary.

Bt3—18 to 24 inches; yellowish brown (10YR 5/6) silt loam; moderate medium prismatic structure parting to moderate coarse and medium angular blocky; firm; common very fine roots; few distinct dark brown (7.5YR 4/4) and common distinct dark yellowish brown (10YR 4/4) clay films on faces of peds and common distinct pale brown (10YR 6/3) silt coatings on faces of peds and in pores; few fine rounded dark nodules of iron and manganese oxide; medium acid; clear smooth boundary.

2Bt4—24 to 39 inches; strong brown (7.5YR 5/6) loam; moderate medium and coarse prismatic structure; firm; few very fine roots; very few distinct dark brown (10YR 4/3) clay films and few distinct pale brown (10YR 6/3) silt coatings in pores and many distinct reddish brown (5YR 4/3) clay films on faces of peds; common fine and medium rounded dark nodules of iron and manganese oxide; medium acid; gradual smooth boundary.

2Bt5—39 to 60 inches; strong brown (7.5YR 5/6) loam; weak coarse prismatic structure parting to weak very thick platy; firm; very few distinct white (10YR 8/1) silica coatings, very few distinct dark brown (10YR 4/3) clay films, and few distinct pale brown (10YR 6/3) silt coatings in pores and common distinct reddish brown (5YR 4/4) clay films on faces of peds; common fine and medium rounded dark nodules of iron and manganese oxide; about 3 percent fine gravel; medium acid; clear smooth boundary.

2Bt6—60 to 66 inches; strong brown (7.5YR 5/6) sandy clay loam; mixed with few fine pockets of yellowish brown (10YR 5/4) material; weak medium prismatic structure parting to weak coarse and medium angular blocky; firm; common distinct dark brown (10YR 4/3) clay films in pores and common distinct reddish brown (5YR 4/4) and red (2.5YR 4/6) clay films on faces of peds and in pores; common fine and medium rounded dark nodules of iron and manganese oxide; about 5 percent fine gravel; medium acid.

The solum is more than 60 inches thick. The loess ranges from 20 to 40 inches in thickness. The control section ranges from 20 to 35 percent clay and has less than 15 percent fine sand or coarser sand.

The Ap horizon has value of 4 or 5. The E horizon, if it occurs, has hue of 10YR, value of 5, and chroma of 3 or 4. It is silt loam. The Bt horizon has hue of 10YR or 7.5YR and chroma of 4 to 6. It ranges from slightly acid to very strongly acid. The 2Bt horizon has hue of 10YR, 7.5YR, or 5YR, value of 4 or 5, and chroma of 3 to 6. It is loam, clay loam, sandy clay loam, or silty clay loam. It ranges from very strongly acid to neutral.

Petrolia Series

The Petrolia series consists of very poorly drained, moderately slowly permeable soils in slightly depressional areas on broad flood plains. These soils formed in silty alluvium. Slope ranges from 0 to 2 percent.

Petrolia soils commonly are adjacent to Birds, Hickory, and Wakeland soils. The poorly drained Birds soils are in nearly level areas on flood plains. They have less clay in the control section than the Petrolia soils. The well drained Hickory soils are on side slopes in the uplands. The somewhat poorly drained Wakeland soils are in the slightly higher positions on flood plains. They have less clay in the control section than the Petrolia soils.

Typical pedon of Petrolia silty clay loam, wet, 1,610 feet north and 950 feet west of the southeast corner of sec. 24, T. 4 N., R. 2 E.

A—0 to 6 inches; dark grayish brown (10YR 4/2) silty clay loam, light brownish gray (10YR 6/2) dry; common fine distinct dark yellowish brown (10YR 4/6) and common fine faint gray (10YR 5/1) mottles; weak medium subangular blocky structure parting to weak medium and fine granular; firm; many very fine and fine roots; common fine irregular dark stains and common fine and medium rounded dark nodules of iron and manganese oxide; neutral; clear smooth boundary.

AC—6 to 17 inches; dark gray (10YR 4/1) silty clay loam; common fine prominent dark yellowish brown (10YR 4/6) and common fine faint gray (10YR 5/1) mottles; weak medium and coarse subangular blocky structure parting to weak medium and fine granular; firm; many very fine, fine, and medium roots; common fine irregular dark stains and few fine, medium, and coarse rounded dark nodules of iron and manganese oxide; neutral; gradual smooth boundary.

Cg1—17 to 33 inches; dark gray (10YR 4/1) silty clay loam; common fine prominent dark yellowish brown (10YR 4/6) and common fine faint grayish brown (10YR 5/2) mottles; moderate medium prismatic structure parting to moderate medium angular blocky and fine prismatic; firm; common very fine and fine roots; common distinct very dark gray (10YR 3/1) organic coatings on faces of peds; common fine and medium rounded dark nodules of iron and manganese oxide; neutral; clear smooth boundary.

Cg2—33 to 54 inches; gray (10YR 5/1) silty clay loam; common fine prominent dark yellowish brown (10YR 4/6) and common fine faint grayish brown (10YR 5/2) mottles; moderate medium prismatic structure parting to moderate medium and coarse angular blocky; firm; few very fine and fine roots; common distinct very dark gray (10YR 3/1) organic coatings on faces of peds; common fine and medium rounded dark nodules of iron and manganese oxide; neutral; clear smooth boundary.

Cg3—54 to 60 inches; light brownish gray (2.5Y 6/2) silty clay loam; common fine and medium prominent dark yellowish brown (10YR 4/6) mottles; weak medium prismatic structure parting to weak medium angular blocky and coarse subangular blocky; firm; few very fine and fine roots; common distinct very dark gray (10YR 3/1) organic coatings on faces of peds; common fine and medium rounded dark nodules of iron and manganese oxide; neutral.

The thickness of the solum ranges from 6 to 17 inches. It is the same as the thickness of the A horizon. The 10- to 40-inch control section ranges from 27 to 40 percent clay and has less than 15 percent fine sand or coarser sand. It is slightly acid or neutral.

The Ap or A horizon has hue of 10YR or 2.5Y and value of 4 or 5. It is typically silty clay loam but is silt loam in some pedons. The part of the Cg horizon below a depth of 40 inches ranges from silt loam to silty clay.

The Petrolia soils in this survey area are taxadjuncts because they have more clay in the control section than is definitive for the series. They are classified as fine, montmorillonitic, nonacid, mesic Typic Fluvaquents. This difference does not significantly affect the use or behavior of the soils.

Racoon Series

The Racoon series consists of poorly drained, slowly permeable soils in slightly depressional areas at the head of drainageways on the Illinoian till plain and on foot slopes above flood plains. These soils formed in a mixture of loess and silty local alluvium. Slope ranges from 0 to 3 percent.

Racoon soils are similar to Newberry soils and commonly are adjacent to Blair, Bluford, and Wynoose soils. The somewhat poorly drained Blair soils are on side slopes below the Racoon soils. The somewhat poorly drained Bluford soils are on low ridges and broad ridgetops above the Racoon soils or on short side slopes along drainageways below the Racoon soils. The very poorly drained Newberry soils have a surface layer that is darker than that of the Racoon soils. Wynoose soils have more clay in the control section than the Racoon soils. They are in nearly level areas above the Racoon soils.

Typical pedon of Racoon silt loam, 1,240 feet south and 125 feet west of the center of sec. 9, T. 1 N., R. 4 E.

Ap—0 to 6 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; few fine distinct dark yellowish brown (10YR 4/6) mottles; moderate medium granular structure; friable; common very fine roots; common fine irregular dark accumulations of iron and manganese oxide; neutral; abrupt smooth boundary.

Eg1—6 to 8 inches; grayish brown (10YR 5/2) silt loam; many fine faint dark brown (10YR 4/3) mottles; weak medium subangular blocky structure parting to weak medium platy; friable; common very fine roots; common fine irregular dark accumulations of iron and manganese oxide; neutral; abrupt smooth boundary.

Eg2—8 to 15 inches; light brownish gray (10YR 6/2) silt loam; many fine prominent dark yellowish brown (10YR 4/6) mottles; moderate medium subangular blocky structure parting to moderate thick platy; friable; common very fine roots; common fine irregular dark accumulations of iron and manganese oxide; extremely acid; clear smooth boundary.

Eg3—15 to 26 inches; light brownish gray (10YR 6/2) silt loam; common fine prominent yellowish brown (10YR 5/6) mottles; moderate medium subangular blocky structure parting to weak medium platy; friable; few very fine roots; few faint grayish brown (10YR 5/2) clay films on faces of peds; few fine irregular dark accumulations of iron and manganese oxide; very strongly acid; clear smooth boundary.

Btg1—26 to 29 inches; grayish brown (10YR 5/2) silty clay loam; common fine prominent strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; firm; many distinct dark gray (10YR 4/1) and common distinct dark grayish brown (10YR 4/2) clay films on faces of peds; few fine irregular dark accumulations of iron and manganese oxide; strongly acid; abrupt smooth boundary.

Btg2—29 to 39 inches; grayish brown (10YR 5/2) silty clay; common fine prominent strong brown (7.5YR 4/6 and 5/6) mottles; weak 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 irregular dark accumulations of iron and manganese oxide; strongly acid; clear smooth boundary.

Btg3—39 to 47 inches; grayish brown (10YR 5/2) silty clay loam; common fine prominent strong brown (7.5YR 4/6 and 5/6) mottles; moderate medium angular blocky structure; firm; common distinct white (10YR 8/1 dry) silt coatings and common distinct dark gray (10YR 4/1) clay films on faces of peds; few fine irregular dark accumulations of iron and manganese oxide; medium acid; abrupt smooth boundary.

2Btg4—47 to 56 inches; grayish brown (10YR 5/2) silty clay loam; common coarse prominent strong brown (7.5YR 5/6) mottles; moderate medium angular blocky structure; firm; few faint white (10YR 8/1 dry) silt coatings and few faint dark grayish brown (10YR 4/2) clay films on faces of peds; few fine irregular dark accumulations of iron and manganese oxide; medium acid; clear smooth boundary.

2BCg—56 to 60 inches; light brownish gray (10YR 6/2) silt loam; many coarse prominent yellowish brown (10YR 5/6) and common medium prominent dark brown (7.5YR 4/4) mottles; weak medium angular blocky structure; firm; few faint white (10YR 8/1 dry) silt coatings on faces of peds and few faint gray (10YR 5/1) clay films in pores; few fine irregular dark accumulations of iron and manganese oxide; medium acid.

The solum ranges from 40 to more than 60 inches in thickness. Depth to the Bt horizon ranges from 24 to 36 inches. The control section ranges from 27 to 35 percent clay and has less than 15 percent fine sand or coarser sand.

The Ap horizon has chroma of 2 or 3. The Btg horizon has value of 5 or 6 and chroma of 1 or 2. It is very strongly acid to medium acid.

Richview Series

The Richview series consists of moderately well drained, moderately permeable soils on the side slopes and crest of prominent ridges and on narrow ridgetops on the Illinoian till plain. These soils formed in loess and erosional sediments. Slope ranges from 1 to 10 percent.

Richview soils are similar to Parke soils and commonly are adjacent to Cisne, Hoyleton, and Newberry soils. The well drained Parke soils have a surface layer that is lighter colored than that of the Richview soils. The poorly drained Cisne soils are in nearly level areas below the Richview soils. The somewhat poorly drained Hoyleton soils are on low ridges or side slopes below the Richview soils. They have more clay in the control section than the Richview soils. The poorly drained Newberry soils are in slightly depressional areas near the base of prominent ridges.

Typical pedon of Richview silt loam, 1 to 5 percent slopes, 1,440 feet north and 310 feet east of the southwest corner of sec. 12, T. 1 N., R. 2 E.

Ap—0 to 9 inches; very dark grayish brown (10YR 3/2) silt loam, brown (10YR 5/3) dry; weak very fine and fine granular structure; friable; few fine rounded dark nodules of iron and manganese oxide; neutral; abrupt smooth boundary.

BA—9 to 12 inches; dark brown (10YR 4/3) silty clay loam; weak medium subangular blocky structure parting to moderate medium and fine granular; friable; few fine rounded dark nodules of iron and manganese oxide; neutral; clear smooth boundary.

Bt1—12 to 22 inches; yellowish brown (10YR 5/4) silty clay loam; common fine prominent strong brown (7.5YR 5/6) and common fine prominent yellowish red (5YR 4/6) mottles; moderate fine prismatic structure parting to moderate medium and fine angular blocky; friable; few distinct dark brown (10YR 3/3) and common distinct brown (10YR 4/3) clay films on faces of peds and few distinct white (10YR 8/1 dry) silt coatings on faces of peds and in pores; few medium and few fine rounded dark nodules of iron and manganese oxide; strongly acid; clear smooth boundary.

Bt2—22 to 34 inches; strong brown (7.5YR 4/6) silty clay loam; common fine faint strong brown (7.5YR 5/6) and common fine prominent red (2.5YR 4/6) and dark red (2.5YR 3/6) mottles; moderate medium prismatic structure parting to moderate coarse and medium angular blocky; friable; few distinct dark reddish brown (5YR 3/3) and many distinct dark brown (10YR 4/3) clay films on faces of peds and few distinct white (10YR 8/1 dry) silt coatings and common distinct very dark gray (10YR 3/1) clay films on faces of peds and in pores; common fine rounded dark accumulations and nodules of iron and manganese oxide; strongly acid; abrupt smooth boundary.

2Bt3—34 to 41 inches; strong brown (7.5YR 4/6) silt loam; common fine faint strong brown (7.5YR 5/6) mottles; weak medium prismatic structure; friable; very few distinct dark reddish brown (5YR 3/3) and very few distinct very dark gray (10YR 3/1) clay films in pores and few distinct white (10YR 8/1 dry) silt coatings and common distinct dark brown (10YR 4/3) clay films on faces of peds and in pores; common medium and fine rounded dark nodules of iron and manganese oxide; strongly acid; clear smooth boundary.

2Bt4—41 to 48 inches; strong brown (7.5YR 4/6) silt loam; common fine faint strong brown (7.5YR 5/6) and few fine prominent red (2.5YR 4/6) mottles; weak medium prismatic structure; friable; very few distinct dark reddish brown (5YR 3/3) and very few distinct very dark gray (10YR 3/1) clay films in pores and few distinct white (10YR 8/1 dry) silt coatings and common distinct dark brown (10YR 4/3) clay films on faces of peds and in pores; common medium and fine irregular dark accumulations and nodules of iron and manganese oxide; slightly acid; clear smooth boundary.

2Bt5—48 to 56 inches; strong brown (7.5YR 4/6) loam; common fine faint strong brown (7.5YR 5/6) and common fine distinct brown (7.5YR 5/2) mottles; weak medium prismatic structure; friable; very few distinct very dark gray (10YR 3/1) clay films in pores and few distinct white (10YR 8/1 dry) silt coatings and common distinct dark brown (10YR 4/3) and few distinct dark reddish brown (5YR 3/3) clay films on faces of peds and in pores; common fine and medium rounded dark nodules of iron and manganese oxide; neutral; gradual smooth boundary.

2BC—56 to 65 inches; strong brown (7.5YR 5/6) and light yellowish brown (10YR 6/4) fine sandy loam; common fine prominent light brownish gray (10YR 6/2) and common fine faint strong brown (7.5YR 4/6) mottles; massive; friable; very few distinct white (10YR 8/1 dry) silt coatings and very few distinct very dark gray (10YR 3/1) and common distinct dark reddish brown (5YR 3/3) clay films in pores; common fine and medium rounded dark nodules of iron and manganese oxide; neutral.

The solum ranges from 42 to more than 60 inches in thickness. The loess ranges from 30 to 50 inches in thickness. The control section ranges from 27 to 35 percent clay and has less than 15 percent fine sand or coarser sand.

The Ap horizon has value and chroma of 2 or 3. The E horizon, if it occurs, has value of 4 or 5 and chroma of 2 or 3. The Bt, 2Bt, and 2BC horizons have chroma of 3 to 6. They are very strongly acid to slightly acid.

Sharon Series

The Sharon series consists of moderately well drained, moderately permeable soils on natural levees along stream channels and on slight rises on broad flood plains. These soils formed in silty alluvium. Slope ranges from 0 to 2 percent.

Sharon soils are similar to Belknap soils and commonly are adjacent to Belknap and Hickory soils. The somewhat poorly drained Belknap soils are in the slightly lower positions on flood plains. The well drained Hickory soils are on side slopes in the uplands.

Typical pedon of Sharon silt loam, frequently flooded, 1,815 feet north and 205 feet west of the center of sec. 23, T. 1 N., R. 4 E.

Ap1—0 to 7 inches; dark brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; weak fine and medium granular structure; friable; few fine rounded dark nodules of iron and manganese oxide; neutral; clear smooth boundary.

Ap2—7 to 10 inches; dark brown (10YR 4/3) silt loam; mixed with common fine pockets of yellowish brown (10YR 5/6) material; weak fine and medium granular structure; friable; very few distinct light gray (10YR 7/2 dry) silt coatings and common distinct dark brown (10YR 3/3) organic coatings on faces of peds and in pores; few fine rounded dark nodules of iron and manganese oxide; neutral; abrupt smooth boundary.

C1—10 to 15 inches; dark brown (10YR 4/3) silt loam; weak medium subangular blocky structure; friable; very few distinct light gray (10YR 7/2 dry) silt coatings and few distinct dark brown (10YR 3/3) organic coatings on faces of peds and in pores; few fine rounded dark nodules of iron and manganese oxide; slightly acid; clear smooth boundary.

C2—15 to 29 inches; dark brown (10YR 4/3) silt loam; weak medium subangular blocky structure; friable; very few distinct light gray (10YR 7/2 dry) silt coatings and very few distinct dark brown (10YR 3/3) organic coatings in pores; few fine rounded dark nodules and few fine irregular dark stains of iron and manganese oxide; strongly acid; clear smooth boundary.

C3—29 to 41 inches; dark brown (10YR 4/3) silt loam; common fine prominent strong brown (7.5YR 4/6) and distinct yellowish brown (10YR 5/6) mottles and common fine distinct light brownish gray (2.5Y 6/2) linear mottles around large pores; massive; friable; few distinct light gray (10YR 7/2 dry) silt coatings and few distinct white (10YR 8/1) silica coatings in pores; few fine rounded dark nodules of iron and manganese oxide; strongly acid; gradual smooth boundary.

C4—41 to 48 inches; dark brown (10YR 4/3) and yellowish brown (10YR 5/4) silt loam; few fine distinct light brownish gray (2.5Y 6/2) and common fine prominent strong brown (7.5YR 4/6) and distinct yellowish brown (10YR 5/6) mottles; massive; friable; common distinct white (10YR 8/1) silica coatings in pores; few fine rounded dark nodules of iron and manganese oxide; strongly acid; gradual smooth boundary.

C5—48 to 60 inches; dark brown (10YR 4/3) and yellowish brown (10YR 5/4), stratified silt loam and loam; few fine distinct light brownish gray (2.5Y 6/2) and common fine prominent strong brown (7.5YR 4/6) and distinct yellowish brown (10YR 5/6) mottles; massive; friable; many distinct white (10YR 8/1) silica coatings in pores; few fine rounded dark nodules of iron and manganese oxide; strongly acid.

The thickness of the solum ranges from 10 to 32 inches. It is the same as the thickness of the A horizon. The 10- to 40-inch control section averages less than 18 percent clay and less than 15 percent fine sand or coarser sand. It is slightly acid to very strongly acid.

The Ap or A horizon has value of 4 or 5 and chroma of 3 or 4. The C horizon has value of 4 to 6 and chroma of 3 to 6.

Tamalco Series

The Tamalco series consists of moderately well drained, very slowly permeable soils on low ridges on the Illinoian till plain. These soils formed in loess and erosional sediments. Slope ranges from 1 to 3 percent.

Tamalco soils are similar to Darmstadt soils and commonly are adjacent to Cisne, Darmstadt, Hoyleton, and Huey soils. The poorly drained Cisne soils are in nearly level areas below the Tamalco soils. They do not have a natric horizon. The somewhat poorly drained Darmstadt and Hoyleton soils are in landscape positions similar to those of the Tamalco soils or are on short side slopes along drainageways below the Tamalco soils. Also, Hoyleton soils do not have a natric horizon. The poorly drained Huey soils are in nearly level or slightly depressional areas below the Tamalco soils. They have less clay in the control section than the Tamalco soils and have a natric horizon within a depth of 16 inches.

Typical pedon of Tamalco silt loam, 1 to 3 percent slopes, 75 feet south and 180 feet east of the northwest corner of sec. 1, T. 2 N., R. 1 E.

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak medium platy structure; friable; neutral; abrupt smooth boundary.

Bt1—8 to 12 inches; dark brown (7.5YR 4/4) silty clay; common fine prominent yellowish red (5YR 4/6) mottles; strong very fine angular blocky structure; very firm; many prominent strong brown (7.5YR 4/6) clay films on faces of peds; very strongly acid; abrupt smooth boundary.

Bt2—12 to 15 inches; strong brown (7.5YR 5/6) silty clay; few fine distinct dark yellowish brown (10YR 4/6) and few fine distinct dark brown (7.5YR 3/4) mottles; moderate very fine angular blocky structure; very firm; many distinct strong brown (7.5YR 4/6) clay films on faces of peds; very strongly acid; clear smooth boundary.

Bt3—15 to 20 inches; yellowish brown (10YR 5/4) silty clay loam; common medium distinct light brownish gray (10YR 6/2) and common medium distinct dark yellowish brown (10YR 4/6) mottles; moderate fine angular blocky structure; very firm; common distinct light brownish gray (10YR 6/2) silt coatings and common distinct dark brown (10YR 4/3) clay films on faces of peds; strongly acid; abrupt smooth boundary.

Bt4—20 to 26 inches; pale brown (10YR 6/3) silty clay loam; common medium distinct yellowish brown (10YR 5/6) and many coarse distinct light brownish gray (2.5Y 6/2) mottles; weak fine and medium angular blocky structure; firm; very few faint brown (10YR 5/3) clay films on faces of peds; many coarse irregular dark stains of iron and manganese oxide; slightly acid; clear smooth boundary.

Bt5—26 to 38 inches; pale brown (10YR 6/3) silt loam; many medium prominent yellowish brown (10YR 5/8) and many coarse prominent olive yellow (2.5Y 6/6) mottles; weak medium angular blocky structure; friable; very few faint grayish brown (10YR 5/2) clay films on faces of peds; common coarse irregular dark stains of iron and manganese oxide; very dark gray (10YR 3/1) krotovinas; moderately alkaline; abrupt smooth boundary.

2BC—38 to 42 inches; brown (10YR 5/3) and dark brown (10YR 4/3) silt loam; common medium distinct dark yellowish brown (10YR 4/6) mottles; weak medium angular blocky structure; friable; common coarse irregular dark stains of iron and manganese oxide; about 21 percent sand; moderately alkaline; clear smooth boundary.

2C1—42 to 49 inches; brown (10YR 5/3) silt loam; common medium distinct dark yellowish brown (10YR 4/6) mottles; massive; friable; common coarse irregular dark stains of iron and manganese oxide; about 25 percent sand; moderately alkaline; clear smooth boundary.

2C2—49 to 60 inches; brown (10YR 5/3) and dark yellowish brown (10YR 4/6) silt loam; few fine distinct pale brown (10YR 6/3) mottles; massive; friable; common coarse irregular dark stains of iron and manganese oxide; about 31 percent sand; moderately alkaline.

The solum and the loess range from 40 to 60 inches in thickness. Depth to the natric horizon ranges from 12 to 24 inches. The control section ranges from 35 to 42 percent clay and has less than 15 percent fine sand or coarser sand.

The Ap horizon has value of 4 or 5 and chroma of 2 or 3. The Bt horizon has chroma of 3 to 6 in the upper part and has hue of 10YR or 2.5Y, value of 5 or 6, and chroma of 1 to 4 in the lower part. It ranges from very strongly acid to neutral in the upper part and from neutral to moderately alkaline in the lower part. The C or 2C horizon has 7.5YR, value of 4 to 6, and chroma of 2 to 4. It is silt loam or clay loam.

Wakeland Series

The Wakeland series consists of somewhat poorly drained, moderately permeable soils on flood plains. These soils formed in silty alluvium. Slope ranges from 0 to 2 percent.

Wakeland soils are similar to Orion soils and commonly are adjacent to Birds, Hickory, Orion, and Wirt soils. The poorly drained Birds soils are in the slightly lower positions on flood plains. They have more clay in the control section than the Wakeland soils. The well drained Hickory soils formed in glacial till on side slopes in the uplands. Orion soils have a dark buried soil within a depth of 40 inches. They are in landscape positions similar to those of the Wakeland soils. The moderately well drained Wirt soils are in the slightly higher positions, mainly on natural levees adjacent to streams. They have more sand in the control section than the Wakeland soils.

Typical pedon of Wakeland silt loam, frequently flooded, 245 feet north and 2,225 feet west of the southeast corner of sec. 24, T. 4 N., R. 2 E.

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; common fine distinct dark yellowish brown (10YR 4/6) mottles; moderate medium and fine granular structure; friable; common distinct very dark gray (10YR 3/1) organic coatings on faces of peds; few fine rounded dark nodules of iron and manganese oxide; neutral; abrupt smooth boundary.

A—8 to 13 inches; dark brown (10YR 4/3) silt loam; common fine faint grayish brown (10YR 5/2) and common fine distinct dark yellowish brown (10YR 4/6) mottles; weak very fine and fine granular structure; friable; common distinct very dark gray (10YR 3/1) organic coatings on faces of peds; few fine rounded dark nodules of iron and manganese oxide; neutral; abrupt smooth boundary.

C1—13 to 20 inches; brown (10YR 5/3) silt loam; many fine distinct dark yellowish brown (10YR 4/6) and common medium distinct gray (10YR 5/1) mottles; massive; friable; few distinct white (10YR 8/1 dry) silt coatings and common distinct dark gray (10YR 4/1) clay films in pores; few fine rounded dark nodules of iron and manganese oxide; neutral; clear smooth boundary.

C2—20 to 28 inches; dark brown (10YR 4/3) silt loam; common fine distinct gray (10YR 5/1) and many fine distinct very dark yellowish brown (10YR 4/6) mottles; massive; friable; very few distinct white (10YR 8/1 dry) silt coatings and few distinct dark gray (10YR 4/1) clay films in pores; few fine rounded dark nodules of iron and manganese oxide; neutral; clear smooth boundary.

C3—28 to 46 inches; grayish brown (10YR 5/2) silt loam; common fine faint gray (10YR 6/1), common fine distinct dark yellowish brown (10YR 4/6), and many fine prominent dark brown (7.5YR 3/4) mottles; massive; friable; very few distinct dark gray (10YR 4/1) clay films in pores; common fine rounded dark nodules and few fine irregular dark stains of iron and manganese oxide; slightly acid; clear smooth boundary.

C4—46 to 52 inches; dark brown (10YR 4/3) silt loam; common fine distinct dark yellowish brown (10YR 4/6) and common fine distinct gray (10YR 5/1) mottles; massive; friable; very few distinct dark gray (10YR 4/1) clay films in pores; common fine rounded dark nodules of iron and manganese oxide; slightly acid; clear smooth boundary.

C5—52 to 60 inches; grayish brown (10YR 5/2), stratified silt loam and loam; common fine prominent strong brown (7.5YR 4/6) and common fine prominent dark brown (7.5YR 3/4) mottles; massive; friable; very few distinct dark gray (10YR 4/1) clay films in pores; few fine rounded dark nodules and common fine irregular dark stains of iron and manganese oxide; slightly acid.

The thickness of the solum ranges from 6 to 13 inches. It is the same as the thickness of the A horizon. The 10- to 40-inch control section averages less than 18 percent clay and less than 15 percent fine sand or coarser sand. It ranges from medium acid to neutral.

The Ap and A horizons have value of 2 or 3. The C horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 to 4. Some pedons have a dark buried soil below a depth of 40 inches.

Wirt Series

The Wirt series consists of well drained, moderately permeable soils on narrow flood plains and on natural levees along tributary streams on broad flood plains. These soils formed in loamy alluvium. Slope ranges from 0 to 2 percent.

Wirt soils are similar to Holton soils and commonly are adjacent to Hickory, Holton, and Wakeland soils. The well drained Hickory soils formed in glacial till on side slopes in the uplands. The somewhat poorly drained Holton and Wakeland soils are in the slightly lower positions on flood plains. Also, Wakeland soils have less sand in the control section than the Wirt soils.

Typical pedon of Wirt silt loam, frequently flooded, 2,560 feet south and 250 feet west of the northeast corner of sec. 21, T. 3 N., R. 1 E.

A1—0 to 3 inches; dark grayish brown (10YR 4/2) silt loam, pale brown (10YR 6/3) dry; weak medium and fine granular structure; friable; common very fine to coarse roots; common distinct very dark gray (10YR 3/1) organic coatings on faces of peds; few fine rounded dark nodules of iron and manganese oxide; neutral; abrupt wavy boundary.

A2—3 to 12 inches; dark brown (10YR 4/3) loam; weak coarse angular blocky structure; friable; common very fine to coarse roots; common distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds; few fine rounded dark nodules of iron and manganese oxide; slightly acid; abrupt wavy boundary.

Bw—12 to 36 inches; dark brown (10YR 4/3) silt loam; moderate medium prismatic structure parting to moderate coarse angular blocky; friable; common very fine to coarse roots; common distinct very dark grayish brown (10YR 3/2) organic coatings on faces of peds; few fine rounded dark nodules of iron and manganese oxide; medium acid; gradual wavy boundary.

C1—36 to 46 inches; brown (10YR 5/3), stratified silt loam and loam; massive; friable; few very fine to coarse roots; few distinct very dark grayish brown (10YR 3/2) organic coatings in pores; few fine rounded dark nodules of iron and manganese oxide; medium acid; abrupt wavy boundary.

C2—46 to 60 inches; yellowish brown (10YR 5/4) sandy loam; common fine distinct yellowish brown (10YR

5/6) and common medium distinct grayish brown (10YR 5/2) mottles; massive; very friable; few fine rounded dark nodules of iron and manganese oxide; medium acid.

The solum ranges from 24 to 40 inches in thickness. The 10- to 40-inch control section ranges from 10 to 18 percent clay and has 15 percent or more fine sand or coarser sand. It ranges from medium acid to neutral.

The Ap or A horizon has value of 3 to 5. It is dominantly loam but has thin strata of silt loam in some pedons. The Bw horizon has value of 3 to 5 and chroma of 3 to 6. It is silt loam, loam, or fine sandy loam. The C horizon has value of 4 or 5. It is silt loam to sandy loam or is the gravelly analogs of the textures within that range.

Wynoose Series

The Wynoose series consists of poorly drained, very slowly permeable soils on the broad, nearly level parts of the Illinoian till plain. These soils formed in loess and erosional sediments. Slope ranges from 0 to 2 percent.

Wynoose soils are similar to Cisne soils and commonly are adjacent to Atlas, Bluford, Cisne, and Racoon soils. The somewhat poorly drained Atlas soils formed in accretion gley and glacial till on side slopes along drainageways below the Wynoose soils. The somewhat poorly drained Bluford soils are on low ridges and broad ridgetops above the Wynoose soils or on short side slopes along drainageways below the Wynoose soils. Cisne soils have a surface layer that is darker than that of the Wynoose soils. They are in landscape positions similar to those of the Wynoose soils. Racoon soils have less clay in the control section than the Wynoose soils and have a thicker Eg horizon. They are in slightly depressional areas below the Wynoose soils.

Typical pedon of Wynoose silt loam, 90 feet north and 1,450 feet east of the center of sec. 31, T. 2 N., R. 3 E.

Ap1—0 to 6 inches; dark grayish brown (10YR 4/2) silt loam, very pale brown (10YR 7/3) dry; weak medium granular structure; friable; moderately alkaline; clear smooth boundary.

Ap2—6 to 10 inches; grayish brown (10YR 5/2) silt loam; common fine prominent strong brown (7.5YR 4/6) mottles; weak medium platy structure; friable; common fine rounded dark accumulations of iron and manganese oxide; neutral; abrupt smooth boundary.

Eg—10 to 13 inches; light gray (10YR 7/2) silt loam; common fine distinct yellowish brown (10YR 5/4) mottles; weak medium platy and subangular blocky structure; friable; common fine rounded dark accumulations of iron and manganese oxide; strongly acid; abrupt smooth boundary.

Btg1—13 to 21 inches; grayish brown (10YR 5/2) silty clay loam; few medium faint dark brown (10YR 4/3) mottles; strong fine prismatic structure parting to moderate fine and medium angular blocky; very firm; many distinct light gray (10YR 7/2 dry) silt coatings and many distinct grayish brown (10YR 5/2) clay films on faces of peds; few fine rounded dark accumulations of iron and manganese oxide; very strongly acid; clear smooth boundary.

Btg2—21 to 32 inches; light brownish gray (10YR 6/2) silty clay; few medium distinct dark yellowish brown (10YR 4/6) mottles; moderate medium prismatic structure parting to moderate medium angular blocky; very firm; few distinct light gray (10YR 7/2 dry) silt coatings and many distinct grayish brown (10YR 5/2) clay films on faces of peds; few fine rounded dark accumulations of iron and manganese oxide; very strongly acid; clear smooth boundary.

Btg3—32 to 47 inches; light brownish gray (10YR 6/2) silty clay loam; many medium prominent strong brown (7.5YR 5/6) mottles; moderate medium prismatic structure parting to weak and moderate medium and coarse subangular blocky; firm; few faint light gray (10YR 7/2 dry) silt coatings and many distinct grayish brown (10YR 5/2) clay films on faces of peds; common fine rounded dark accumulations of iron and manganese oxide; very strongly acid; clear smooth boundary.

2BCg1—47 to 51 inches; very dark grayish brown (10YR 3/2) silty clay loam; many coarse distinct yellowish brown (10YR 5/4) and many coarse prominent strong brown (7.5YR 5/6) mottles; weak medium and coarse subangular blocky structure; firm; few faint grayish brown (10YR 5/2) clay films on faces of peds; few fine rounded dark accumulations of iron and manganese oxide; strongly acid; clear smooth boundary.

2BCg2—51 to 60 inches; gray (10YR 5/1) silty clay loam; many coarse distinct yellowish brown (10YR 5/4) and many coarse prominent strong brown (7.5YR 5/6) mottles; weak coarse subangular blocky structure; friable; common medium irregular dark accumulations of iron and manganese oxide in pores; about 8 percent sand; strongly acid.

The solum ranges from 40 to 60 inches in thickness. The loess ranges from 30 to 55 inches in thickness. The control section ranges from 35 to 42 percent clay and has less than 15 percent fine sand or coarser sand.

The Ap or A horizon has value of 4 or 5. The Eg horizon has value of 6 or 7 and chroma of 1 or 2. The Btg horizon has hue of 10YR or 2.5Y. Pedons having an Ab horizon have value of 3 at the top of the paleosol. The Btg is strongly acid to extremely acid.

The 2BCg horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 1 or 2. It is silty clay loam or loam. It ranges from extremely acid to medium acid.

Formation of the Soils

This section relates the factors of soil formation to the soils in Marion County. Soils are a product of the environment in which they formed. They are the result of interactions among soil-forming processes *(5)*. The characteristics of a soil at any given time are determined by the physical, chemical, and mineralogical composition of the parent material; the climate under which the soil material accumulated and has existed since accumulation; the native vegetation and animal life on and in the soil; the relief, or lay of the land; and the length of time that the forces of soil formation have acted on the soil material *(4)*.

Climate, vegetation, and animal life are active factors of soil formation. They act on the parent material, slowly changing it into a natural body that has genetically related horizons. The effects of climate, vegetation, and animal life are conditioned by relief. The parent material affects the kind of soil profile that forms. Finally, time is needed for the transformation of the parent material into a soil.

The five factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effects on any one factor unless conditions are specified for the other four.

Parent Material

Dr. Leon R. Follmer, Illinois State Geological Survey, helped prepare this section.

Parent material is the unconsolidated mass in which a soil forms. The major kinds of parent material in Marion County are loess, or wind-deposited silt; alluvium; glacial till; deposits of accretion gley; and material weathered from bedrock.

Loess is the most extensive parent material in the county. The primary source of the loess in Illinois is the flood plains along the Mississippi and Illinois Rivers. In most areas on uplands, the loess is made up of two parts. The upper part is Peoria Loess, which was deposited during the last glaciation (late Wisconsinan) in the Midwest. It is generally 30 to 50 inches thick in the nearly level to gently sloping areas on uplands in Marion County. The lower part is Roxana Silt, which consists of a variety of silty and loamy sediments and has more sand than the overlying Peoria Loess. Roxana Silt was weathered before the last glaciation and was reworked by erosion in the more sloping areas. Soil formation in the Roxana Silt caused some mixing with the underlying Sangamon Soil, a paleosol that formed in the Glasford Formation (Illinoian till). Cisne and Hoyleton are examples of soils that formed in about 3 feet of Peoria Loess and in the underlying Roxana Silt.

Soils on the flood plains in the county formed in alluvium, which is material deposited by water. Many of these soils still receive sediments. Holton soils formed in loamy alluvium on narrow flood plains along intermittent streams and along some perennial streams, such as Davidson Creek. Belknap and Bonnie soils formed in silty alluvium on broad flood plains along perennial streams, such as the North Fork of the Kaskaskia River.

Before the loess was deposited, the Illinoian glacier covered all of Marion County. The deposits from this glacier are part of the Glasford Formation, which in this county includes Vandalia Till, Hagarstown drift, and deposits of accretion gley. Vandalia Till is quite extensive in southern Illinois and covers all of Marion County, except for some eroded areas. In most areas the unweathered till has a texture of loam. Hagarstown drift is water-sorted gravel, sand, and loamy material deposited locally during periods when the glacier melted. It overlies Vandalia Till. It generally is coarser textured than Vandalia Till and weathers to a redder color. Many of the prominent oval and oblong ridges in the county have cores consisting of Hagarstown drift. Parke soils are an examples of soils that formed on these ridges.

The deposits of accretion gley formed through accretion in areas where drainage was restricted and gleying occurred. These deposits generally consist of clay loam, silty clay loam, or finer textured material. The Sangamon paleosol formed in these deposits. Atlas soils are an example of soils that formed in accretion gley.

Some of the soils in the county formed in material weathered from sandstone, siltstone, or shale. Most of these soils are on steep or very steep side slopes. Eleva soils formed in material weathered from sandstone and siltstone. Gosport soils formed in material weathered from shale.

Several of the soils in Marion County are affected by sodium. These are the Huey, Darmstadt, Tamalco, and Grantfork Variant soils. The sodium in these soils originated from the weathering of sodium feldspar in the loess. The sodium was concentrated through the lateral movement of ground water above the Illinoian till. The lateral movement was caused by a variation in the permeability and landscape position of the till. The source of the sodium in Grantfork Variant soils is leachate, which probably originated through the weathering of sodium feldspar in the loess in upslope areas.

Climate

Marion County has a temperate, humid, continental climate, which has very important effects on weathering, vegetation, and erosion. Temperature and precipitation affect the physical and chemical nature of the soil. The weathering of minerals in the soil accelerates as the temperature increases. As water from precipitation moves through the soil, soluble salts are dissolved and transported downward. The water also transports clay-sized particles downward in the soil. A clay-enriched subsoil results from this translocation and deposition of clay. Climate also affects soil formation indirectly through its interaction with the vegetation on the soil. The temperature and precipitation in Marion County favor both prairie grasses and forest vegetation.

Precipitation can affect soil formation by removing soil material at the surface. As the rate of erosion approaches the rate of soil formation, the soil generally exhibits less profile development.

Additional information about the climate is available under the heading "General Nature of the County."

Vegetation and Animal Life

Soils are affected by the vegetation under which they formed. The native vegetation in the county was mainly hardwoods and prairie grasses. Soils are commonly grouped as either forest soils or prairie soils. Hickory and Wynoose soils formed under forest vegetation. They have a thin, relatively light colored surface layer. The organic matter in the surface layer is derived mainly from the decomposition of leaf litter. Hoyleton and Cisne soils formed under grasses. The grasses have many fine, fibrous roots, which add large amounts of organic matter to the soils when they die and decompose. As a result, these soils have a thick, dark surface layer.

Other living organisms have also contributed to soil formation in the county. These include micro-organisms, bacteria, fungi, earthworms, insects, and burrowing animals. These organisms help to break down the organic material and mix and churn the soil.

Human activities can affect soil formation. In some areas of the county, farming reduces the amount of organic matter in the surface soil and increases or decreases the hazards of runoff and erosion on a particular soil. The water table in some soils has been lowered by subsurface drains.

Relief

Relief tends to modify the effects of the other soil-forming factors. It controls the amount of water in the soil through its effect on runoff and infiltration.

Natural drainage generally is closely associated with slope or relief. The more sloping soils on uplands are moderately well drained or well drained and have a brown or yellowish brown subsoil. Ava and Hickory soils are examples. Soils in low areas, such as shallow depressions, and nearly level soils on broad plains are very poorly drained or poorly drained and have a grayish subsoil. Newberry and Cisne soils are examples. Soils in intermediate landscape positions, such as low ridges and gently sloping side slopes, are somewhat poorly drained and have a grayish or brownish, mottled subsoil. Hoyleton and Bluford soils are examples.

Time

Time is necessary for the other soil-forming factors to interact. Soil profiles normally become more strongly expressed with increased exposure to the processes of weathering. The influences of time, however, can be modified by the deposition of material and by topography. Soils on bottom land, such as Birds and Wakeland soils, receive surface deposits each time they are flooded. These weakly developed soils are much younger than the other soils in the county. Because the slope affects the amount of water that enters the soil, the extent of profile development generally decreases as the slope increases. Therefore, nearly level soils on uplands commonly are genetically and morphologically older than the more sloping soils.

References

(1) Allen, John. 1973. History of Marion County.

(2) American Association of State Highway and Transportation Officials. 1986. Standard specifications for highway materials and methods of sampling and testing. Ed. 14, 2 vols.

(3) American Society for Testing and Materials. 1993. Standard classification of soils for engineering purposes. ASTM Stand. D 2487.

(4) Jenny, Hans. 1941. Factors of soil formation.

(5) Simonson, Roy W. 1959. Outline of a generalized theory of soil genesis. Soil Sci. Soc. Am. Proc. 23: 152-156.

(6) Smith, R.S, and others. 1926. Marion County soils. Univ. of Illinois Agric. Exp. Stn. Soil Rep. 34.

(7) United States Department of Agriculture. 1961. Land capability classification. U.S. Dep. Agric. Handb. 210.

(8) United States Department of Agriculture. 1975. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. Soil Conserv. Serv., U.S. Dep. Agric. Handb. 436.

(9) United States Department of Agriculture. 1993. Soil survey manual. U.S. Dep. Agric. Handb. 18.

(10) United States Department of Commerce, Bureau of the Census. 1982. 1980 census of population, Illinois, characteristics of the population, general population characteristics. Vol. 1, chapter B, part 15.

(11) Werries, L., W. Kibler, and F. Barnett. 1986. Illinois agricultural statistics. Illinois Coop. Crop Rep. Serv., Bull. 86-1.

Glossary

ABC soil. A soil having an A, a B, and a C horizon.
Ablation till. Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.
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 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

Basal till. Compact glacial till deposited beneath the ice.
Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation-exchange capacity.
Bedding planes. Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.
Bedding system. A drainage system made by plowing, grading, or otherwise shaping the surface of a flat field. It consists of a series of low ridges separated by shallow, parallel dead furrows.
Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.
Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on the contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.
Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.
Blowout. A shallow depression from which all or most of the soil material has been removed by the wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.
Bottom land. The normal flood plain of a stream, subject to flooding.
Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.
Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.
Capillary water. Water held as a film around soil

particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

Catsteps. Very small, irregular terraces on steep hillsides, especially in pasture, formed by the trampling of cattle or the slippage of saturated soil.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a channer.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Congeliturbate. Soil material disturbed by frost action.

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.

Coprogenous earth (sedimentary peat). Fecal material deposited in water by aquatic organisms.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Drumlin. A low, smooth, elongated oval hill, mound, or ridge of compact glacial till. The longer axis is parallel to the path of the glacier and commonly has a blunt nose pointing in the direction from which the ice approached.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, for example, fire, that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

Esker (geology). A narrow, winding ridge of stratified gravelly and sandy drift deposited by a stream flowing in a tunnel beneath a glacier.

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.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gilgai. Commonly, a succession of microbasins and microknolls in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the microrelief of clayey soils that shrink and swell considerably with changes in moisture content.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also, the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits (geology). Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Graded stripcropping. Growing crops in strips that grade toward a protected waterway.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.6 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of 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 capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are:

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.

Kame (geology). An irregular, short ridge or hill of stratified glacial drift.

Karst (topography). The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by 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.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

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 colored, 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.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

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 downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil, adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, 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
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep-sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 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.
Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.
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.
Saprolite (soil science). Unconsolidated residual material underlying the soil and grading to hard bedrock below.
Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.
Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.
Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)
Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the substratum. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.
Shale. Sedimentary rock formed by the hardening of a clay deposit.
Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.
Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.
Silica. A combination of silicon and oxygen. The mineral form is called quartz.
Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.
Siltstone. Sedimentary rock made up of dominantly silt-sized particles.
Sinkhole. A depression in the landscape where limestone has been dissolved.
Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.
Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.
Slick spot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil is generally silty or clayey, is slippery when wet, and is low in productivity.
Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.
Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.
Sloughed till. Water-saturated till that has flowed slowly downhill from its original place of deposit by glacial ice. It may rest on other till, on glacial outwash, or on a glaciolacustrine deposit.
Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.
Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na^{+} to Ca^{++} + Mg^{++}. The degrees of sodicity and their respective ratios are:

Slight	less than 13:1
Moderate	13-30:1
Strong	more than 30:1

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, 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.

Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded 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.

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 grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from soil blowing and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Breaking up a compact subsoil by pulling a special chisel through the soil.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from about 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons. It includes all subdivisions of these horizons.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay.* The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). 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.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

Varve. A sedimentary layer of a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically 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 Salem, Illinois)

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days*	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January-----	37.9	19.4	28.6	67	-12	4	1.90	0.71	2.89	4	5.5
February----	43.0	23.5	33.2	71	-7	10	2.38	1.37	3.28	4	4.4
March-------	55.2	34.0	44.6	81	9	70	4.10	2.39	5.63	7	2.0
April-------	67.4	44.2	55.8	87	24	225	3.77	2.04	5.29	7	.3
May---------	77.0	53.2	65.1	92	34	469	4.25	2.23	6.03	7	.0
June--------	85.8	62.0	73.9	97	45	713	3.96	1.94	5.71	6	.0
July--------	89.1	66.1	77.6	99	51	856	4.04	2.01	5.80	5	.0
August------	87.3	63.8	75.5	100	49	791	3.06	1.58	4.35	5	.0
September---	80.9	56.9	68.9	95	37	567	3.04	1.38	4.47	5	.0
October-----	69.4	44.9	57.2	88	25	255	2.92	1.40	4.23	5	.0
November----	55.3	35.5	45.4	78	13	69	3.65	1.59	5.41	6	.4
December----	42.2	24.9	33.6	68	-4	11	3.68	1.65	5.41	6	3.5
Yearly:											
Average---	65.9	44.0	55.0	---	---	---	---	---	---	---	---
Extreme---	108	-23	---	101	-14	---	---	---	---	---	---
Total-----	---	---	---	---	---	4,040	40.76	34.62	46.65	67	16.1

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50 degrees F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

(Recorded in the period 1961-90 at Salem, 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. 8	Apr. 18	Apr. 29
2 years in 10 later than--	Apr. 3	Apr. 13	Apr. 24
5 years in 10 later than--	Mar. 25	Apr. 3	Apr. 13
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 27	Oct. 14	Oct. 3
2 years in 10 earlier than--	Nov. 2	Oct. 19	Oct. 8
5 years in 10 earlier than--	Nov. 12	Oct. 30	Oct. 17

TABLE 3.--GROWING SEASON

(Recorded in the period 1961-90 at Salem, 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	187	167
8 years in 10	206	193	174
5 years in 10	218	206	186
2 years in 10	230	218	199
1 year in 10	236	225	205

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
2	Cisne silt loam	33,530	9.1
3A	Hoyleton silt loam, 0 to 2 percent slopes	18,113	5.0
3B	Hoyleton silt loam, 2 to 5 percent slopes	7,090	1.9
3B2	Hoyleton silt loam, 3 to 7 percent slopes, eroded	6,055	1.6
4B	Richview silt loam, 1 to 5 percent slopes	525	0.1
4C2	Richview silt loam, 5 to 10 percent slopes, eroded	620	0.2
5C3	Blair silt loam, 4 to 10 percent slopes, severely eroded	18,053	5.0
5D3	Blair clay loam, 10 to 18 percent slopes, severely eroded	2,310	0.6
7C2	Atlas silt loam, 4 to 10 percent slopes, eroded	4,520	1.2
7C3	Atlas silty clay loam, 4 to 10 percent slopes, serverely eroded	2,030	0.6
7D2	Atlas silt loam, 10 to 18 percent slopes, eroded	3,050	0.8
7D3	Atlas clay loam, 10 to 18 percent slopes, severely eroded	1,200	0.3
8D2	Hickory loam, 10 to 15 percent slopes, eroded	5,940	1.6
8D3	Hickory clay loam, 10 to 15 percent slopes, severely eroded	1,200	0.3
8E3	Hickory loam, 15 to 25 percent slopes, severely eroded	2,335	0.6
8F	Hickory loam, 18 to 35 percent slopes	17,259	4.7
8G	Hickory loam, 35 to 50 percent slopes	635	0.2
12	Wynoose silt loam	13,440	3.6
13A	Bluford silt loam, 0 to 2 percent slopes	32,389	8.8
13B	Bluford silt loam, 2 to 5 percent slopes	13,525	3.7
13B2	Bluford silt loam, 3 to 7 percent slopes, eroded	3,680	1.0
14B	Ava silt loam, 1 to 5 percent slopes	16,435	4.5
14C2	Ava silt loam, 5 to 10 percent slopes, eroded	3,045	0.8
14C3	Ava silt loam, 5 to 10 percent slopes, severely eroded	990	0.3
15B2	Parke silt loam, 3 to 7 percent slopes, eroded	175	*
109	Racoon silt loam	665	0.2
120	Huey silt loam	745	0.2
218	Newberry silt loam	3,660	1.0
337B	Creal silt loam, 1 to 5 percent slopes	890	0.2
533	Urban land	970	0.3
551D2	Gosport loam, 10 to 18 percent slopes, eroded	1,255	0.3
551G	Gosport loam, 25 to 45 percent slopes	660	0.2
581B	Tamalco silt loam, 1 to 3 percent slopes	190	0.1
620A	Darmstadt silt loam, 0 to 2 percent slopes	8,395	2.3
620B2	Darmstadt silt loam, 3 to 6 percent slopes, eroded	8,575	2.3
761G	Eleva fine sandy loam, 25 to 45 percent slopes	2,750	0.7
786D2	Frondorf silt loam, 10 to 18 percent slopes, eroded	2,075	0.6
801B	Orthents, silty, undulating	1,530	0.4
810	Oil-waste land, brine damaged	340	0.1
912A	Hoyleton-Darmstadt silt loams, 0 to 2 percent slopes	21,458	5.8
912B	Hoyleton-Darmstadt silt loams, 2 to 5 percent slopes	4,080	1.1
929D2	Ava-Hickory silt loams, 10 to 18 percent slopes, eroded	2,495	0.7
934C2	Blair-Grantfork silt loams, 4 to 12 percent slopes, eroded	7,000	1.9
967F	Hickory-Gosport complex, 18 to 30 percent slopes	2,880	0.8
987C2	Atlas-Grantfork Variant silt loams, 4 to 12 percent slopes, eroded	4,050	1.1
991	Cisne-Huey silt loams	45,383	12.3
1288	Petrolia silty clay loam, wet	250	0.1
2002	Cisne-Urban land complex	1,990	0.5
2012	Wynoose-Urban land complex	215	0.1
2013B	Bluford-Urban land complex, 1 to 5 percent slopes	510	0.1
2912A	Hoyleton-Darmstadt-Urban land complex, 0 to 3 percent slopes	885	0.2
3072	Sharon silt loam, frequently flooded	725	0.2
3108	Bonnie silt loam, frequently flooded	3,660	1.0
3225	Holton loam, frequently flooded	8,910	2.4
3226	Wirt silt loam, frequently flooded	1,985	0.5
3333	Wakeland silt loam, frequently flooded	7,295	2.0
3334	Birds silt loam, frequently flooded	2,275	0.6
3382	Belknap silt loam, frequently flooded	5,115	1.4
3415	Orion silt loam, frequently flooded	1,065	0.3

See footnote at end of table.

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
8787	Banlic silt loam, occasionally flooded	2,315	0.6
	Water	3,300	0.9
	Total	368,685	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, 3 to 7 percent slopes, eroded
4B	Richview silt loam, 1 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, 3 to 7 percent slopes, eroded
14B	Ava silt loam, 1 to 5 percent slopes
15B2	Parke silt loam, 3 to 7 percent slopes, eroded
109	Racoon silt loam (where drained)
218	Newberry silt loam (where drained)
337B	Creal silt loam, 1 to 5 percent slopes
3072	Sharon silt loam, frequently flooded (where protected from flooding or not frequently flooded during the growing season)
3108	Bonnie silt loam, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
3225	Holton loam, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
3226	Wirt silt loam, frequently flooded (where 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)
3415	Orion silt loam, frequently flooded (where drained and either protected from flooding or not frequently flooded during the growing season)
8787	Banlic silt loam, occasionally 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	Orchard-grass-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	IIIe	109	32	50	---	---
4B-------------- Richview	IIe	109	33	50	---	---
4C2------------- Richview	IIIe	103	29	47	---	7.1
5C3------------- Blair	IVe	82	29	38	3.2	5.4
5D3------------- Blair	VIe	---	---	---	3.1	5.1
7C2------------- Atlas	IIIe	52	---	19	2.2	---
7C3------------- Atlas	IVe	---	---	---	1.8	---
7D2------------- Atlas	IVe	---	---	18	---	---
7D3------------- Atlas	VIe	---	---	---	1.7	---
8D2------------- Hickory	IIIe	72	23	28	2.7	4.5
8D3------------- Hickory	IVe	65	20	25	2.5	4.1
8E3------------- Hickory	VIe	---	---	---	1.9	3.2
8F-------------- Hickory	VIe	---	---	---	2.4	4.0
8G-------------- Hickory	VIIe	---	---	---	---	---
12-------------- Wynoose	IIIw	96	33	46	---	---
13A------------- Bluford	IIw	103	33	49	---	---

See footnotes 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	Orchard-grass-alfalfa hay	Bromegrass-alfalfa
		Bu	Bu	Bu	Tons	AUM*
13B------------- Bluford	IIe	102	33	49	---	---
13B2------------ Bluford	IIIe	97	31	46	3.9	---
14B------------- Ava	IIe	97	33	48	---	---
14C2------------ Ava	IIIe	89	30	44	3.9	---
14C3------------ Ava	IVe	74	25	36	3.3	---
15B2------------ Parke	IIIe	115	40	46	3.8	---
109------------- Racoon	IIIw	108	35	35	---	---
120------------- Huey	IVw	64	23	33	---	---
218------------- Newberry	IIIw	106	33	42	---	---
337B------------ Creal	IIe	108	35	50	4.3	---
533**. Urban land						
551D2----------- Gosport	VIIe	---	---	---	2.2	2.3
551G------------ Gosport	VIIe	---	---	---	---	---
581B------------ Tamalco	IIIe	69	24	34	2.9	4.8
620A------------ Darmstadt	IIIw	69	26	36	---	---
620B2----------- Darmstadt	IIIe	65	24	34	2.8	4.7
761G------------ Eleva	VIIe	---	---	---	---	---
786D2----------- Frondorf	IVe	80	25	---	---	---
801B. Orthents						
810**. Oil-waste land						

See footnotes 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	Orchard-grass-alfalfa hay	Bromegrass-alfalfa
		Bu	Bu	Bu	Tons	AUM*
912A**---------- Hoyleton-Darmstadt	IIIw	98	30	46	4.0	6.5
912B**---------- Hoyleton-Darmstadt	IIIe	93	30	45	3.9	6.3
929D2**--------- Ava-Hickory	IIIe	80	26	35	3.3	---
934C2**--------- Blair-Grantfork	IVe	70	27	35	3.0	4.9
967F**---------- Hickory-Gosport	VIIe	---	---	---	2.3	---
987C2**--------- Atlas-Grantfork Variant	IVe	48	---	21	2.3	---
991**----------- Cisne-Huey	IVw	95	30	44	3.7	---
1288------------ Petrolia	Vw	---	---	---	---	---
2002**. Cisne-Urban land						
2012**. Wynoose-Urban land						
2013B**. Bluford-Urban land						
2912A**. Hoyleton-Darmstadt-Urban land						
3072------------ Sharon	IIw	90	25	---	---	---
3108------------ Bonnie	IIIw	96	31	---	4.0	---
3225------------ Holton	IIIw	75	26	32	3.0	---
3226------------ Wirt	IIw	95	32	42	4.0	---
3333------------ Wakeland	IIw	125	44	50	5.2	---
3334------------ Birds	IIIw	111	38	47	4.4	---

See footnotes 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	Orchard-grass-alfalfa hay	Bromegrass-alfalfa
		Bu	Bu	Bu	Tons	AUM*
3382------------ Belknap	IIw	112	35	---	4.6	6.7
3415------------ Orion	IIw	80	26	---	---	---
8787------------ Banlic	IIw	115	37	46	4.2	7.0

* Animal unit month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY

(Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available)

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Management concerns: Equipment limitation	Management concerns: Seedling mortality	Management concerns: Windthrow hazard	Potential productivity: Common trees	Potential productivity: Site index	Potential productivity: Volume*	Trees to plant
7C2, 7C3, 7D2, 7D3------------ Atlas	4C	Slight	Slight	Moderate	Moderate	White oak-----------	70	52	Green ash, pin oak, red maple, Austrian pine.
						Northern red oak----	70	52	
						Bur oak-------------	70	52	
						Green ash-----------	---	---	
8D3------------- Hickory	5A	Slight	Slight	Slight	Slight	White oak-----------	85	67	White oak, yellow-poplar, black walnut, sugar maple, eastern white pine.
						Northern red oak----	85	67	
						Black oak-----------	---	---	
						Yellow-poplar-------	95	98	
						Green ash-----------	---	---	
8E3, 8F--------- 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	98	
8G-------------- Hickory	5R	Severe	Severe	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	98	
12-------------- Wynoose	4W	Slight	Severe	Moderate	Moderate	Pin oak-------------	70	52	Pin oak, red maple.
						White oak-----------	---	---	
						Black oak-----------	---	---	
14B, 14C2, 14C3- Ava	4A	Slight	Slight	Slight	Slight	White oak-----------	75	52	Black walnut, eastern cottonwood, sweetgum, yellow-poplar, white oak, American sycamore.
						Northern red oak----	80	52	
						Yellow-poplar-------	90	90	
						Black walnut--------	---	---	
109------------- Racoon	4W	Slight	Severe	Severe	Severe	Pin oak-------------	80	62	Pin oak, red maple, baldcypress, water tupelo.
						Post oak------------	80	62	
						Green ash-----------	---	---	
						White oak-----------	---	---	
551D2----------- Gosport	2C	Slight	Slight	Severe	Severe	White oak-----------	45	30	Eastern white pine, red pine, Norway spruce, Scotch pine, white spruce, cottonwood.

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordi-nation symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equip-ment limita-tion	Seedling mortal-ity	Wind-throw hazard	Common trees	Site index	Volume*	
551G------------ Gosport	2R	Severe	Severe	Severe	Severe	White oak-----------	45	30	Eastern white pine, red pine, Norway spruce, Scotch pine, white spruce, cottonwood.
761G------------ Eleva	2R	Severe	Severe	Severe	Moderate	Black oak-----------	45	30	Jack pine, red pine.
						Jack pine-----------	---	---	
						Northern pin oak----	---	---	
						Northern red 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	84	
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	98	
Gosport--------	2R	Moderate	Moderate	Severe	Severe	White oak-----------	45	30	Eastern white pine, red pine, Norway spruce, Scotch pine, white spruce, cottonwood.
3072------------ Sharon	7A	Slight	Slight	Slight	Slight	Yellow-poplar-------	95	98	Black walnut, pin oak, pecan.
						Eastern cottonwood--	105	141	
						American sycamore---	---	---	
						Cherrybark oak------	---	---	
						Sweetgum------------	---	---	
						Green ash-----------	---	---	
						Southern red oak----	---	---	
3108------------ Bonnie	5W	Slight	Severe	Severe	Severe	Pin oak-------------	90	72	Eastern cottonwood, red maple, American sycamore, sweetgum, baldcypress, pin oak.
						Eastern cottonwood--	100	128	
						Sweetgum------------	---	---	
						Cherrybark oak------	---	---	
						American sycamore---	---	---	

See footnotes at end of table.

TABLE 7.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns: Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Potential productivity: Common trees	Site index	Volume*	Trees to plant
3225------------ Holton	5A	Slight	Slight	Slight	Slight	Pin oak-------------	85	67	Yellow-poplar, white oak, black walnut, white ash, eastern white pine, red pine.
						Northern red oak----	80	62	
						Yellow-poplar-------	90	90	
						Sugar maple---------	80	50	
						White oak-----------	---	---	
						Black walnut--------	---	---	
						Black cherry--------	---	---	
						White ash-----------	---	---	
3226------------ Wirt	7A	Slight	Slight	Slight	Slight	Yellow-poplar-------	95	98	Yellow-poplar, eastern white pine, black walnut.
3333------------ Wakeland	5A	Slight	Slight	Slight	Slight	Pin oak-------------	90	72	Eastern white pine, baldcypress, American sycamore, red maple, white ash.
						Sweetgum------------	88	101	
						Yellow-poplar-------	90	90	
						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	128	
						Sweetgum------------	---	--	
						Cherrybark oak------	---	--	
						American sycamore---	---	--	
3382------------ Belknap	6A	Slight	Slight	Slight	Slight	Yellow-poplar-------	90	90	Eastern cottonwood, red maple, American sycamore, sweetgum, baldcypress.
						Eastern cottonwood--	100	128	
						American sycamore---	---	---	
						Sweetgum------------	---	---	
						Pin oak-------------	90	72	
3415------------ Orion	2W	Slight	Moderate	Slight	Slight	Silver maple--------	80	34	White spruce, silver maple, white ash, eastern cottonwood.
						Red maple-----------	---	---	
						White ash-----------	---	---	

* Volume is the yield in cubic feet per acre per year calculated at the age of culmination of mean annual increment for fully stocked natural stands.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 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.
5C3, 5D3 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, 8E3, 8F, 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.	---
15B2: Parke	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, northern whitecedar, blue spruce, white fir.	Austrian pine, Norway spruce.	Pin oak, eastern white pine.
109: Racoon	Silky dogwood, Amur honeysuckle, Amur privet, American cranberrybush.	Washington hawthorn, blue spruce, northern whitecedar, white fir, Austrian pine, Norway spruce.	Eastern white pine	Pin oak.
120: Huey	Eastern redcedar, Russian-olive, silky dogwood.	Siberian elm, green ash.	---	---
218: 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.
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.
533*. Urban land				
551D2, 551G: Gosport	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, Amur honeysuckle, American cranberrybush.	Austrian pine, green ash, Osage-orange.	Eastern white pine, pin oak.	---
581B: Tamalco	Russian-olive, eastern redcedar.	Siberian elm, green ash.	---	---
620A, 620B2: Darmstadt	Eastern redcedar, Russian-olive.	Siberian elm, green ash.	---	---
761G: Eleva	Autumn-olive, eastern redcedar, radiant crabapple, Washington hawthorn, Amur honeysuckle, lilac.	Eastern white pine, Austrian pine, red pine, jack pine.	---	---

See footnote at end of table.

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
786D2: 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				
912A*, 912B*:				
Hoyleton	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, Amur honeysuckle, American cranberrybush.	Austrian pine, green ash, Osage-orange.	Eastern white pine, pin oak.	---
Darmstadt	Eastern redcedar, Russian-olive.	Siberian elm, green ash.	---	---
929D2*:				
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.	---
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.
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.

See footnote at end of table.

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
967F*:				
Gosport	Arrowwood, Amur honeysuckle, Siberian peashrub, Washington hawthorn, American cranberrybush, Manchurian crabapple.	Osage-orange, eastern redcedar, Austrian pine, jack pine, honeylocust, Russian-olive, green ash, hackberry.	Eastern white pine, pin oak.	---
987C2*:				
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.	---
Grantfork Variant	Eastern redcedar, Russian-olive.	Green ash, Siberian elm.	---	---
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.
2002*:				
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.
Urban land.				
2012*:				
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.

See footnote at end of table.

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
2012*: Urban land.				
2013B*: Bluford	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, Amur honeysuckle, American cranberrybush.	Austrian pine, green ash, Osage-orange.	Eastern white pine, pin oak.	---
Urban land.				
2912A*: Hoyleton	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, Amur honeysuckle, American cranberrybush.	Austrian pine, green ash, Osage-orange.	Eastern white pine, pin oak.	---
Darmstadt	Eastern redcedar, Russian-olive.	Siberian elm, green ash.	---	---
Urban land.				
3072 Sharon	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, northern whitecedar, blue spruce, white fir, Austrian pine.	Norway spruce	Pin oak, eastern white pine.
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.
3225 Holton	Amur honeysuckle, Amur privet, American cranberrybush, silky dogwood.	White fir, blue spruce, whitecedar, Austrian pine, Washington hawthorn.	Norway spruce	Eastern white pine, pin oak.
3226 Wirt	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Austrian pine, white fir, blue spruce, northern whitecedar, Washington hawthorn.	Norway spruce	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.

See footnote at end of table.

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
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.
3415 Orion	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.
8787 Banlic	Amur privet, arrowwood, eastern redcedar, Washington hawthorn, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, green ash, Osage-orange.	Eastern white pine, pin oak.	---

* See description of the map unit for composition and behavior characteristics of the map unit.

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.
5C3 Blair	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: wetness.
5D3 Blair	Moderate: slope, wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: wetness, slope.
7C2, 7C3 Atlas	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: slope, wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness, droughty.
7D2 Atlas	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: slope, wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness, droughty, slope.
7D3 Atlas	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: slope, wetness, percs slowly.	Moderate: wetness.	Moderate: wetness, droughty, slope.
8D2, 8D3 Hickory	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
8E3 Hickory	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
8F, 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.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
14B Ava	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Severe: erodes easily.	Moderate: wetness.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
14C2, 14C3: Ava	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Moderate: wetness.
15B2: Parke	Slight	Slight	Moderate: slope.	Severe: erodes easily.	Slight.
109: Racoon	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
120: 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.
218: Newberry	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
337B: Creal	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
533*. Urban land					
551D2: Gosport	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Moderate: slope, depth to rock.
551G: Gosport	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: slope, erodes easily.	Severe: slope.
581B: Tamalco	Severe: percs slowly, excess sodium.	Severe: excess sodium, percs slowly.	Severe: percs slowly, excess sodium.	Slight	Severe: excess sodium.
620A, 620B2: Darmstadt	Severe: wetness, percs slowly, excess sodium.	Severe: excess sodium, percs slowly.	Severe: wetness, percs slowly.	Severe: erodes easily.	Severe: excess sodium.
761G: Eleva	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
786D2: Frondorf	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope, thin layer.
801B: Orthents	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
810*. Oil-waste land					
912A*, 912B*:					
Hoyleton	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
912A*, 912B*:					
Darmstadt	Severe: wetness, percs slowly, excess sodium.	Severe: excess sodium, percs slowly.	Severe: wetness, percs slowly.	Severe: erodes easily.	Severe: excess sodium.
929D2*:					
Ava	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Moderate: wetness, slope.
Hickory	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
934C2*:					
Blair	Moderate: slope, wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: wetness, slope.
Grantfork	Severe: wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope, wetness.	Severe: erodes easily.	Moderate: wetness, slope.
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.
987C2*:					
Atlas	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: slope, wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness, droughty, slope.
Grantfork-Variant	Severe: wetness.	Moderate: slope, wetness, percs slowly.	Severe: slope, wetness.	Severe: erodes easily.	Moderate: wetness, slope.
991*:					
Cisne	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
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.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
2002*:					
Cisne	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
Urban land.					
2012*:					
Wynoose	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.
Urban land.					
2013B*:					
Bluford	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Urban land.					
2912A*:					
Hoyleton	Severe: wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Darmstadt	Severe: wetness, percs slowly, excess sodium.	Severe: excess sodium, percs slowly.	Severe: wetness, percs slowly.	Severe: erodes easily.	Severe: excess sodium.
Urban land.					
3072 Sharon	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
3108 Bonnie	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding, flooding.	Severe: ponding.	Severe: ponding, flooding.
3225 Holton	Severe: flooding, wetness.	Moderate: flooding, wetness.	Severe: wetness, flooding.	Moderate: wetness, flooding.	Severe: flooding.
3226 Wirt	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
3333 Wakeland	Severe: flooding, wetness.	Moderate: flooding, wetness.	Severe: wetness, flooding.	Moderate: wetness, flooding.	Severe: flooding.
3334 Birds	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding, flooding.	Severe: ponding.	Severe: ponding, flooding.
3382 Belknap	Severe: flooding, wetness.	Moderate: flooding, wetness, percs slowly.	Severe: wetness, flooding.	Moderate: wetness, flooding.	Severe: flooding.

See footnote at end of table.

TABLE 9.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
3415------------------ Orion	Severe: flooding, wetness.	Moderate: flooding, wetness.	Severe: wetness, flooding.	Moderate: wetness, flooding.	Severe: flooding.
8787------------------ Banlic	Severe: flooding, wetness.	Moderate: wetness, percs slowly.	Severe: wetness.	Moderate: wetness.	Moderate: wetness, flooding.

* See description of the map unit for composition and behavior characteristics of the map unit.

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----------------Hoyleton	Fair	Good	Good	Good	Good	Fair	Poor	Good	Good	Poor.
3B2---------------Hoyleton	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very 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.
5C3, 5D3----------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.
8E3---------------Hickory	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
8F, 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.
15B2--------------Parke	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
109---------------Racoon	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
120---------------Huey	Poor	Poor	Poor	Fair	Fair	Good	Good	Poor	Fair	Good.
218---------------Newberry	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
337B---------------Creal	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
533*. Urban land										
551D2, 551G--------Gosport	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
581B---------------Tamalco	Good	Good	Fair	Good	Good	Poor	Poor	Good	Good	Poor.
620A---------------Darmstadt	Fair	Good	Poor	Good	Good	Fair	Fair	Fair	Good	Fair.
620B2--------------Darmstadt	Fair	Good	Poor	Good	Good	Fair	Poor	Fair	Good	Poor.
761G---------------Eleva	Poor	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
786D2--------------Frondorf	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
801B. Orthents										
810*. Oil-waste land										
912A*:										
Hoyleton-----------	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Darmstadt----------	Fair	Good	Poor	Good	Good	Fair	Fair	Fair	Good	Fair.
912B*:										
Hoyleton-----------	Fair	Good	Good	Good	Good	Fair	Poor	Good	Good	Poor.
Darmstadt----------	Fair	Good	Poor	Good	Good	Fair	Poor	Fair	Good	Poor.
929D2*:										
Ava----------------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Hickory------------	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very 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.

See footnote at end of table.

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
987C2*:										
Atlas	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Grantfork Variant	Fair	Good	Fair	Good	Good	Poor	Very poor.	Fair	Good	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.
2002*:										
Cisne	Fair	Fair	Fair	Fair	Poor	Good	Good	Fair	Fair	Good.
Urban land.										
2012*:										
Wynoose	Poor	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Urban land.										
2013B*:										
Bluford	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Urban land.										
2912A*:										
Hoyleton	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Darmstadt	Fair	Good	Poor	Good	Good	Fair	Fair	Fair	Good	Fair.
Urban land.										
3072 Sharon	Poor	Fair	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
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.
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.

See footnote at end of table.

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
3415---------------- Orion	Good	Good	Good	Good	Good	Good	Fair	Good	Good	Good.
8787---------------- Banlic	Fair	Good	Good	Good	Good	Fair	Good	Good	Good	Fair.

* See description of the map unit for composition and behavior characteristics of the map unit.

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.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
3A, 3B, 3B2------- Hoyleton	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	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.
5C3--------------- Blair	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength, frost action.	Moderate: wetness.
5D3--------------- Blair	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: wetness.	Severe: slope.	Severe: low strength, frost action.	Moderate: wetness, slope.
7C2, 7C3---------- Atlas	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength.	Moderate: wetness, droughty.
7D2, 7D3---------- Atlas	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: wetness, droughty, slope.
8D2, 8D3---------- Hickory	Moderate: wetness, slope.	Moderate: shrink-swell, slope.	Moderate: wetness, slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
8E3, 8F, 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.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
13A, 13B, 13B2---- Bluford	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	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
14B--------------- Ava	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Moderate: wetness.
14C2, 14C3-------- Ava	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength, frost action.	Moderate: wetness.
15B2-------------- Parke	Slight---------	Moderate: shrink-swell.	Slight---------	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
109--------------- Racoon	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
120--------------- Huey	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: excess sodium, ponding.
218--------------- Newberry	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
337B-------------- Creal	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: frost action.	Moderate: wetness.
533*. Urban land						
551D2------------- Gosport	Severe: wetness.	Severe: shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: wetness, slope, depth to rock.
551G-------------- Gosport	Severe: wetness, slope.	Severe: shrink-swell, slope.	Severe: slope.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
581B-------------- Tamalco	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Severe: excess sodium.
620A, 620B2------- Darmstadt	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Severe: excess sodium.
761G-------------- Eleva	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
786D2------------- Frondorf	Moderate: depth to rock, slope.	Moderate: slope.	Moderate: depth to rock, slope.	Severe: slope.	Moderate: slope.	Moderate: slope, thin layer.

See footnote at end of table.

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
801B: Orthents	Severe: wetness.	Severe: wetness.	Severe: wetness.	Moderate: wetness, slope.	Moderate: wetness.	Moderate: wetness.
810*. Oil-waste land						
912A*, 912B*:						
Hoyleton	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.	Moderate: wetness.
Darmstadt	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Severe: excess sodium.
929D2*:						
Ava	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: wetness.	Severe: slope.	Severe: low strength, frost action.	Moderate: wetness, slope.
Hickory	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
934C2*:						
Blair	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: wetness.	Severe: slope.	Severe: low strength, frost action.	Moderate: wetness, slope.
Grantfork	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, slope.	Severe: low strength, frost action.	Moderate: wetness, slope.
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.	Severe: shrink-swell, slope.	Severe: shrink-swell, low strength, slope.	Severe: slope.
987C2*:						
Atlas	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell, slope.	Severe: shrink-swell, low strength.	Moderate: wetness, droughty, slope.
Grantfork Variant	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness, slope.	Severe: low strength, frost action.	Moderate: wetness, slope.

See footnote at end of table.

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
991*:						
Cisne	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	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.
2002*:						
Cisne	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
Urban land.						
2012*:						
Wynoose	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, wetness.	Severe: wetness.
Urban land.						
2013B*:						
Bluford	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Urban land.						
2912A*:						
Hoyleton	Severe: wetness.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: wetness, shrink-swell.	Severe: shrink-swell, low strength, frost action.	Moderate: wetness.
Darmstadt	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Severe: excess sodium.
Urban land.						
3072 Sharon	Moderate: wetness, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding, frost action.	Severe: flooding.
3108 Bonnie	Severe: ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: low strength, ponding, flooding.	Severe: ponding, flooding.

See footnote at end of table.

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
3225 Holton	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Severe: flooding.
3226 Wirt	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
3333 Wakeland	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Severe: flooding.
3334 Birds	Severe: ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: low strength, ponding, flooding.	Severe: ponding, flooding.
3382 Belknap	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Severe: flooding.
3415 Orion	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, flooding, frost action.	Severe: flooding.
8787 Banlic	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Moderate: wetness, flooding.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--SANITARY FACILITIES

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
2: Cisne	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Severe: wetness.	Poor: wetness.
3A: Hoyleton	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
3B, 3B2: Hoyleton	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
4B: Richview	Moderate: wetness, percs slowly.	Moderate: seepage, slope, wetness.	Severe: wetness.	Moderate: wetness.	Fair: too clayey.
4C2: Richview	Moderate: wetness, percs slowly.	Severe: slope.	Severe: wetness.	Moderate: wetness.	Fair: too clayey.
5C3: Blair	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.
5D3: Blair	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, slope, wetness.
7C2, 7C3, 7D2, 7D3: Atlas	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
8D2, 8D3: Hickory	Moderate: wetness, percs slowly, slope.	Severe: slope.	Severe: wetness.	Moderate: wetness, slope.	Fair: too clayey, slope.
8E3, 8F, 8G: Hickory	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
12: Wynoose	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Severe: wetness.	Poor: wetness.
13A: Bluford	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Severe: wetness.	Poor: wetness.
13B, 13B2: Bluford	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Severe: wetness.	Poor: wetness.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
14B----------------- Ava	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Fair: too clayey, wetness.
14C2, 14C3---------- Ava	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness.	Moderate: wetness.	Fair: too clayey, wetness.
15B2---------------- Parke	Slight-----------	Moderate: seepage, slope.	Slight-----------	Slight-----------	Good.
109----------------- Racoon	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding, thin layer.
120----------------- Huey	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey, excess sodium.	Severe: ponding.	Poor: too clayey, ponding, excess sodium.
218----------------- Newberry	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: hard to pack, ponding.
337B---------------- Creal	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
533*. Urban land					
551D2--------------- Gosport	Severe: depth to rock, wetness, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: depth to rock.
551G---------------- Gosport	Severe: depth to rock, wetness, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
581B---------------- Tamalco	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, excess sodium.	Severe: wetness.	Poor: excess sodium.
620A---------------- Darmstadt	Severe: wetness, percs slowly.	Slight-----------	Severe: wetness, excess sodium.	Severe: wetness.	Poor: wetness, excess sodium.
620B2--------------- Darmstadt	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, excess sodium.	Severe: wetness.	Poor: wetness, excess sodium.
761G---------------- Eleva	Severe: depth to rock, poor filter, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: depth to rock, slope.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
786D2 Frondorf	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, small stones.
801B Orthents	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
810*. Oil-waste land					
912A*:					
Hoyleton	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Darmstadt	Severe: wetness, percs slowly.	Slight	Severe: wetness, excess sodium.	Severe: wetness.	Poor: wetness, excess sodium.
912B*:					
Hoyleton	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Darmstadt	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness, excess sodium.	Severe: wetness.	Poor: wetness, excess sodium.
929D2*:					
Ava	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness.	Moderate: wetness, slope.	Fair: too clayey, slope, wetness.
Hickory	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, small stones, slope.
934C2*:					
Blair	Severe: wetness, percs slowly.	Severe: slope, wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, slope, wetness.
Grantfork	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness.	Severe: wetness.	Poor: wetness.
967F*:					
Hickory	Severe: slope.	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.	Severe: depth to rock, slope.	Poor: depth to rock, slope.

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
987C2*:					
Atlas	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
Grantfork Variant	Severe: wetness, percs slowly.	Severe: slope.	Severe: wetness, too clayey.	Severe: wetness.	Poor: wetness, too clayey, hard to pack.
991*:					
Cisne	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Severe: wetness.	Poor: wetness.
Huey	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey, excess sodium.	Severe: ponding.	Poor: too clayey, ponding, excess sodium.
1288 Petrolia	Severe: flooding, ponding, percs slowly.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Poor: ponding.
2002*:					
Cisne	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Severe: wetness.	Poor: wetness.
Urban land.					
2012*:					
Wynoose	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Severe: wetness.	Poor: wetness.
Urban land.					
2013B*:					
Bluford	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Urban land.					
2912A*:					
Hoyleton	Severe: wetness, percs slowly.	Slight	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack, wetness.
Darmstadt	Severe: wetness, percs slowly.	Slight	Severe: wetness, excess sodium.	Severe: wetness.	Poor: wetness, excess sodium.
Urban land.					

See footnote at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
3072 Sharon	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
3108 Bonnie	Severe: flooding, ponding, percs slowly.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Poor: ponding.
3225 Holton	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: large stones, wetness.
3226 Wirt	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding, seepage.	Good.
3333 Wakeland	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
3334 Birds	Severe: flooding, ponding, percs slowly.	Severe: flooding, ponding.	Severe: flooding, ponding.	Severe: flooding, ponding.	Poor: ponding.
3382 Belknap	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
3415 Orion	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
8787 Banlic	Severe: flooding, wetness, percs slowly.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

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: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
3A, 3B, 3B2 Hoyleton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
4B, 4C2 Richview	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
5C3 Blair	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones.
5D3 Blair	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
7C2, 7C3, 7D2, 7D3 Atlas	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
8D2, 8D3 Hickory	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
8E3 Hickory	Fair: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
8F, 8G Hickory	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
12 Wynoose	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
13A, 13B, 13B2 Bluford	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
14B, 14C2, 14C3 Ava	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
15B2 Parke	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
109 Racoon	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
120 Huey	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness, excess sodium.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
218: Newberry	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
337B: Creal	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
533*. Urban land				
551D2: Gosport	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
551G: Gosport	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
581B: Tamalco	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, excess sodium.
620A, 620B2: Darmstadt	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess sodium.
761G: Eleva	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
786D2: Frondorf	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
801B: Orthents	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
810*. Oil-waste land				
912A*, 912B*:				
Hoyleton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Darmstadt	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess sodium.
929D2*:				
Ava	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, slope.
Hickory	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
934C2*:				
Blair	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
934C2*:				
Grantfork	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, small stones, slope.
967F*:				
Hickory	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Gosport	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, slope.
987C2*:				
Atlas	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Grantfork Variant	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
991*:				
Cisne	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Huey	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness, excess sodium.
1288 Petrolia	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
2002*:				
Cisne	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Urban land.				
2012*:				
Wynoose	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, wetness.
Urban land.				
2013B*:				
Bluford	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
Urban land.				
2912A*:				
Hoyleton	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
2912A*:				
Darmstadt	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, excess sodium.
Urban land.				
3072 Sharon	Good	Improbable: excess fines.	Improbable: excess fines.	Good.
3108 Bonnie	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
3225 Holton	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, area reclaim.
3226 Wirt	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
3333 Wakeland	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
3334 Birds	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
3382 Belknap	Fair: thin layer, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
3415 Orion	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
8787 Banlic	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim.

* See description of the map unit for composition and behavior characteristics of the map unit.

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: thin layer, wetness.	Percs slowly, frost action.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
3B, 3B2 Hoyleton	Moderate: slope.	Severe: thin layer, 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.
5C3 Blair	Moderate: slope.	Severe: wetness.	Frost action, slope.	Slope, wetness, erodes easily.	Erodes easily, wetness.	Erodes easily.
5D3 Blair	Severe: slope.	Severe: wetness.	Frost action, slope.	Slope, wetness, erodes easily.	Slope, erodes easily, wetness.	Slope, erodes easily.
7C2, 7C3 Atlas	Moderate: slope.	Severe: hard to pack.	Percs slowly, frost action, slope.	Slope, wetness, droughty.	Erodes easily, wetness.	Wetness, erodes easily.
7D2 Atlas	Severe: slope.	Severe: hard to pack.	Percs slowly, frost action, slope.	Slope, wetness, droughty.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
7D3 Atlas	Severe: slope.	Severe: hard to pack.	Percs slowly, frost action, slope.	Slope, wetness, droughty.	Slope, wetness.	Wetness, slope.
8D2, 8D3 Hickory	Severe: slope.	Slight	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
8E3, 8F, 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.	Percs slowly, frost action.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
13B, 13B2 Bluford	Moderate: slope.	Severe: piping.	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.	Erodes easily, rooting depth.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
15B2: Parke	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
109: Racoon	Slight	Severe: piping, ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly, erodes easily.	Erodes easily, ponding.	Wetness, erodes easily, percs slowly.
120: Huey	Slight	Severe: ponding, excess sodium.	Ponding, percs slowly, frost action.	Ponding, droughty, percs slowly.	Erodes easily, ponding, percs slowly.	Wetness, excess sodium, erodes easily.
218: Newberry	Slight	Severe: ponding.	Ponding, percs slowly, frost action.	Ponding, percs slowly, erodes easily.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
337B: Creal	Moderate: slope.	Severe: thin layer, wetness.	Frost action, slope.	Slope, wetness, erodes easily.	Erodes easily, wetness.	Wetness, erodes easily.
533*. Urban land						
551D2: Gosport	Severe: slope.	Moderate: wetness.	Percs slowly, depth to rock, slope.	Slope, wetness, percs slowly.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
551G: Gosport	Severe: slope.	Moderate: wetness.	Percs slowly, depth to rock, slope.	Slope, wetness, percs slowly.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
581B: Tamalco	Slight	Severe: excess sodium.	Percs slowly, frost action.	Wetness	Erodes easily, wetness, percs slowly.	Excess sodium, erodes easily.
620A: Darmstadt	Slight	Severe: excess sodium.	Percs slowly, frost action.	Wetness, percs slowly.	Erodes easily, wetness.	Wetness, excess sodium.
620B2: Darmstadt	Moderate: slope.	Severe: excess sodium.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Erodes easily, wetness.	Wetness, excess sodium.
761G: Eleva	Severe: seepage, slope.	Slight	Deep to water	Slope, droughty.	Slope, depth to rock, soil blowing.	Slope, droughty, depth to rock.
786D2: Frondorf	Severe: slope.	Severe: piping.	Deep to water	Depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
801B: Orthents	Moderate: seepage, slope.	Severe: wetness.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Wetness, percs slowly.	Wetness, percs slowly.
810*. Oil-waste land						
912A*: Hoyleton	Slight	Severe: thin layer, wetness.	Percs slowly, frost action.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
912A*:						
Darmstadt	Slight	Severe: excess sodium.	Percs slowly, frost action.	Wetness, percs slowly.	Erodes easily, wetness.	Wetness, excess sodium.
912B*:						
Hoyleton	Moderate: slope.	Severe: thin layer, wetness.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Darmstadt	Moderate: slope.	Severe: excess sodium.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Erodes easily, wetness.	Wetness, excess sodium.
929D2*:						
Ava	Severe: slope.	Severe: piping.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Slope, erodes easily, wetness.	Slope, erodes easily, rooting depth.
Hickory	Severe: slope.	Moderate: thin layer.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
934C2*:						
Blair	Severe: slope.	Severe: wetness.	Frost action, slope.	Slope, wetness, erodes easily.	Slope, erodes easily, wetness.	Slope, erodes easily.
Grantfork	Severe: slope.	Moderate: piping, wetness.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
967F*:						
Hickory	Severe: slope.	Moderate: thin layer.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
Gosport	Severe: slope.	Slight	Percs slowly, depth to rock, slope.	Slope, wetness, percs slowly.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
987C2*:						
Atlas	Severe: slope.	Severe: hard to pack.	Percs slowly, frost action, slope.	Slope, wetness, droughty.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
Grantfork Variant	Severe: slope.	Moderate: piping, wetness.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Slope, erodes easily, wetness.	Wetness, slope, erodes easily.
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, droughty, percs slowly.	Erodes easily, ponding, percs slowly.	Wetness, excess sodium, erodes easily.
1288 Petrolia	Slight	Severe: ponding.	Ponding, flooding, frost action.	Ponding, flooding.	Ponding	Wetness.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
2002*:						
Cisne	Slight	Severe: wetness.	Percs slowly, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Urban land.						
2012*:						
Wynoose	Slight	Severe: wetness.	Percs slowly, frost action.	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Urban land.						
2013B*:						
Bluford	Moderate: slope.	Severe: piping.	Percs slowly, frost action, slope.	Slope, wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Urban land.						
2912A*:						
Hoyleton	Slight	Severe: thin layer, wetness.	Percs slowly, frost action.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.
Darmstadt	Slight	Severe: excess sodium.	Percs slowly, frost action.	Wetness, percs slowly.	Erodes easily, wetness.	Wetness, excess sodium.
Urban land.						
3072 Sharon	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily, flooding.	Erodes easily	Erodes easily.
3108 Bonnie	Slight	Severe: ponding.	Ponding, flooding, frost action.	Ponding, erodes easily, flooding.	Erodes easily, ponding.	Wetness, erodes easily.
3225 Holton	Moderate: seepage.	Severe: piping, wetness.	Flooding, large stones, frost action.	Wetness, erodes easily, flooding.	Large stones, erodes easily, wetness.	Large stones, wetness, erodes easily.
3226 Wirt	Severe: seepage.	Severe: piping.	Deep to water	Flooding	Erodes easily	Erodes easily.
3333 Wakeland	Moderate: seepage.	Severe: piping, wetness.	Flooding, frost action.	Wetness, erodes easily, flooding.	Erodes easily, wetness.	Wetness, erodes easily.
3334 Birds	Slight	Severe: ponding.	Ponding, flooding, frost action.	Ponding, erodes easily, flooding.	Erodes easily, ponding.	Wetness, erodes easily.
3382 Belknap	Moderate: seepage.	Severe: piping, wetness.	Flooding, frost action.	Wetness, erodes easily.	Erodes easily, wetness.	Wetness, erodes easily.
3415 Orion	Moderate: seepage.	Severe: piping, wetness.	Flooding, frost action.	Wetness	Erodes easily, wetness.	Wetness, erodes easily.

See footnote at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Embankments, dikes, and levees	Features affecting-- Drainage	Irrigation	Terraces and diversions	Grassed waterways
8787---------------- Banlic	Slight----------	Severe: piping.	Percs slowly, flooding, frost action.	Wetness, percs slowly, rooting depth.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, rooting depth.

* See description of the map unit for composition and behavior characteristics of the map unit.

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: Unified	Classification: AASHTO	Fragments >3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
2------------- Cisne	0-8	Silt loam-----	CL, CL-ML, ML	A-4	0	100	100	90-100	90-100	25-35	5-10
	8-16	Silt loam-----	CL-ML, CL	A-4, A-6	0	100	100	95-100	90-100	25-35	5-15
	16-42	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	90-100	90-100	45-60	20-35
	42-60	Silty clay loam, clay loam, silt loam.	CL	A-6, A-7	0-5	100	90-100	70-95	50-90	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
	12-39	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	95-100	85-100	40-55	20-30
	39-60	Silt loam, loam, clay loam.	CL, CL-ML	A-6, A-7, A-4	0	100	95-100	90-100	70-95	20-45	5-25
3B2----------- Hoyleton	0-7	Silt loam-----	CL-ML, CL	A-4, A-6	0	100	100	95-100	85-100	25-35	5-15
	7-36	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	95-100	85-100	40-55	20-30
	36-60	Silt loam, loam, clay loam.	CL, CL-ML	A-6, A-7, A-4	0	100	95-100	90-100	70-95	20-45	5-25
4B------------ Richview	0-9	Silt loam-----	CL-ML, CL	A-4, A-6	0	100	100	95-100	90-100	25-35	5-15
	9-48	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	90-100	35-50	15-30
	48-60	Silt loam, loam, clay loam.	CL	A-6, A-7	0	100	90-100	90-100	70-95	25-45	10-20
4C2----------- Richview	0-5	Silt loam-----	CL-ML, CL	A-4, A-6	0	100	100	95-100	90-100	25-35	5-15
	5-38	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	90-100	35-50	15-30
	38-60	Silt loam, loam, clay loam.	CL	A-6, A-7	0	100	90-100	90-100	70-95	25-45	10-20
5C3----------- Blair	0-4	Silt loam-----	CL-ML, CL	A-4, A-6	0-2	95-100	90-100	90-100	85-95	20-35	5-15
	4-25	Silty clay loam, loam, silt loam.	CL	A-6, A-7	0-5	95-100	90-100	90-100	80-100	30-50	15-30
	25-60	Silty clay loam, loam, silt loam.	CL	A-6, A-7	0-5	95-100	90-100	85-100	70-95	30-50	15-30

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	
5D3----------- Blair	0-4	Clay loam-----	CL	A-6	0-5	95-100	90-100	90-100	75-100	25-40	10-20
	4-25	Silty clay loam, loam, silt loam.	CL	A-6, A-7	0-5	95-100	90-100	90-100	80-100	30-50	15-30
	25-60	Silty clay loam, clay loam, silt loam.	CL	A-6, A-7	0-5	95-100	90-100	85-100	70-95	30-50	15-30
7C2----------- Atlas	0-10	Silt loam-----	CL, CL-ML	A-6, A-4	0	100	100	95-100	75-95	25-35	5-15
	10-29	Silty clay loam, clay, clay loam.	CH	A-7	0	100	95-100	95-100	75-95	50-70	30-45
	29-60	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
	4-31	Silty clay loam, clay, clay loam.	CH	A-7	0	100	95-100	95-100	75-95	50-70	30-45
	31-50	Silty clay loam, clay, clay loam.	CH	A-7	0	100	95-100	95-100	75-95	50-70	30-45
	50-60	Clay loam, clay, loam.	CH, CL	A-6, A-7	0	95-100	90-100	90-100	65-95	35-55	20-30
7D2----------- Atlas	0-6	Silt loam-----	CL, CL-ML	A-6, A-4	0	100	100	95-100	75-95	25-35	5-15
	6-29	Silty clay loam, clay, clay loam.	CH	A-7	0	100	95-100	95-100	75-95	50-70	30-45
	29-60	Silty clay loam, clay, clay loam.	CH	A-7	0	100	95-100	95-100	75-95	50-70	30-45
7D3----------- Atlas	0-5	Clay loam-----	CH, CL	A-7	0	100	100	95-100	75-95	45-65	30-40
	5-31	Silty clay loam, clay, clay loam.	CH	A-7	0	100	95-100	95-100	75-95	50-70	30-45
	31-50	Silty clay loam, clay, clay loam.	CH	A-7	0	100	95-100	95-100	75-95	50-70	30-45
	50-60	Clay loam, clay, loam.	CH, CL	A-6, A-7	0	95-100	90-100	90-100	65-95	35-55	20-30
8D2----------- Hickory	0-9	Loam----------	CL	A-4, A-6	0-1	95-100	90-100	90-100	75-95	20-35	8-15
	9-60	Clay loam, loam.	CL	A-7, A-6	0-5	95-100	90-100	70-100	65-80	30-50	15-30
8D3----------- Hickory	0-5	Clay loam-----	CL	A-6, A-7	0-3	95-100	90-100	90-100	80-95	30-50	15-30
	5-53	Clay loam, loam.	CL	A-7, A-6	0-5	95-100	90-100	70-100	65-80	30-50	15-30
	53-60	Sandy loam, loam, gravelly clay loam.	CL-ML, CL	A-4, A-6	0-5	85-100	75-95	70-95	60-80	20-40	5-20

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments >3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
8E3----------- Hickory	0-3	Loam----------	CL	A-6, A-4	0-5	95-100	90-100	90-100	75-95	20-35	8-15
	3-49	Clay loam, silty clay loam, gravelly clay loam.	CL	A-6, A-7	0-5	95-100	75-100	70-95	65-80	30-50	15-30
	49-60	Sandy loam, loam, gravelly clay loam.	CL-ML, CL	A-4, A-6	0-5	85-100	75-95	70-95	60-80	20-40	5-20
8F, 8G-------- Hickory	0-14	Loam----------	CL, ML, CL-ML	A-6, A-4	0-5	95-100	90-100	90-100	75-95	20-35	3-15
	14-39	Clay loam, silty clay loam, gravelly clay loam.	CL	A-6, A-7	0-5	95-100	75-100	70-95	65-80	30-50	15-30
	39-60	Sandy loam, loam, gravelly clay loam.	CL-ML, CL	A-4, A-6	0-5	85-100	75-95	70-95	60-80	20-40	5-20
12------------ Wynoose	0-6	Silt loam-----	CL-ML, CL	A-4, A-6	0	100	100	95-100	85-95	20-35	5-15
	6-13	Silt loam-----	CL, ML, CL-ML	A-4, A-6	0	100	100	95-100	85-95	15-30	2-15
	13-51	Silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	85-95	40-55	20-35
	51-60	Silt loam, clay loam, silty clay loam.	CL	A-6, A-7	0	100	95-100	90-100	70-90	30-45	15-25
13A, 13B------ Bluford	0-8	Silt loam-----	CL, CL-ML	A-6, A-4	0	100	95-100	95-100	90-100	20-35	5-15
	8-13	Silt loam-----	ML, CL-ML, CL	A-4	0	100	95-100	95-100	90-100	20-30	NP-10
	13-44	Silty clay loam, silty clay.	CL	A-7, A-6	0	100	95-100	95-100	90-100	35-50	15-30
	44-60	Silt loam, loam, clay loam.	CL-ML, CL	A-6, A-4	0-5	100	95-100	90-100	70-90	25-40	5-20
13B2---------- Bluford	0-6	Silt loam-----	CL, CL-ML	A-6, A-4	0	100	95-100	95-100	90-100	20-35	5-15
	6-24	Silty clay loam.	CL	A-7, A-6	0	100	95-100	95-100	90-100	35-50	15-30
	24-60	Silt loam, loam, clay loam.	CL-ML, CL	A-6, A-4	0-5	100	95-100	90-100	70-90	25-40	5-20

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments >3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
14B----------- Ava	0-11	Silt loam-----	CL, ML, CL-ML	A-6, A-4	0	100	100	95-100	90-100	25-35	5-15
	11-30	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	90-100	25-45	10-20
	30-37	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	90-100	25-45	10-20
	37-52	Silty clay loam, loam, clay loam.	CL, CL-ML, ML	A-4, A-6, A-7	0	100	95-100	90-100	80-90	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	80-90	25-40	5-20
14C2---------- Ava	0-7	Silt loam-----	CL, ML, CL-ML	A-6, A-4	0	100	100	95-100	90-100	25-35	5-15
	7-20	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	90-100	25-45	10-20
	20-44	Silty clay loam, loam, clay loam.	CL, CL-ML, ML	A-4, A-6, A-7	0	100	95-100	90-100	80-90	20-45	5-20
	44-60	Loam, silt loam, clay loam.	CL, ML, CL-ML	A-4, A-6	0	100	95-100	90-100	80-90	25-40	5-20
14C3---------- Ava	0-3	Silt loam-----	CL, ML, CL-ML	A-6, A-4	0	100	100	95-100	90-100	25-35	5-15
	3-18	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	90-100	25-45	10-20
	18-49	Silty clay loam, loam, clay loam.	CL, CL-ML, ML	A-4, A-6, A-7	0	100	95-100	90-100	80-90	20-45	5-20
	49-60	Loam, silt loam, clay loam.	CL, ML, CL-ML	A-4, A-6	0	100	95-100	90-100	80-90	25-40	5-20
15B2---------- Parke	0-6	Silt loam-----	CL-ML, CL	A-4, A-6	0	100	100	90-100	70-100	20-35	7-15
	6-24	Silty clay loam, silt loam.	CL	A-6, A-4	0	95-100	95-100	90-100	80-100	25-40	7-15
	24-60	Sandy clay loam, loam, sandy loam.	SC, CL	A-2, A-6, A-4	0-3	90-100	85-95	55-90	30-60	25-35	7-15
109----------- Racoon	0-6	Silt loam-----	CL	A-4, A-6	0	100	100	95-100	90-100	20-40	8-20
	6-26	Silt loam-----	CL, CL-ML	A-4, A-6	0	100	100	95-100	90-100	20-40	5-20
	26-39	Silty clay loam.	CL, CH	A-6, A-7	0	100	100	95-100	85-100	35-60	15-30
	39-47	Silty clay loam.	CL	A-6, A-7	0	100	100	95-100	85-100	35-50	15-30
	47-60	Silty clay loam, silt loam.	CL, ML, CL-ML	A-4, A-6, A-7	0	95-100	90-100	75-100	50-100	25-45	3-20

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments >3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
120----------- Huey	0-7	Silt loam-----	CL, CL-ML, ML	A-4, A-6	0	100	100	90-100	85-95	20-35	3-15
	7-15	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	95-100	90-100	25-45	10-25
	15-52	Silt loam, silty clay loam, silty clay.	CL	A-6, A-7	0	100	100	95-100	90-100	30-50	15-30
	52-60	Loam, silt loam, silty clay loam.	CL	A-6	0	95-100	90-100	80-95	65-90	20-35	10-20
218----------- Newberry	0-9	Silt loam-----	CL	A-6	0	100	100	95-100	85-100	25-40	10-20
	9-24	Silt loam-----	CL	A-4, A-6	0	100	100	95-100	85-100	25-40	8-15
	24-45	Silt loam, silty clay loam.	CL, CH	A-7, A-6	0	100	100	95-100	85-100	35-55	15-30
	45-60	Silty clay loam, silt loam, loam.	CL	A-7, A-6	0	95-100	95-100	75-100	55-100	30-45	15-25
337B---------- Creal	0-6	Silt loam-----	ML, CL	A-4, A-6	0	100	100	95-100	85-100	30-40	5-15
	6-27	Silt loam-----	CL-ML, CL	A-4, A-6	0	100	100	95-100	85-100	25-35	4-12
	27-60	Silt loam, silty clay loam.	CL, ML	A-6, A-7	0	100	100	95-100	90-100	35-50	10-25
533*. Urban land											
551D2, 551G--- Gosport	0-5	Loam----------	CL, CL-ML	A-4, A-6	0	100	90-100	90-100	70-100	25-40	5-15
	5-27	Silty clay, silty clay loam.	CH	A-7	0	100	90-100	90-100	85-100	50-65	35-50
	27-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
581B---------- Tamalco	0-8	Silt loam-----	CL, CL-ML	A-4, A-6	0	100	100	95-100	90-100	25-40	5-15
	8-26	Silty clay loam, silty clay.	CH	A-7	0	100	100	95-100	95-100	55-75	35-45
	26-42	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	95-100	30-50	15-25
	42-60	Silt loam, loam, clay loam.	CL	A-6	0	100	100	95-100	80-100	30-40	15-25
620A---------- Darmstadt	0-10	Silt loam-----	CL, CL-ML	A-6, A-7, A-4	0	95-100	95-100	95-100	75-100	25-45	5-20
	10-21	Silty clay loam, silty clay.	CL, CH	A-7	0	100	95-100	95-100	90-100	40-65	20-40
	21-31	Silty clay loam, silty clay.	CL, CH	A-7	0	100	95-100	95-100	90-100	40-65	20-40
	31-60	Silt loam, silty clay loam, loam.	CL	A-6, A-7, A-4	0	95-100	95-100	90-100	75-100	20-50	7-30

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments >3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
620B2--------- 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
	7-14	Silty clay loam, silty clay.	CL, CH	A-7	0	100	95-100	95-100	90-100	40-65	20-40
	14-35	Silty clay loam, silty clay.	CL, CH	A-7	0	100	95-100	95-100	90-100	40-65	20-40
	35-60	Silt loam, silty clay loam, loam.	CL	A-6, A-7, A-4	0	95-100	95-100	90-100	75-100	20-50	7-30
761G---------- Eleva	0-4	Fine sandy loam.	SM, SC-SM, ML, CL-ML	A-4, A-2-4, A-1-b	0	75-100	70-100	40-90	20-55	<25	NP-7
	4-27	Sandy loam, fine sandy loam, loam.	CL, SC, ML, SM	A-4, A-2-4, A-1-b	0-2	75-100	70-100	40-95	20-75	<30	3-9
	27-37	Sand, fine sand, loamy sand.	SM, SP-SM	A-2, A-3, A-1	0-15	75-100	70-100	35-85	5-35	<20	NP-4
	37-41	Weathered bedrock.	---	---	---	---	---	---	---	---	---
786D2--------- Frondorf	0-10	Silt loam-----	ML, CL, CL-ML	A-4	0-5	90-100	90-100	85-100	75-100	25-35	5-10
	10-35	Channery silty clay loam, silty clay loam, channery sandy clay loam.	ML, CL, GM, GC	A-4, A-6, A-2, A-7	10-40	55-90	50-85	40-80	30-75	<45	NP-25
	35-60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
801B---------- Orthents	0-60	Variable------	---	---	---	---	---	---	---	---	---
810*. Oil-waste land											
912A*, 912B*: 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
	12-39	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	95-100	85-100	40-55	20-30
	39-60	Silt loam, loam, clay loam.	CL, CL-ML	A-6, A-7, A-4	0	100	95-100	90-100	70-95	20-45	5-25

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments >3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
912A*, 912B*: 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
	13-21	Silty clay loam, silty clay.	CL, CH	A-7	0	100	95-100	95-100	90-100	40-65	20-40
	21-31	Silty clay loam, silty clay.	CL, CH	A-7	0	100	95-100	95-100	90-100	40-65	20-40
	31-60	Silt loam, silty clay loam, loam.	CL	A-6, A-7, A-4	0	95-100	95-100	90-100	75-100	20-50	7-30
929D2*: Ava	0-5	Silt loam	CL, ML, CL-ML	A-6, A-4	0	100	100	95-100	90-100	25-35	5-15
	5-11	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	90-100	25-45	10-20
	11-25	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	90-100	25-45	10-20
	25-60	Loam, silt loam, clay loam.	CL, ML, CL-ML	A-4, A-6	0	100	95-100	90-100	80-90	25-40	5-20
Hickory	0-4	Silt loam	CL	A-6, A-4	0-5	95-100	90-100	90-100	75-95	20-35	8-15
	4-60	Clay loam, silty clay loam, gravelly clay loam.	CL	A-6, A-7	0-5	95-100	75-100	70-95	65-80	30-50	15-30
934C2*: Blair	0-6	Silt loam	CL-ML, CL	A-4, A-6	0-2	95-100	90-100	90-100	85-95	20-35	5-15
	6-38	Silty clay loam, clay loam, silt loam.	CL	A-6, A-7	0-5	95-100	90-100	90-100	80-100	30-50	15-30
	38-60	Silty clay loam, clay loam, silt loam.	CL	A-6, A-7	0-5	95-100	90-100	85-100	70-95	30-50	15-30
Grantfork	0-4	Silt loam	CL	A-6	0	100	95-100	85-95	80-90	25-40	10-20
	4-60	Silt loam, clay loam, loam.	CL	A-6, A-7	0	100	90-100	80-90	70-80	30-45	10-20
967F*: Hickory	0-7	Loam	CL, ML, CL-ML	A-6, A-4	0-5	95-100	90-100	90-100	75-95	20-35	3-15
	7-41	Clay loam, silty clay loam, gravelly clay loam.	CL	A-6, A-7	0-5	95-100	75-100	70-95	65-80	30-50	15-30
	41-60	Sandy loam, loam, gravelly clay loam.	CL-ML, CL	A-4, A-6	0-5	85-100	75-95	70-95	60-80	20-40	5-20

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Frag- ments >3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plas- ticity index
	In				Pct					Pct	
967F*:											
Gosport------	0-6	Silt loam-----	CL, CL-ML	A-4, A-6	0	100	90-100	90-100	70-100	25-40	5-15
	6-31	Clay, silty clay, silty clay loam.	CH	A-7	0	100	90-100	90-100	85-100	50-65	35-50
	31-60	Weathered bedrock.	---	---	---	---	---	---	---	---	---
987C2*:											
Atlas--------	0-4	Silt loam-----	CL, CL-ML	A-6, A-4	0	100	100	95-100	75-95	25-35	5-15
	4-29	Silty clay loam, clay, clay loam.	CH	A-7	0	100	95-100	95-100	75-95	50-70	30-45
	29-51	Silty clay loam, clay, clay loam.	CH	A-7	0	100	95-100	95-100	75-95	50-70	30-45
	51-60	Clay loam, clay, loam.	CH, CL	A-6, A-7	0	95-100	90-100	90-100	65-95	35-55	20-30
Grantfork Variant-----	0-6	Silt loam-----	CL	A-6	0	100	95-100	85-95	80-90	25-40	10-20
	6-31	Silty clay loam, clay loam.	CL	A-6, A-7	0	100	90-100	80-90	70-80	30-45	10-20
	31-60	Clay loam, silty clay loam.	CL	A-6, A-7	0-5	95-100	85-95	70-80	55-75	25-45	10-25
991*:											
Cisne--------	0-7	Silt loam-----	CL, CL-ML, ML	A-4	0	100	100	90-100	90-100	25-35	5-10
	7-16	Silt loam-----	CL-ML, CL	A-4, A-6	0	100	100	95-100	90-100	25-35	5-15
	16-42	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	90-100	90-100	45-60	20-35
	42-60	Silty clay loam, clay loam, silt loam.	CL	A-6, A-7	0-5	100	90-100	70-95	50-90	30-50	15-30
Huey---------	0-7	Silt loam-----	CL, CL-ML, ML	A-4, A-6	0	100	100	90-100	85-95	20-35	3-15
	7-15	Silt loam, silty clay loam.	CL	A-6, A-7	0	100	100	95-100	90-100	25-45	10-25
	15-52	Silt loam, silty clay loam, silty clay.	CL	A-6, A-7	0	100	100	95-100	90-100	30-50	15-30
	52-60	Loam, silt loam, silty clay loam.	CL	A-6	0	95-100	90-100	80-95	65-90	20-35	10-20
1288---------- Petrolia	0-6	Silty clay loam.	CL	A-6, A-7	0	100	95-100	90-100	80-100	30-45	10-20
	6-60	Silty clay loam, silt loam.	CL	A-4, A-6, A-7	0	100	95-100	80-100	60-100	20-45	8-20

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments >3 inches	Percentage passing sieve number--: 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
2002*:											
Cisne	0-9	Silt loam	CL, CL-ML, ML	A-4	0	100	100	90-100	90-100	25-35	5-10
	9-17	Silt loam	CL-ML, CL	A-4, A-6	0	100	100	95-100	90-100	25-35	5-15
	17-42	Silty clay loam, silty clay.	CH, CL	A-7	0	100	100	90-100	90-100	45-60	20-35
	42-60	Silty clay loam, clay loam, silt loam.	CL	A-6, A-7	0-5	100	90-100	70-95	50-90	30-50	15-30
Urban land.											
2012*:											
Wynoose	0-6	Silt loam	CL-ML, CL	A-4, A-6	0	100	100	95-100	85-95	20-35	5-15
	6-13	Silt loam	CL, ML, CL-ML	A-4, A-6	0	100	100	95-100	85-95	15-30	2-15
	13-47	Silty clay, silty clay loam.	CL, CH	A-7	0	100	100	95-100	85-95	40-55	20-35
	47-60	Silt loam, clay loam, silty clay loam.	CL	A-6, A-7	0	100	95-100	90-100	70-90	30-45	15-25
Urban land.											
2013B*:											
Bluford	0-7	Silt loam	CL, CL-ML	A-6, A-4	0	100	95-100	95-100	90-100	20-35	5-15
	7-16	Silt loam	ML, CL-ML, CL	A-4	0	100	95-100	95-100	90-100	20-30	NP-10
	16-60	Silty clay loam, silty clay.	CL	A-7, A-6	0	100	95-100	95-100	90-100	35-50	15-30
Urban land.											
2912A*:											
Hoyleton	0-16	Silt loam	CL-ML, CL	A-4, A-6	0	100	100	95-100	85-100	25-35	5-15
	16-42	Silty clay loam, silty clay.	CL, CH	A-7	0	100	100	95-100	85-100	40-55	20-30
	42-60	Silt loam, loam, clay loam.	CL, CL-ML	A-6, A-7, A-4	0	100	95-100	90-100	70-95	20-45	5-25
Darmstadt	0-16	Silt loam	CL, CL-ML	A-6, A-7, A-4	0	95-100	95-100	95-100	75-100	25-45	5-20
	16-21	Silty clay loam, silty clay.	CL, CH	A-7	0	100	95-100	95-100	90-100	40-65	20-40
	21-31	Silty clay loam, silty clay.	CL, CH	A-7	0	100	95-100	95-100	90-100	40-65	20-40
	31-60	Silt loam, silty clay loam, loam.	CL	A-6, A-7, A-4	0	95-100	95-100	90-100	75-100	20-50	7-30
Urban land.											

See footnote at end of table.

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	
3072----------Sharon	0-10	Silt loam-----	ML, CL, CL-ML	A-4	0	100	100	95-100	85-95	20-30	2-10
	10-48	Silt loam-----	ML, CL, CL-ML	A-4	0	100	100	95-100	85-95	20-30	2-10
	48-60	Silt loam, loam, sandy loam.	ML, CL, SM, SC	A-4	0	100	100	70-95	40-90	15-30	NP-10
3108----------Bonnie	0-10	Silt loam-----	CL	A-4, A-6	0	100	100	95-100	90-100	27-34	8-12
	10-43	Silt loam-----	CL	A-4, A-6	0	100	100	95-100	90-100	27-34	8-12
	43-60	Silt loam, silty clay loam.	CL	A-4, A-6	0	100	100	90-100	80-100	25-39	8-15
3225----------Holton	0-9	Loam, silt loam.	CL, CL-ML, ML	A-4	0-20	90-100	85-100	80-100	60-90	<25	2-10
	9-26	Silt loam, loam, loamy sand.	CL-ML, CL, SC-SM, SC	A-4, A-2, A-6	0-20	90-100	85-100	60-95	30-75	<25	4-12
	26-60	Stratified loamy fine sand to sandy clay loam.	SC, SC-SM, CL, CL-ML	A-4, A-2, A-6	0-40	75-100	60-100	55-90	30-55	<25	2-14
3226----------Wirt	0-3	Silt loam-----	CL-ML, ML	A-4	0	95-100	80-100	80-100	65-90	<25	3-7
	3-36	Silt loam, loam, sandy loam.	CL-ML, ML	A-4	0	95-100	80-100	75-100	55-90	<25	3-7
	36-60	Sandy loam, loam, gravelly sandy loam.	SM, SC-SM, ML, CL-ML	A-4, A-2, A-1-b	0-5	85-95	50-95	40-75	20-55	<25	NP-7
3333----------Wakeland	0-13	Silt loam-----	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
	13-60	Silt loam-----	ML	A-4	0	100	100	90-100	80-90	27-36	4-10
3334----------Birds	0-5	Silt loam-----	CL	A-4, A-6	0	100	95-100	90-100	80-100	24-34	8-15
	5-60	Silt loam-----	CL	A-4, A-6	0	100	95-100	90-100	80-100	24-34	8-15
3382----------Belknap	0-17	Silt loam-----	ML, CL, CL-ML	A-4	0	100	95-100	90-100	80-100	20-30	2-8
	17-60	Silt loam-----	ML, CL-ML, CL	A-4, A-6	0	100	95-100	90-100	80-100	20-35	NP-12
3415----------Orion	0-7	Silt loam-----	CL, CL-ML	A-4, A-6	0	100	100	85-100	80-100	25-35	4-12
	7-24	Stratified silt loam to very fine sand.	CL, CL-ML	A-4	0	100	100	90-100	70-80	20-30	4-10
	24-42	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-4	0	100	100	85-100	85-100	20-40	4-18
	42-60	Stratified silt loam to sand.	CL, CL-ML	A-4	0	80-100	80-100	80-100	80-100	20-30	4-10

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification: Unified	Classification: AASHTO	Fragments >3 inches	Percentage passing sieve number-- 4	10	40	200	Liquid limit	Plasticity index
	In				Pct					Pct	
8787---------- Banlic	0-25	Silt loam-----	ML, CL, CL-ML	A-4	0	100	95-100	90-100	85-95	20-30	3-10
	25-53	Silt loam, silt.	ML, CL-ML, CL	A-4	0	100	95-100	90-100	85-95	20-30	3-10
	53-60	Silt loam-----	ML, CL-ML, CL	A-4	0	100	95-100	90-100	85-95	20-30	3-10

* See description of the map unit for composition and behavior characteristics of the map unit.

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 K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
2----------------- Cisne	0-8	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
	8-16	15-27	1.25-1.45	0.06-0.6	0.18-0.20	4.5-6.0	Low----------	0.37			
	16-42	35-45	1.40-1.60	<0.06	0.09-0.15	4.5-6.0	High---------	0.37			
	42-60	25-37	1.50-1.70	<0.06	0.08-0.14	5.1-6.5	Moderate-----	0.37			
3A, 3B----------- 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
	8-12	15-27	1.35-1.60	0.2-0.6	0.16-0.18	4.5-6.5	Low----------	0.43			
	12-39	35-45	1.40-1.65	0.06-0.2	0.13-0.20	4.5-6.0	High---------	0.43			
	39-60	15-33	1.35-1.70	0.06-0.2	0.17-0.22	5.1-7.3	Moderate-----	0.43			
3B2--------------- 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
	7-36	35-45	1.40-1.65	0.06-0.2	0.13-0.20	4.5-6.0	High---------	0.43			
	36-60	15-33	1.35-1.70	0.06-0.2	0.17-0.22	5.1-7.3	Moderate-----	0.43			
4B---------------- Richview	0-9	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
	9-48	25-35	1.30-1.50	0.6-2.0	0.18-0.20	4.5-6.5	Moderate-----	0.43			
	48-60	22-35	1.50-1.70	0.6-2.0	0.14-0.20	4.5-6.5	Moderate-----	0.43			
4C2--------------- Richview	0-5	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
	5-38	25-35	1.30-1.50	0.6-2.0	0.18-0.20	4.5-6.5	Moderate-----	0.43			
	38-60	22-35	1.50-1.70	0.6-2.0	0.14-0.20	4.5-6.5	Moderate-----	0.43			
5C3--------------- Blair	0-4	20-27	1.35-1.55	0.6-2.0	0.15-0.24	5.1-7.3	Low----------	0.37	4	6	1-3
	4-25	18-30	1.45-1.60	0.2-0.6	0.16-0.21	4.5-6.0	Moderate-----	0.37			
	25-60	18-30	1.45-1.60	0.2-0.6	0.16-0.21	5.1-7.8	Moderate-----	0.37			
5D3--------------- Blair	0-4	27-35	1.40-1.60	0.2-0.6	0.11-0.15	5.1-7.3	Moderate-----	0.37	4	6	.5-1
	4-25	18-30	1.45-1.60	0.2-0.6	0.16-0.21	4.5-6.0	Moderate-----	0.37			
	25-60	18-30	1.45-1.60	0.2-0.6	0.16-0.21	5.1-7.8	Moderate-----	0.37			
7C2--------------- Atlas	0-10	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
	10-29	35-45	1.35-1.55	<0.06	0.07-0.19	4.5-7.3	High---------	0.32			
	29-60	30-45	1.35-1.55	<0.06	0.07-0.19	4.5-7.8	High---------	0.32			
7C3--------------- Atlas	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
	4-31	35-45	1.35-1.55	<0.06	0.07-0.19	4.5-7.3	High---------	0.32			
	31-50	30-45	1.35-1.55	<0.06	0.07-0.19	4.5-7.8	High---------	0.32			
	50-60	20-30	1.35-1.60	0.06-0.2	0.07-0.18	6.1-7.8	Moderate-----	0.32			
7D2--------------- Atlas	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
	6-29	35-45	1.35-1.55	<0.06	0.07-0.19	4.5-7.3	High---------	0.32			
	29-60	30-45	1.35-1.55	<0.06	0.07-0.19	4.5-7.8	High---------	0.32			
7D3--------------- Atlas	0-5	30-40	1.35-1.55	0.06-0.2	0.11-0.16	4.5-7.3	High---------	0.32	2	6	.5-2
	5-31	35-45	1.35-1.55	<0.06	0.07-0.19	4.5-7.3	High---------	0.32			
	31-50	30-45	1.35-1.55	<0.06	0.07-0.19	4.5-7.8	High---------	0.32			
	50-60	20-30	1.35-1.60	0.06-0.2	0.07-0.18	6.1-7.8	Moderate-----	0.32			
8D2--------------- Hickory	0-9	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
	9-60	24-35	1.45-1.65	0.6-2.0	0.15-0.19	4.5-7.3	Moderate-----	0.37			
8D3--------------- Hickory	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
	5-53	24-35	1.45-1.65	0.6-2.0	0.15-0.19	4.5-7.3	Moderate-----	0.37			
	53-60	15-32	1.50-1.70	0.6-2.0	0.11-0.19	5.1-8.4	Low----------	0.37			
8E3--------------- Hickory	0-3	19-25	1.30-1.50	0.6-2.0	0.20-0.22	4.5-7.3	Low----------	0.37	4	6	1-2
	3-49	27-35	1.45-1.65	0.6-2.0	0.15-0.19	4.5-6.0	Moderate-----	0.28			
	49-60	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 K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
8F, 8G----------- Hickory	0-14	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
	14-39	27-35	1.45-1.65	0.6-2.0	0.15-0.19	4.5-7.3	Moderate-----	0.28			
	39-60	15-32	1.50-1.70	0.6-2.0	0.11-0.19	5.1-8.4	Low----------	0.28			
12--------------- Wynoose	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
	6-13	12-18	1.30-1.50	0.06-0.2	0.18-0.20	3.6-7.3	Low----------	0.43			
	13-51	35-42	1.40-1.60	<0.06	0.09-0.13	3.6-6.0	High---------	0.43			
	51-60	25-37	1.50-1.70	0.06-0.2	0.11-0.15	3.6-6.0	Moderate-----	0.43			
13A, 13B--------- Bluford	0-8	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
	8-13	15-25	1.40-1.60	0.2-0.6	0.18-0.20	3.6-6.0	Low----------	0.43			
	13-44	35-42	1.45-1.65	0.06-0.6	0.11-0.20	3.6-5.5	Moderate-----	0.43			
	44-60	22-35	1.60-1.70	0.06-0.2	0.11-0.16	3.6-6.0	Moderate-----	0.43			
13B2------------- Bluford	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
	6-24	27-35	1.45-1.65	0.06-0.6	0.11-0.20	3.6-5.5	Moderate-----	0.43			
	24-60	22-35	1.60-1.70	0.06-0.2	0.11-0.16	3.6-6.0	Moderate-----	0.43			
14B-------------- Ava	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	.5-2
	11-30	22-33	1.40-1.60	0.6-2.0	0.18-0.21	4.5-5.5	Moderate-----	0.43			
	30-37	24-35	1.50-1.70	0.2-0.6	0.18-0.21	4.5-5.5	Moderate-----	0.43			
	37-52	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			
14C2------------- Ava	0-7	20-27	1.40-1.60	0.6-2.0	0.21-0.24	4.5-7.3	Low----------	0.43	4	6	.5-2
	7-20	22-33	1.40-1.60	0.6-2.0	0.18-0.21	4.5-5.5	Moderate-----	0.43			
	20-44	20-30	1.55-1.80	<0.06	0.09-0.11	4.5-5.5	Low----------	0.43			
	44-60	20-30	1.55-1.75	0.2-0.6	0.05-0.10	4.5-6.0	Low----------	0.43			
14C3------------- Ava	0-3	20-27	1.40-1.60	0.6-2.0	0.21-0.24	4.5-7.3	Low----------	0.43	4	6	.5-2
	3-18	22-33	1.40-1.60	0.6-2.0	0.18-0.21	4.5-5.5	Moderate-----	0.43			
	18-49	20-30	1.55-1.80	<0.06	0.09-0.11	4.5-5.5	Low----------	0.43			
	49-60	20-30	1.55-1.75	0.2-0.6	0.05-0.10	4.5-6.0	Low----------	0.43			
15B2------------- Parke	0-6	18-27	1.25-1.40	0.6-2.0	0.22-0.24	5.1-7.3	Low----------	0.37	5	6	.5-2
	6-24	22-35	1.30-1.45	0.6-2.0	0.18-0.20	4.5-6.0	Moderate-----	0.37			
	24-60	18-30	1.55-1.65	0.6-2.0	0.16-0.18	4.5-5.5	Low----------	0.28			
109-------------- Racoon	0-6	18-27	1.30-1.50	0.2-0.6	0.22-0.24	4.5-7.3	Low----------	0.37	3	6	1-2
	6-26	18-27	1.35-1.55	0.2-0.6	0.20-0.22	4.5-7.3	Low----------	0.37			
	26-39	27-40	1.35-1.60	0.06-0.2	0.15-0.20	4.5-5.5	High---------	0.37			
	39-47	27-35	1.35-1.60	0.06-0.2	0.18-0.20	4.5-6.0	Moderate-----	0.37			
	47-60	18-35	1.40-1.65	0.2-0.6	0.15-0.20	4.5-6.0	Moderate-----	0.37			
120-------------- Huey	0-7	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
	7-15	20-35	1.40-1.60	0.06-0.2	0.10-0.18	5.6-8.4	Moderate-----	0.43			
	15-52	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	6.6-8.4	Moderate-----	0.43			
218-------------- Newberry	0-9	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
	9-24	18-25	1.30-1.50	0.2-0.6	0.20-0.22	4.5-6.0	Low----------	0.37			
	24-45	27-35	1.30-1.55	0.06-0.2	0.18-0.20	4.5-6.0	Moderate-----	0.37			
	45-60	22-33	1.50-1.70	0.06-0.2	0.14-0.20	4.5-7.3	Moderate-----	0.37			
337B------------- Creal	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
	6-27	18-25	1.35-1.60	0.2-0.6	0.18-0.20	3.6-7.3	Low----------	0.37			
	27-60	25-35	1.35-1.60	0.2-0.6	0.18-0.20	4.5-6.5	Moderate-----	0.37			
533* Urban land											

See footnote at end of table.

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 K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
551D2 Gosport	0-5	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
	5-27	36-60	1.50-1.60	<0.06	0.12-0.14	3.6-5.5	High	0.32			
	27-60	---	---	<0.06	---	---	---	---			
551G Gosport	0-5	18-27	1.30-1.40	0.2-0.6	0.18-0.20	5.1-6.5	Low	0.43	3	6	2-3
	5-27	36-60	1.50-1.60	<0.06	0.12-0.14	3.6-5.5	High	0.32			
	27-60	---	---	<0.06	---	---	---	---			
581B Tamalco	0-8	20-27	1.30-1.50	0.6-2.0	0.22-0.24	4.5-7.8	Low	0.43	3	6	2-3
	8-26	35-45	1.35-1.60	<0.06	0.09-0.14	4.5-7.3	High	0.43			
	26-42	20-35	1.50-1.70	<0.06	0.07-0.11	5.1-8.4	Moderate	0.43			
	42-60	20-30	1.55-1.75	<0.06	0.02-0.12	7.4-9.0	Moderate	0.43			
620A Darmstadt	0-10	10-27	1.30-1.50	0.06-0.2	0.22-0.24	5.1-7.3	Low	0.43	3	6	.5-2
	10-21	27-35	1.40-1.65	0.06-0.2	0.11-0.20	4.5-7.8	Moderate	0.43			
	21-31	27-35	1.40-1.65	<0.06	0.09-0.10	6.6-9.0	Moderate	0.43			
	31-60	15-30	1.50-1.70	<0.06	0.10-0.15	7.4-9.0	Low	0.43			
620B2 Darmstadt	0-7	10-27	1.30-1.50	0.06-0.2	0.22-0.24	5.1-7.3	Low	0.43	3	6	.5-2
	7-14	27-35	1.40-1.65	0.06-0.2	0.11-0.20	4.5-7.8	Moderate	0.43			
	14-35	27-35	1.40-1.65	<0.06	0.09-0.10	6.6-9.0	Moderate	0.43			
	35-60	15-30	1.50-1.70	<0.06	0.10-0.15	7.4-9.0	Low	0.43			
761G Eleva	0-4	5-15	1.40-1.60	2.0-6.0	0.10-0.18	3.6-7.3	Low	0.24	4	3	1-3
	4-27	6-18	1.50-1.60	0.6-6.0	0.09-0.19	3.6-6.5	Low	0.24			
	27-37	1-8	1.50-1.70	2.0-20	0.04-0.10	3.6-6.5	Low	0.15			
	37-41	---	---	0.2-2.0	---	---	---	---			
786D2 Frondorf	0-10	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
	10-35	20-35	1.20-1.45	0.6-2.0	0.08-0.16	4.5-6.0	Low	0.17			
	35-60	---	---	0.00-2.0	---	---	---	---			
801B Orthents	0-60	---	---	0.06-2.0	---	---	---	---	---	---	---
810*. Oil-waste land											
912A*, 912B*:											
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
	8-12	15-27	1.35-1.60	0.2-0.6	0.16-0.18	4.5-6.5	Low	0.43			
	12-39	35-45	1.40-1.65	0.06-0.2	0.13-0.20	4.5-6.0	High	0.43			
	39-60	15-33	1.35-1.70	0.06-0.2	0.17-0.22	5.1-7.3	Moderate	0.43			
Darmstadt	0-13	10-27	1.30-1.50	0.06-0.2	0.22-0.24	5.1-7.3	Low	0.43	3	6	.5-2
	13-21	27-35	1.40-1.65	0.06-0.2	0.11-0.20	4.5-7.8	Moderate	0.43			
	21-31	27-35	1.40-1.65	<0.06	0.09-0.10	6.6-9.0	Moderate	0.43			
	31-60	15-30	1.50-1.70	<0.06	0.10-0.15	7.4-9.0	Low	0.43			
929D2*:											
Ava	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	.5-2
	5-11	22-33	1.40-1.60	0.6-2.0	0.18-0.21	4.5-5.5	Moderate	0.43			
	11-25	24-35	1.50-1.70	0.2-0.6	0.18-0.21	4.5-5.5	Moderate	0.43			
	25-60	20-30	1.55-1.75	<0.06	0.05-0.10	4.5-6.0	Low	0.43			
Hickory	0-4	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
	4-60	27-35	1.45-1.65	0.6-2.0	0.15-0.19	4.5-6.0	Moderate	0.28			

See footnote at end of table.

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 K	Erosion factors T	Wind erodi-bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
934C2*:											
Blair-----------	0-6	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
	6-38	18-30	1.45-1.60	0.2-0.6	0.16-0.21	4.5-6.0	Moderate-----	0.37			
	38-60	18-30	1.45-1.60	0.2-0.6	0.16-0.21	5.1-7.8	Moderate-----	0.37			
Grantfork-------	0-4	20-27	1.35-1.55	0.2-0.6	0.18-0.20	4.5-7.8	Low----------	0.37	5	6	.5-1
	4-16	20-30	1.40-1.60	0.2-0.6	0.15-0.20	5.1-9.0	Low----------	0.37			
	16-60	20-30	1.65-1.80	0.06-0.2	0.07-0.10	7.4-9.0	Moderate-----	0.37			
967F*:											
Hickory---------	0-7	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
	7-41	27-35	1.45-1.65	0.6-2.0	0.15-0.19	4.5-7.3	Moderate-----	0.28			
	41-60	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	2-3
	6-31	36-60	1.50-1.60	<0.06	0.12-0.14	3.6-5.5	High---------	0.32			
	31-60	---	---	<0.06	---	---	-------------	----			
987C2*:											
Atlas-----------	0-4	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
	4-29	35-45	1.35-1.55	<0.06	0.07-0.19	4.5-7.3	High---------	0.32			
	29-51	30-45	1.35-1.55	<0.06	0.07-0.19	4.5-7.8	High---------	0.32			
	51-60	20-30	1.35-1.60	0.06-0.2	0.07-0.18	6.1-7.8	Moderate-----	0.32			
Grantfork Variant--------	0-6	20-27	1.30-1.50	0.2-0.6	0.20-0.24	4.5-7.8	Moderate-----	0.43	3	6	.5-1
	6-31	35-45	1.50-1.70	<0.06	0.09-0.13	4.5-7.8	High---------	0.43			
	31-60	30-45	1.55-1.70	<0.06	0.09-0.13	6.6-8.4	High---------	0.43			
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
	7-16	15-27	1.25-1.45	0.06-0.6	0.18-0.20	4.5-6.0	Low----------	0.37			
	16-42	35-45	1.40-1.60	<0.06	0.09-0.15	4.5-6.0	High---------	0.37			
	42-60	25-37	1.50-1.70	<0.06	0.08-0.14	5.1-6.5	Moderate-----	0.37			
Huey------------	0-7	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
	7-15	20-35	1.40-1.60	0.06-0.2	0.10-0.18	5.6-8.4	Moderate-----	0.43			
	15-52	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	6.6-8.4	Moderate-----	0.43			
1288------------- Petrolia	0-6	27-35	1.20-1.40	0.2-0.6	0.21-0.23	5.6-8.4	Moderate-----	0.32	5	7	2-3
	6-60	20-35	1.40-1.60	0.2-0.6	0.18-0.20	4.5-7.8	Moderate-----	0.32			
2002*:											
Cisne-----------	0-9	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
	9-17	15-27	1.25-1.45	0.06-0.6	0.18-0.20	4.5-6.0	Low----------	0.37			
	17-42	35-45	1.40-1.60	<0.06	0.09-0.15	4.5-6.0	High---------	0.37			
	42-60	25-37	1.50-1.70	<0.06	0.08-0.14	5.1-6.5	Moderate-----	0.37			
Urban land.											
2012*:											
Wynoose---------	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
	6-13	12-18	1.30-1.50	0.06-0.2	0.18-0.20	3.6-7.3	Low----------	0.43			
	13-47	35-42	1.40-1.60	<0.06	0.09-0.13	3.6-6.0	High---------	0.43			
	47-60	25-37	1.50-1.70	0.06-0.2	0.11-0.15	3.6-6.0	Moderate-----	0.43			
Urban land.											

See footnote at end of table.

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 K	Erosion factors T	Wind erodi- bility group	Organic matter
	In	Pct	g/cc	In/hr	In/in	pH					Pct
2013B*:											
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
	7-16	15-25	1.40-1.60	0.2-0.6	0.18-0.20	3.6-6.0	Low-----------	0.43			
	16-60	35-42	1.45-1.65	0.06-0.2	0.11-0.20	3.6-5.5	Moderate-----	0.43			
Urban land.											
2912A*:											
Hoyleton--------	0-16	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
	16-42	35-45	1.40-1.65	0.06-0.2	0.13-0.20	4.5-6.0	High----------	0.43			
	42-60	15-33	1.35-1.70	0.06-0.2	0.17-0.22	5.1-7.3	Moderate-----	0.43			
Darmstadt-------	0-16	10-27	1.30-1.50	0.06-0.2	0.22-0.24	5.1-7.3	Low-----------	0.43	3	6	.5-2
	16-21	27-35	1.40-1.65	0.06-0.2	0.11-0.20	4.5-7.8	Moderate-----	0.43			
	21-31	27-35	1.40-1.65	<0.06	0.09-0.10	6.6-9.0	Moderate-----	0.43			
	31-60	15-30	1.50-1.70	<0.06	0.10-0.15	7.4-9.0	Low-----------	0.43			
Urban land.											
3072------------- Sharon	0-10	10-18	1.30-1.50	0.6-2.0	0.22-0.24	4.5-7.3	Low-----------	0.37	5	5	.5-2
	10-48	10-18	1.30-1.50	0.6-2.0	0.20-0.22	4.5-6.5	Low-----------	0.37			
	48-60	5-18	1.35-1.65	0.6-2.0	0.11-0.22	4.5-5.5	Low-----------	0.37			
3108------------- Bonnie	0-10	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
	10-43	18-27	1.35-1.55	0.2-0.6	0.21-0.24	4.5-5.5	Low-----------	0.43			
	43-60	18-30	1.35-1.55	0.2-0.6	0.14-0.24	4.5-7.8	Low-----------	0.43			
3225------------- Holton	0-9	5-18	1.20-1.45	0.6-2.0	0.15-0.20	5.6-7.3	Low-----------	0.37	5	5	1-3
	9-26	5-18	1.25-1.45	0.6-2.0	0.13-0.17	5.6-7.8	Low-----------	0.24			
	26-60	5-20	1.25-1.45	0.6-2.0	0.07-0.16	5.6-7.8	Low-----------	0.24			
3226------------- Wirt	0-3	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
	3-36	10-18	1.40-1.55	0.6-2.0	0.15-0.20	5.6-7.3	Low-----------	0.24			
	36-60	8-18	1.45-1.60	2.0-6.0	0.07-0.17	5.6-7.3	Low-----------	0.24			
3333------------- Wakeland	0-13	10-17	1.30-1.50	0.6-2.0	0.22-0.24	5.6-7.3	Low-----------	0.37	5	5	1-3
	13-60	10-17	1.30-1.50	0.6-2.0	0.20-0.22	5.6-7.8	Low-----------	0.37			
3334------------- Birds	0-5	15-25	1.30-1.50	0.2-0.6	0.21-0.25	5.1-7.8	Low-----------	0.43	5	6	1-3
	5-60	18-27	1.40-1.60	0.2-0.6	0.20-0.22	5.1-7.8	Low-----------	0.43			
3382------------- Belknap	0-17	8-18	1.35-1.55	0.2-2.0	0.21-0.25	4.5-7.3	Low-----------	0.37	5	5	1-3
	17-60	8-18	1.40-1.60	0.2-2.0	0.21-0.24	4.5-6.0	Low-----------	0.37			
3415------------- Orion	0-7	10-18	1.20-1.30	0.6-2.0	0.22-0.24	5.6-7.8	Low-----------	0.37	5	5	1-3
	7-24	10-18	1.20-1.30	0.6-2.0	0.20-0.22	5.6-7.8	Low-----------	0.37			
	24-42	10-30	1.25-1.45	0.6-2.0	0.18-0.22	5.6-7.8	Low-----------	0.37			
	42-60	10-18	1.20-1.40	0.6-2.0	0.18-0.22	5.6-7.8	Low-----------	0.37			
8787------------- Banlic	0-25	10-18	1.40-1.60	0.2-0.6	0.20-0.24	5.1-7.8	Low-----------	0.43	4	5	.5-1
	25-53	10-18	1.65-1.90	0.06-0.2	0.10-0.11	4.5-6.0	Low-----------	0.43			
	53-60	12-18	1.50-1.70	0.2-0.6	0.05-0.08	4.5-6.5	Low-----------	0.43			

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--SOIL AND WATER FEATURES

("Flooding," "water table," and terms such as "frequent," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	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--------	---	---	0-2.0	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.
5C3, 5D3---------- Blair	C	None--------	---	---	1.5-3.5	Apparent	Mar-Jun	>60	---	High-----	High-----	High.
7C2, 7C3, 7D2, 7D3-------------- Atlas	D	None--------	---	---	1.0-2.0	Perched	Apr-Jun	>60	---	High-----	High-----	Moderate.
8D2, 8D3---------- Hickory	C	None--------	---	---	4.0-6.0	Apparent	Mar-Jun	>60	---	Moderate	Moderate	Moderate.
8E3, 8F, 8G------- Hickory	C	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
12---------------- Wynoose	D	None--------	---	---	0-2.0	Perched	Mar-Jun	>60	---	High-----	High-----	High.
13A, 13B, 13B2---- Bluford	C	None--------	---	---	1.0-3.0	Perched	Mar-Jun	>60	---	High-----	High-----	High.
14B, 14C2, 14C3--- Ava	C	None--------	---	---	1.5-3.5	Perched	Mar-Jun	>60	---	High-----	Moderate	High.
15B2-------------- Parke	B	None--------	---	---	>6.0	---	---	>60	---	High-----	Moderate	High.
109--------------- Racoon	C/D	None--------	---	---	+.5-1.0	Apparent	Mar-Jun	>60	---	High-----	High-----	High.
120--------------- Huey	D	None--------	---	---	+.5-2.0	Perched	Mar-Jun	>60	---	High-----	High-----	Low.
218--------------- Newberry	C	None--------	---	---	+.5-1.0	Apparent	Mar-Jun	>60	---	High-----	High-----	High.
337B-------------- Creal	C	None--------	---	---	1.0-3.0	Apparent	Feb-May	>60	---	High-----	High-----	High.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
533*. Urban land												
551D2 Gosport	C	None	---	---	1.5-3.0	Perched	Jan-Apr	20-40	Soft	Moderate	High	High.
551G Gosport	C	None	---	---	1.5-3.0	Perched	Jan-Apr	20-40	Soft	Moderate	High	High.
581B Tamalco	D	None	---	---	2.5-5.0	Apparent	Feb-Apr	>60	---	High	High	Low.
620A, 620B2 Darmstadt	D	None	---	---	1.0-3.0	Perched	Feb-May	>60	---	High	High	High.
761G Eleva	B	None	---	---	>6.0	---	---	20-40	Soft	Moderate	Low	Moderate.
786D2 Frondorf	B	None	---	---	>6.0	---	---	20-40	Soft	Moderate	Moderate	High.
801B Orthents	---	None	---	---	1.0-3.0	Apparent	Feb-May	>60	---	---	---	---
810*. Oil-waste land												
912A*, 912B*:												
Hoyleton	C	None	---	---	1.0-3.0	Apparent	Feb-Jun	>60	---	High	High	High.
Darmstadt	D	None	---	---	1.0-3.0	Perched	Feb-Jun	>60	---	High	High	High.
929D2*:												
Ava	C	None	---	---	1.5-3.5	Perched	Mar-Jun	>60	---	High	Moderate	High.
Hickory	C	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
934C2*:												
Blair	C	None	---	---	1.5-3.5	Apparent	Mar-Jun	>60	---	High	High	High.
Grantfork	D	None	---	---	1.0-3.0	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.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding: Frequency	Flooding: Duration	Flooding: Months	High water table: Depth	High water table: Kind	High water table: Months	Bedrock: Depth	Bedrock: Hardness	Potential frost action	Risk of corrosion: Uncoated steel	Risk of corrosion: Concrete
					Ft			In				
987C2*:												
Atlas	D	None	---	---	1.0-2.0	Perched	Apr-Jun	>60	---	High	High	Moderate.
Grantfork Variant	D	None	---	---	1.0-2.0	Perched	Apr-Jun	>60	---	High	High	Low.
991*:												
Cisne	D	None	---	---	0-2.0	Perched	Feb-Jun	>60	---	High	High	Moderate.
Huey	D	None	---	---	+.5-2.0	Perched	Mar-Jun	>60	---	High	High	Low.
1288 Petrolia	C/D	Frequent	Long	Mar-Jun	+.5-1.0	Apparent	Apr-Jun	>60	---	High	High	Low.
2002*:												
Cisne	D	None	---	---	0-2.0	Perched	Feb-Jun	>60	---	High	High	Moderate.
Urban land.												
2012*:												
Wynoose	D	None	---	---	0-2.0	Perched	Mar-Jun	>60	---	High	High	High.
Urban land.												
2013B*:												
Bluford	C	None	---	---	1.0-3.0	Perched	Mar-Jun	>60	---	High	High	High.
Urban land.												
2912A*:												
Hoyleton	C	None	---	---	1.0-3.0	Apparent	Mar-Jun	>60	---	High	High	High.
Darmstadt	D	None	---	---	1.0-3.0	Perched	Feb-May	>60	---	High	High	High.
Urban land.												
3072 Sharon	B	Frequent	Brief	Mar-Jun	3.0-6.0	Apparent	Mar-Jun	>60	---	High	Low	High.
3108 Bonnie	C/D	Frequent	Long	Jan-Jun	+.5-1.0	Apparent	Jan-Jun	>60	---	High	High	High.
3225 Holton	C	Frequent	Brief	Nov-Jun	1.0-3.0	Apparent	Nov-Jun	>60	---	High	Moderate	High.
3226 Wirt	B	Frequent	Brief	Nov-Jun	>6.0	---	---	>60	---	Moderate	Low	Moderate.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
3333-------------- Wakeland	C	Frequent----	Brief-----	Jan-May	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Low.
3334-------------- Birds	C/D	Frequent----	Long------	Mar-Jun	+.5-1.0	Apparent	Mar-Jun	>60	---	High-----	High-----	Moderate.
3382-------------- Belknap	C	Frequent----	Brief to long.	Jan-Jun	1.0-3.0	Apparent	Jan-Jun	>60	---	High-----	High-----	High.
3415-------------- Orion	C	Frequent----	Brief-----	Mar-May	1.0-3.0	Apparent	Nov-May	>60	---	High-----	High-----	Low.
8787-------------- Banlic	C	Occasional	Brief-----	Mar-Jun	1.0-3.0	Perched	Jan-Jun	>60	---	High-----	High-----	High.

* See description of the map unit for composition and behavior characteristics of the map unit.

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	Sample number	Horizon designator	Depth	Moisture density: MAX	Moisture density: OPT	Percentage passing sieve--: No. 4	No. 10	No. 40	No. 200	LL	PI	Classification: AASHTO	Classification: UN
			In	Lb/ cu ft	Pct					Pct			
Ava silt loam:	85IL-121-5-1	Ap	0-7	106.2	18.2	100	99.7	98.3	95.2	32.0	6.6	A-4(7)	ML
	-5-3	Bt	11-22	105.4	19.4	---	100	99.6	98.7	43.3	17.1	A-7-6(20)	CL
	-5-6	Bt	25-30	106.6	19.0	100	99.7	99.4	98.0	43.6	21.6	A-7-6(23)	CL
	-5-7	2BC	37-52	114.7	15.3	100	99.9	98.1	87.5	27.4	11.4	A-6(8)	CL
Blair silty clay loam:	85IL-121-6-1	Ap	0-4	110.1	16.1	99.8	99.4	95.2	85.2	34.3	15.9	A-6(3)	CL
	-6-3	Bt2	11-25	118.1	13.5	99.1	98.1	91.0	68.9	30.2	8.2	A-4(4)	CL
	-6-5	Bt4	40-54	120.8	12.4	98.4	95.5	88.0	61.3	28.9	16.0	A-6(7)	CL
Darmstadt silt loam:	86IL-121-16-1	Ap	0-7	105.3	18.0	99.9	99.8	96.6	89.5	34.0	10.8	A-6(10)	CL
	-16-2	Bt1	7-14	95.7	20.5	100	99.6	97.6	89.3	56.6	32.7	A-7-6(32)	CH
	-16-4	2Bt3	20-35	114.2	15.6	100	99.1	96.7	86.2	36.7	20.6	A-6(17)	CL
	-16-6	2Btg2	46-60	114.1	15.7	100	99.5	96.7	83.4	35.5	20.9	A-6(16)	CL
Grantfork silt loam:	85IL-121-60-3	Bt	9-16	112.3	16.2	99.4	97.5	94.5	78.3	40.7	20.6	A-7-6(16)	CL
	-60-5	2Btg2	30-42	115.8	14.8	97.4	96.2	91.6	72.7	37.3	22.9	A-6(14)	CL
	-60-6	2Btg3	42-53	117.5	14.2	98.1	97.1	92.2	64.9	33.0	19.9	A-6(10)	CL
Hickory silt loam:	85IL-121-9-1	Ap	0-4	110.8	15.8	98.5	97.5	89.1	59.1	31.8	9.8	A-4(4)	CL
	-9-4	Bt3	22-34	110.0	16.0	97.2	93.2	86.6	64.2	41.9	25.5	A-7-6(14)	CL
	-9-6	BC	47-63	121.1	12.8	98.5	96.3	95.5	76.7	27.7	12.7	A-6(7)	CL
Holton silt loam:	85IL-121-48-2	A2	2-9	112.6	14.0	99.3	98.2	92.7	63.2	29.1	7.7	A-4(3)	CL
	-48-4	Bw2	14-26	122.1	10.7	99.7	97.3	92.0	54.9	18.6	2.5	A-4(0)	ML
	-48-6	C2	33-53	122.8	10.9	99.0	94.8	89.4	51.9	18.8	2.8	A-4(0)	ML
Hoyleton silt loam:	84IL-121-45-1	Ap	0-8	107.2	15.5	---	100	94.2	87.5	27.9	4.9	A-4(4)	ML
	-45-3	Bt2	21-30	97.1	22.8	---	100	98.1	92.1	47.9	24.8	A-7-6(25)	CL
	-45-5	2BC	39-50	116.3	14.0	99.7	99.2	96.3	85.7	31.2	14.7	A-6(11)	CL
Huey silt loam:	85IL-121-59-1	Ap	0-7	107.4	17.6	99.7	98.9	97.7	94.9	32.2	13.1	A-6(12)	CL
	-59-3	Btg2	15-23	108.8	18.4	100	99.8	99.0	96.8	51.8	37.5	A-7-6(39)	CH
	-59-5	Btg4	36-52	106.3	19.9	100	99.6	98.4	95.8	51.6	31.5	A-7-6(33)	CH
Richview silt loam:	84IL-121-50-1	Ap	0-9	105.9	17.8	100	99.8	98.4	96.2	33.4	11.4	A-6(11)	CL
	-50-4	Bt2	22-34	112.3	16.1	---	100	99.4	83.2	30.9	12.9	A-6(6)	CL
	-50-7	2BC	48-56	124.1	11.2	99.8	99.6	98.7	45.1	17.8	4.1	A-4(0)	SM-SC
Wakeland silt loam:	84IL-121-51-1	A	0-13	114.3	14.0	---	100	99.7	84.6	27.2	7.2	A-4(5)	CL
	-51-4	C2	20-28	113.7	14.3	---	100	99.8	82.9	27.7	7.8	A-4(5)	CL
	-51-6	C4	46-52	115.1	13.6	---	100	93.9	72.9	30.7	8.4	A-4(5)	CL

TABLE 19.--CLASSIFICATION OF THE SOILS

(An asterisk in the first column indicates that in one or more of the map units the soil is a taxadjunct to the series. The text identifies those map units and describes the characteristics of the soils 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
Banlic	Coarse-silty, mixed, nonacid, mesic Aeric Haplaquepts
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
*Eleva	Coarse-loamy, mixed, mesic Typic Hapludalfs
Frondorf	Fine-loamy, mixed, mesic Ultic Hapludalfs
Gosport	Fine, illitic, mesic Typic Dystrochrepts
Grantfork	Fine-loamy, mixed, mesic, sloping Aeric Ochraqualfs
Grantfork Variant	Fine, montmorillonitic, 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
Newberry	Fine-silty, mixed, mesic Mollic Ochraqualfs
*Orion	Coarse-silty, mixed, nonacid, mesic Aquic Udifluvents
Orthents	Orthents
Parke	Fine-silty, mixed, mesic Ultic Hapludalfs
*Petrolia	Fine-silty, mixed, nonacid, mesic Typic Fluvaquents
Racoon	Fine-silty, mixed, mesic Typic Ochraqualfs
Richview	Fine-silty, mixed, mesic Mollic Hapludalfs
Sharon	Coarse-silty, mixed, acid, mesic Typic Udifluvents
Tamalco	Fine, montmorillonitic, mesic Typic Natrudalfs
Wakeland	Coarse-silty, mixed, nonacid, mesic Aeric Fluvaquents
Wirt	Coarse-loamy, mixed, nonacid, mesic Typic Udifluvents
Wynoose	Fine, montmorillonitic, mesic Typic Albaqualfs

☆ U.S. GOVERNMENT PRINTING OFFICE : 1996—405-693/20020/SCS

Accessibility Statement

This document is not accessible by screen-reader software. The Natural Resources Conservation Service (NRCS) is committed to making its information accessible to all of its customers and employees. If you are experiencing accessibility issues and need assistance, please contact our Helpdesk by phone at (800) 457-3642 or by e-mail at ServiceDesk-FTC@ftc.usda.gov. For assistance with publications that include maps, graphs, or similar forms of information, you may also wish to contact our State or local office. You can locate the correct office and phone number at http://offices.sc.egov.usda.gov/locator/app.

Nondiscrimination Statement

Nondiscrimination Policy

The U.S. Department of Agriculture (USDA) prohibits discrimination against its customers, employees, and applicants for employment on the basis of race, color, national origin, age, disability, sex, gender identity, religion, reprisal, and where applicable, political beliefs, marital status, familial or parental status, sexual orientation, whether all or part of an individual's income is derived from any public assistance program, or protected genetic information. The Department prohibits discrimination in employment or in any program or activity conducted or funded by the Department. (Not all prohibited bases apply to all programs and/or employment activities.)

To File an Employment Complaint

If you wish to file an employment complaint, you must contact your agency's EEO Counselor (http://directives.sc.egov.usda.gov/33081.wba) within 45 days of the date of the alleged discriminatory act, event, or personnel action. Additional information can be found online at http://www.ascr.usda.gov/complaint_filing_file.html.

To File a Program Complaint

If you wish to file a Civil Rights program complaint of discrimination, complete the USDA Program Discrimination Complaint Form, found online at http://www.ascr.usda.gov/complaint_filing_cust.html or at any USDA office, or call (866) 632-9992 to request the form. You may also write a letter containing all of the information requested in the form. Send your completed complaint form or letter by mail to U.S. Department of Agriculture; Director, Office of Adjudication; 1400 Independence Avenue, S.W.; Washington, D.C. 20250-9419; by fax to (202) 690-7442; or by email to program.intake@usda.gov.

Persons with Disabilities

If you are deaf, are hard of hearing, or have speech disabilities and you wish to file either an EEO or program complaint, please contact USDA through the Federal Relay Service at (800) 877-8339 or (800) 845-6136 (in Spanish).

If you have other disabilities and wish to file a program complaint, please see the contact information above. If you require alternative means of communication for program information (e.g., Braille, large print, audiotape, etc.), please contact USDA's TARGET Center at (202) 720-2600 (voice and TDD).

Supplemental Nutrition Assistance Program

For additional information dealing with Supplemental Nutrition Assistance Program (SNAP) issues, call either the USDA SNAP Hotline Number at (800) 221-5689, which is also in Spanish, or the State Information/Hotline Numbers (http://directives.sc.egov.usda.gov/33085.wba).

All Other Inquiries

For information not pertaining to civil rights, please refer to the listing of the USDA Agencies and Offices (http://directives.sc.egov.usda.gov/33086.wba).