SOIL SURVEY OF

Saline County, Illinois

United States Department of Agriculture
Soil Conservation Service and Forest Service
In cooperation with
Illinois Agricultural Experiment Station

This is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and agencies of the States, usually the Agricultural Experiment Stations. In some surveys, other Federal and local agencies also contribute. The Soil Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all who need the information, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in the period 1970–73. Soil names and descriptions were approved in 1974. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1973. This survey was made cooperatively by the Soil Conservation Service, the Forest Service, and the Illinois Agricultural Experiment Station. It is part of the technical assistance furnished to the Saline County Soil and Water Conservation District. This soil survey was partly financed by the Saline County Board of Supervisors and the Saline Valley Conservancy District.

Soil maps in this survey may be copied without permission, but any enlargement of these maps could cause misunderstanding of the detail of mapping and result in erroneous interpretations. Enlarged maps do not show small areas of contrasting soils that could have been shown at a larger mapping scale.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY of Saline County contains information that can be applied in managing farms and woodlands; in selecting sites for roads, ponds, buildings, or other structures; and in evaluating tracts of land for farming, industry, recreation, and other uses.

Locating Soils

All the soils of Saline County are shown on the detailed map at the back of this survey. This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with a number on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and identified by a symbol. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information in this survey. This guide lists all of the soils of the county in numerical order by map symbol, and it shows the capability unit, woodland group, wildlife group, and recreation group in which the soil has been placed. It also lists the page on which each soil is described.

Individual colored maps showing the relative suitability or limitation of soils for many specific purposes can be developed by using the soil map and information in the text. Translucent material can be used as an overlay for the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers or with the land can learn about the use and management of the soils from the descriptions of the soils and from information in the section "Use of the Soils for Cropland."

Homeowners will find useful information on sites for houses in the engineering tables, and homeowners with lawns and gardens will also find useful information in the section on "Use of the Soils for Cropland." Many of the methods and practices needed and used for cropland can be adapted to small tracts of land.

Foresters and others can refer to the section "Use of the Soils for Woodland," where the soils are grouped according to their suitability for trees.

Game managers, sportsmen, and others can refer to the section "Use of the Soils for Wildlife," where the soils are grouped and rated according to their suitability for wildlife habitat and for kinds of wildlife.

Recreation specialists will find the degree of soil limitations affecting use of soils for selected recreational uses in the section "Recreational Uses of the Soils."

Engineers and builders will find, under "Engineering Uses of the Soils," tables that contain test data, estimates of soil properties, and information about soil features that affect engineering practices.

Scientists and students can read about how the soils formed and how they are classified in the section "Formation and Classification of the Soils."

Environmentalists and others will find the descriptions of the soils and information in the sections "Use and Management of the Soils" and "General Nature of the County" helpful in understanding the natural environment and its use by the people of the county.

Cover: Camel Rock, a prominent landmark in the Garden of the Gods and surrounding wooded hillsides attract thousands of visitors each year. The soils are Wellston and Berks soils.

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SOIL SURVEY OF SALINE COUNTY, ILLINOIS

BY CLIFFORD MILES AND BENNY WEISS, SOIL CONSERVATION SERVICE

MAJOR PART OF FIELDWORK BY BENNY WEISS, MIKE KIEFER, CLIFFORD MILES, AND LEWIS DUNGAN, SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE AND FOREST SERVICE, IN COOPERATION WITH ILLINOIS AGRICULTURAL EXPERIMENT STATION

SALINE COUNTY is in southeastern Illinois (fig. 1). The east edge of the county is about 15 miles from the Ohio River. The county is also at the south edge of the region commonly referred to as the "Claypan Area" and at the north edge of the "Shawnee Hills." Total land area in the county is 245,056 acres, or about 383 square miles. Water areas larger than 40 acres make up about one more square mile in the county. Harrisburg is the county seat.

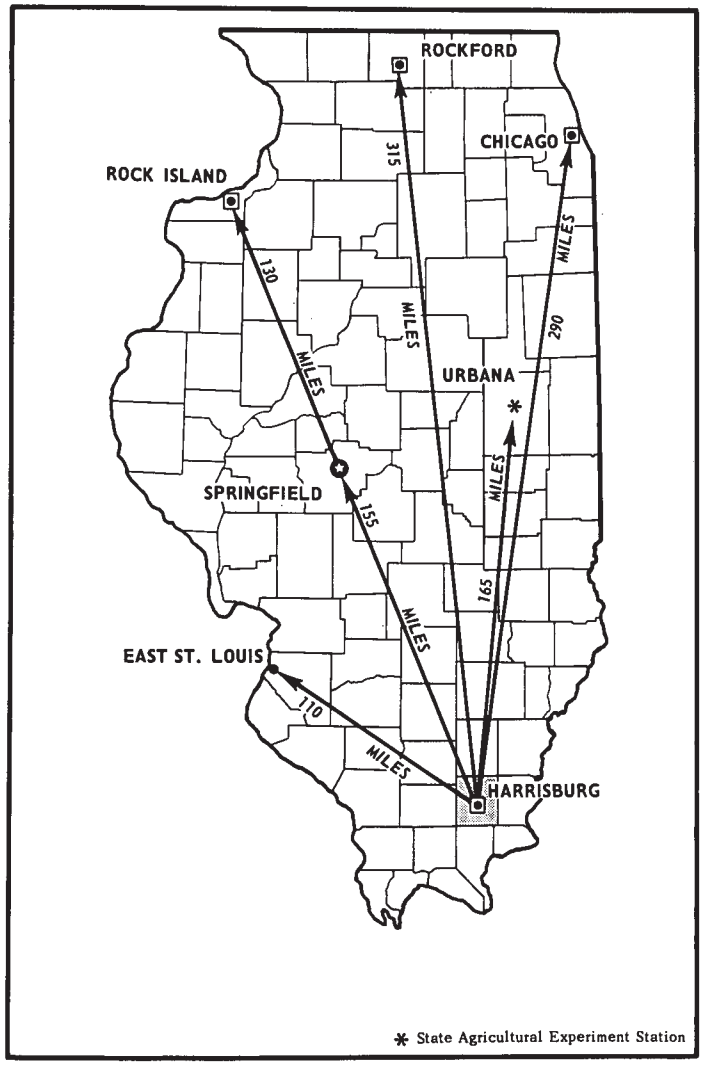

Figure 1.—**Location of Saline County in Illinois.**

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soils are in Saline County, where they are located, and how they can be used.

They went into the county knowing they likely would find many soils they had already seen and perhaps some they had not. As they worked throughout the county, they observed steepness, length, and shape of slopes; size of streams; kinds of native plants or crops; kinds of rock; and many facts about the soils. They dug or bored many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down to material that has not been changed much by leaching or by plant roots.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to uniform procedures. To use this survey efficiently, it is necessary to know the kinds of groupings most used in soil classification.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each series is named for a town or geographic feature near the place where a soil of that series was first observed and mapped. Hosmer and Grantsburg, for example, are the names of two soil series. All the soils in the United States having the same series name are essentially alike in natural characteristics.

Some soil series vary so much in slope, degree of erosion, number and size of stones, or some other fea-

ture affecting their use, that practical suggestions about their management could not be made if they were shown on the soil map as one unit. Such series types are divided into phases. The name of a soil phase indicates a feature that affects management. For example, Ava silt loam, 4 to 7 percent slopes, eroded, is one of several phases of the Ava series.

After a fairly detailed guide for classifying and naming the soils had been worked out, the soil scientists examined soils carefully throughout the county, and they drew soil boundaries on aerial photographs. They used photographs for their base map, because streams, roads, buildings, field borders, trees, and other features that greatly help in drawing boundaries accurately are shown. The soil map at the back of this survey was prepared from the aerial photographs.

The areas or delineations shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning the management of farms and fields, a mapping unit is nearly equivalent to a soil phase. However, because of mapping limitations and the variability of the natural soil and landscape, small inclusions of other soils are present in some delineations.

Some mapping units are made up of soils of different series. One such kind of mapping unit, the soil complex, is shown on the soil map of Saline County. A soil complex consists of areas of two or more soils occurring in an intricate pattern. They are not shown separately on the soil map. Each area of a complex contains some of each of the two or more dominant soils, and the pattern and relative proportions are about the same in all areas. Generally, the name of a soil complex consists of the names of the dominant soils, joined by a hyphen. Wellston-Berks complex, 15 to 30 percent slopes, is an example.

In most areas surveyed, there are places where the soil material is so rocky, so shallow, so severely eroded, or so variable that it has not been classified by soil series. These soils are shown on the soil map and are described in the survey. In this survey, such soils are classified according to the suborder of the classification system, and a descriptive name is added. Orthents, acid, 15 to 60 percent slopes, is such a soil in Saline County.

While a soil survey is in progress, soil scientists take soil samples needed for laboratory measurements and for engineering tests. Laboratory data from the same kind of soil in other places and data on yields of crops under defined practices are assembled from farm records and from field or plot experiments. Yields under defined management are estimated for all the soils.

Soil scientists observe how soils behave when used as a growing place for native and cultivated plants, and as material for structures, foundations for structures, or covering for structures. They relate this behavior to properties of the soils. For example, they observe that filter fields for onsite disposal of sewage fail on a given kind of soil, and they relate this to the slow permeability of the soil or to its high water table. They see that streets, road pavements, and foundations for houses are cracked on a particular soil, and they relate this failure to the high frost-heave potential of the soil material. Thus, they use observation and knowledge of soil properties, together with available research data, to predict limitations or suitability of soils for present and potential uses.

After data have been collected and tested for the key, or benchmark, soils in a survey area, the soil scientists set up trial groups of soils. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others. They then adjust the groups according to the results of their studies and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under current methods of use and management.

General Soil Map[1]

The general soil map at the back of this survey shows, in color, the soil associations in the survey area. A soil association is a landscape that has a distinctive pattern of soils in defined proportions. It typically consists of one or more major soils and at least one minor soil, and it is named for the major soils. The soils in an association can occur in other associations, but in different patterns.

A map showing soil associations is useful to people who want to have a general idea of the soils in a survey area, who want to compare different parts of that area, or who want to locate large tracts that are suitable for a certain kind of land use. Such a map is a useful general guide for broad planning of a watershed, a wooded tract, or a wildlife area, or for broad planning of recreational facilities, community developments, and such engineering work as transportation corridors. It is not a suitable map for detailed planning for management of a farm or field or for selecting the exact location of a road or building or other structure, because the soils in an association ordinarily vary in slope, depth, stoniness, drainage, and other characteristics that affect their management.

The soil associations in this survey area are described in the paragraphs that follow.

1. Zipp-Patton-Hurst Association

Dominantly nearly level, poorly drained and somewhat poorly drained soils; on terraces

This soil association consists mainly of nearly level soils on broad terraces in the eastern part of the county. Gently to strongly sloping soils on ridges or knolls, along the break between different terrace levels, and along streams or drainageways dissecting the terraces are also in this association. The association covers about 20 percent, or 49,000 acres, of the county. About 25 percent is Zipp soils, 16 percent is Patton soils, 10 percent is Hurst soils, and 49 percent is minor soils (fig. 2).

Zipp and Patton soils are poorly drained. Zipp soils have a surface layer of heavy silty clay loam and a subsoil of silty clay. Patton soils are silty clay loam in both of these layers. Hurst soils are somewhat poorly drained. They have a surface layer of silt loam and a

[1] LEWIS DUNGAN, soil scientist, Soil Conservation Service, assisted in the preparation of this section.

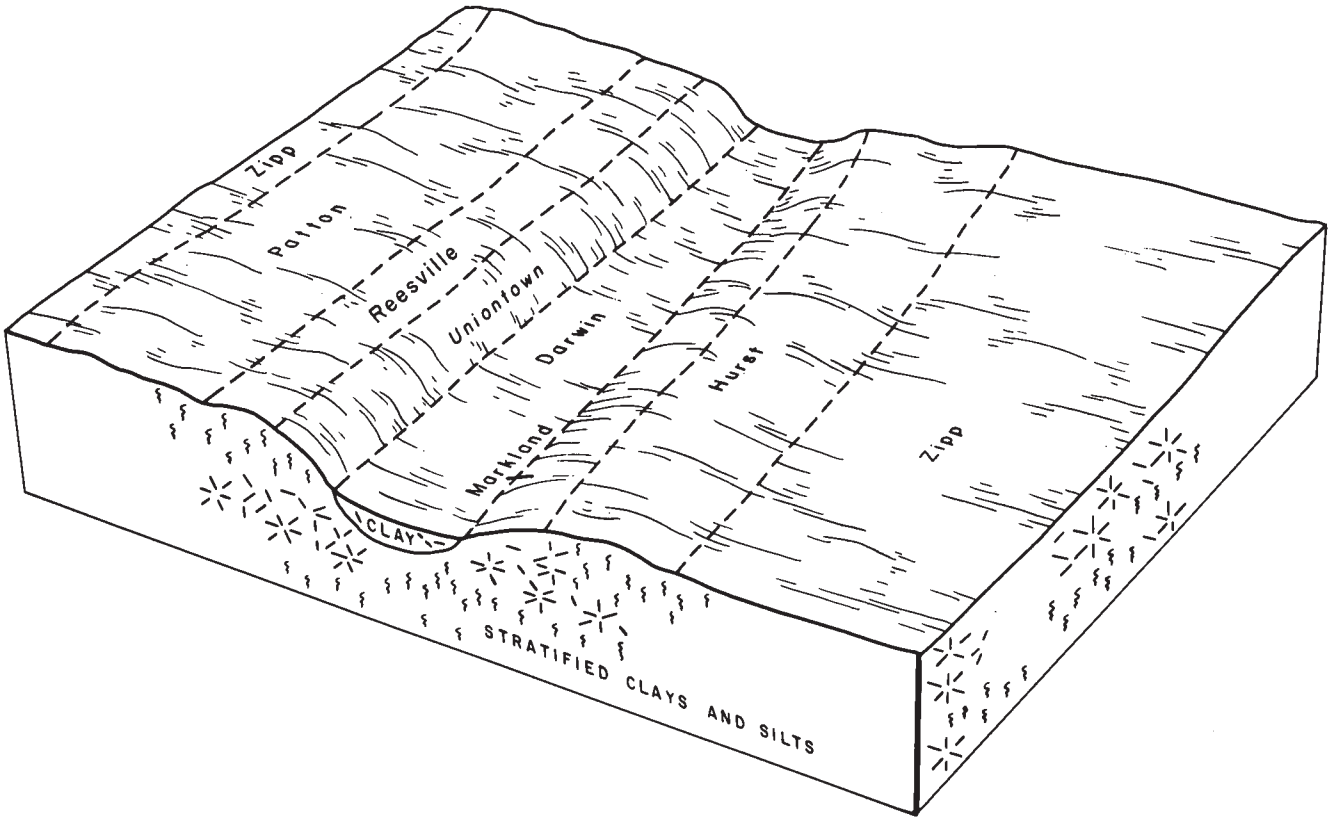

Figure 2.—**Principal soils of association 1 and their relationship to the landscape.**

subsoil of silty clay or heavy silty clay loam. Areas of Zipp and Hurst soils are mostly on a lower terrace level.

Among the minor soils in this association are Uniontown, Colp, McGary, Harco, Markland, and Reesville soils. Also included are small bottom land areas of mainly clayey soils such as Darwin soils.

Most of the soils in this association are well suited to intensive cropping. Corn, soybeans, and grain sorghum and some wheat, hay, and pasture are commonly grown. Some areas are used for woodland. Pasture and woodland are more common on areas of Hurst and Colp soils. Removal of excess water from most of the more level soils and control of erosion on the more sloping soils are needed.

2. Belknap-Banlic-Bonnie Association

Nearly level to depressional, somewhat poorly drained and poorly drained soils; on bottom lands

This soil association consists of nearly level soils on bottom lands. It covers about 24 percent, or 58,800 acres, of the county. About 37 percent is Belknap soils, 26 percent is Banlic soils, 22 percent is Bonnie soils, and 15 percent is minor soils.

Belknap and Banlic soils are somewhat poorly drained, and Bonnie soils are poorly drained. Belknap and Bonnie soils have a surface layer and substratum of silt loam. Banlic soils are also silt loam throughout, but the subsoil is denser.

Among the minor soils in this association are Karnak, Piopolis, Cape, Sharon, and Burnside soils. Karnak, Piopolis, and Cape soils are in depressional areas or sloughs and are naturally poorly drained or very poorly drained. Sharon and Burnside soils are moderately well drained or well drained. These soils are mainly in the narrow bottom lands adjacent to hilly uplands. Sharon soils are also on natural levees along some of the major streams. A few small areas of these soils are on isolated knolls or hills on uplands and segments of terraces.

Most areas of this association are used for soybeans, grain sorghum, or corn and for some pasture, hay, wheat, or woodland. A few areas are wet or swampy. Drainage and protection from flooding or overflow are needed for most cultivated fields. Streams have cut and scoured the soil in some places.

3. Ava-Bluford-Hickory Association

Nearly level to very steep, well drained to somewhat poorly drained soils; on uplands

This soil association consists of nearly level to very steep soils on uplands, mainly in the northern part of the county. These soils are on gently sloping or sloping ridgetops, strongly sloping hillsides, and nearly level accompanying smaller bottom lands. The association covers about 24 percent, or 58,416 acres, of the county. About 60 percent is Ava soils, 24 percent is

Figure 3.—**Hayfield in association 3. Ava soils are on ridgetops and side slopes, and Bluford soils are nearly level or are gently sloping at the heads of drainageways.**

Bluford soils, 7 percent is Hickory soils, and 9 percent is minor soils (fig. 3).

Ava soils are gently sloping to strongly sloping and moderately well drained. They have a surface layer of silt loam and a subsoil of heavy silt loam or silty clay loam. The lower part of the subsoil has a dense fragipan that has gray streaks throughout. Many of the more sloping areas of these soils are eroded.

Bluford soils are gently sloping or nearly level and somewhat poorly drained. They have a surface layer of silt loam and a subsoil of heavy silty clay loam or silty clay. They are more level on drainage divides or at the heads of drainageways.

Hickory soils are moderately steep to very steep and well drained or moderately well drained. They have a surface layer of loam and a subsoil of clay loam. Pebbles are common.

Among the minor soils in this association are Weir, Hoyleton, Creal, Racoon, Huey, and Belknap soils. Weir soils are poorly drained and are associated with Bluford soils. Hoyleton soils are similar to Bluford soils but have a dark surface layer. Creal and Racoon soils are in low-lying areas or on foot slopes and have a surface layer 2 to 3 feet thick. Huey soils are alkaline. Belknap soils are silty soils in narrow stream bottoms.

The soils of this association are used for cultivated crops, hay, pasture, and woodland. Control of erosion on the more sloping soils and drainage for crops on the wetter soils are needed. Many farmsteads and residences are in this association.

4. Hosmer-Zanesville Association

Gently sloping to strongly sloping, moderately well drained soils with a fragipan; on uplands

This soil association consists of gently sloping to strongly sloping soils on uplands, mainly in the central and southern parts of the county. It covers about 16 percent, or 39,200 acres, of the county. About 65 percent is Hosmer soils, 15 percent is Zanesville soils, and 20 percent is minor soils.

Hosmer soils are on gently sloping or sloping ridgetops and strongly sloping side slopes and are moderately well drained. They have a surface layer of silt loam and a subsoil of heavy silt loam or silty clay loam. They have a fragipan in the lower part of the subsoil.

Zanesville soils are on strongly sloping and moder-

ately steep side slopes and are moderately well drained. These soils have a surface layer of silt loam and a subsoil of silty clay loam. They have a fragipan in the lower part of the subsoil. They formed partly in material weathered from bedrock, and part or all of the fragipan is loamy.

Among the minor soils in this association are Grantsburg, Frondorf, Stoy, Wellston, Belknap, Bonnie, Berks, and Creal soils. Grantsburg soils have a thicker and more compact fragipan, and Frondorf soils have a surface layer of silt loam and a subsoil of silty clay loam over sandstone bedrock. Stoy and Creal soils are somewhat poorly drained. Stoy soils are on the broader, flatter ridgetops, and Creal soils are generally on foot slopes and receive occasional runoff from higher ground. Wellston and Berks soils are on the steeper hillsides. They formed partly or entirely in material weathered from bedrock.

Hosmer soils are used mainly for cultivated crops. Control of erosion is needed. Zanesville soils are used for woodland and pasture. Permanent vegetation protects these soils from water erosion damage.

5. Wellston-Berks Association

Moderately steep to very steep, well-drained soils; on uplands

This soil association consists of hilly terrain in the southern part of the county. It covers about 11 percent, or 26,950 acres, of the county. About 60 percent is Wellston and Berks soils, and 40 percent is minor soils.

Wellston and Berks soils are well drained on moderately steep to very steep side slopes. Slopes are generally long and wooded. Wellston soils have a surface layer of silt loam or loam and a subsoil of silty clay loam. Fragments are common in the subsoil. These soils are underlain by bedrock at a depth greater than 40 inches. Berks soils have a surface layer and subsoil of channery loam and are underlain by bedrock at a depth of less than 40 inches.

Among the minor soils in this association are Grantsburg, Zanesville, Hosmer, Burnside, and Sharon soils and rock outcrops. Grantsburg and Zanesville soils are moderately well drained and have a surface layer of silt loam and a subsoil of silty clay loam or clay loam. They have a fragipan in the lower part of the subsoil. Hosmer soils are similar to and are on the same landscape as Grantsburg soils. They are mainly in the southeast corner of the county and on foot slopes elsewhere. Rock outcrops are mainly in narrow belts of boulders, ledges, and bedrock escarpments. Burnside and Sharon soils are on the narrow bottom lands that dissect the uplands. Both of these soils are silty in the upper part, but Burnside soils are flaggy or very flaggy in the lower part.

The soils of this association are used mainly for woodland and pasture. They are generally steep and are also stony in many places. The hazard of erosion is severe. Grasses, forbs, and shrubs are on a number of old crop fields.

6. Orthents Association

Sloping to very steep, well drained and somewhat excessively drained soils; on ridges and in depressions of strip mine spoil banks

This soil association contains the disturbed soil and earth material of strip mined land. Most areas are a series of rugged ridges, narrow depressions, open trenches, and highwalls in a belt south of State Route 13. In areas of more recent mining, the peaks have been struck off and few areas have been leveled to grade (fig. 4). This association covers about 4 percent, of 10,290 acres, of the county. About 77 percent is Orthents, and 23 percent is Orthents, acid.

These soils are made up of predominantly silty or loamy material and of shaly fragments that have scattered flags and stones. The growth of roots and storage of water is impeded, and tillage operations are hindered, by coarse fragments and stones. The narrow ridgetops and steeper side slopes are droughty. Erosion and accompanying sedimentation is a common hazard.

These soil areas are generally suitable for woodland, pasture, or meadow, and for wildlife habitat and water yield. In areas of more acid soils along the southern part of the belt, however, vegetation is sparse, erosion and sedimentation are common, and water in these areas is acid and contains concentrations of iron, manganese, or sulfur.

7. Grantsburg-Zanesville Association

Gently sloping to moderately steep, moderately well drained soils with a fragipan; on uplands

This soil association consists of gently sloping to moderately steep soils on uplands in the southern part of the county. It covers about 1 percent, or 2,400 acres, of the county. About 50 percent is Grantsburg soils, 20 percent is Zanesville soils, and 30 percent is minor soils.

Grantsburg soils are moderately well drained and are on gently sloping or sloping ridgetops and strongly sloping side slopes. They have a surface layer of silt loam and a subsoil of heavy silt loam or silty clay loam. They have a fragipan in the lower part of the subsoil.

Zanesville soils are moderately well drained and are on strongly sloping and moderately steep side slopes. They formed partly in material weathered from bedrock. These soils have a surface layer of silt loam and a subsoil of heavy silt loam or silty clay loam. They have a fragipan in the lower part of the subsoil. Part or all of the fragipan in Zanesvillle soils is loamy.

Among the minor soils in this association are Wellston, Berks, Belknap, Burnside, and Sharon soils. Wellston and Berks soils are moderately steep to very steep on hillsides. They formed partly or entirely in material weathered from bedrock. Belknap, Burnside, and Sharon soils are on the narrow bottom lands that dissect the uplands.

Many of the more sloping soils are eroded, and gullies have cut into the soil in some places. Most of the association is used for hay, pasture, and woodland. Grasses, forbs, and shrubs grow on some fields.

Descriptions of the Soils

The soil series and the mapping units of Saline

Figure 4.—**During strip mining operations, soils are drastically disturbed, and vegetation is destroyed.**

County are described in this section. The descriptions are given in four parts. First is a description of the soil series, including a brief description of a representative profile; next is a technical description of the representative profile; then, the common ranges of characteristics of the soils in the series are given, and similarities and differences between the soils in the series and those of other series are noted; and finally, the mapping units delineated and identified on the soil maps are described. One may wish to omit the detailed profile description, because it is written primarily for use by soil scientists.

Information concerning the characteristics and properties of the soils is given in each series description. However, to get the full information on any one mapping unit, it is necessary to read both the description of the series and that of the mapping unit.

Preceding the name of each mapping unit is the symbol that identifies the soil on the map sheets. The capability unit and the woodland group in which each mapping unit has been placed are listed at the end of the description of each mapping unit. A cross-reference of mapping units and management groups is given in the "Guide to Mapping Units" at the back of the survey.

The acreage and proportionate extent of each mapping unit are shown in table 1. Many of the terms used in describing soils can be found in the Glossary, and more detailed information about the terminology and methods of soil mapping can be obtained from the Soil Survey Manual (*11*).[2]

Ava Series

The Ava series consists of moderately well drained, gently sloping to strongly sloping soils that have a fragipan at a depth of 18 to 30 inches. These soils are on narrow and broad ridgetops, side slopes, and long foot slopes of the uplands. Ava soils formed in loess and in the underlying loamy material. The native vegetation was deciduous forest, mostly oak and hickory.

In a representative profile the surface layer is brown and dark grayish-brown and yellowish-brown silt loam 7 inches thick. The subsurface layer is yellowish-brown silt loam 3 inches thick. The subsoil is about 41 inches thick. The upper 9 inches is strong-brown and yellowish-brown heavy silt loam, and the next 3 inches

[2] Italic numbers in parentheses refer to Literature Cited, p. 89.

TABLE 1.—*Approximate acreage and proportionate extent of the soils*

Soil	Acres	Percent	Soil	Acres	Percent
Ava silt loam, 2 to 4 percent slopes	8,620	3.5	Hoyleton silt loam, 1 to 4 percent slopes	1,400	0.6
Ava silt loam, 4 to 7 percent slopes, eroded	11,935	4.9	Huey silt loam	520	.2
Ava silt loam, 7 to 12 percent slopes, eroded	2,530	1.0	Hurst silt loam	5,375	2.2
Ava silt loam, 5 to 12 percent slopes, severely eroded	11,060	4.5	Karnak silty clay	675	.3
Banlic silt loam	15,170	6.3	Markland silt loam, 3 to 7 percent slopes, eroded	940	.4
Belknap silt loam	22,520	9.3	Markland soils, 7 to 15 percent slopes, severely eroded	1,065	.5
Berks-Wellston complex, 30 to 60 percent slopes	3,480	1.4	McGary silt loam	2,715	1.1
Bluford silt loam, 0 to 2 percent slopes	3,690	1.5	Orthents, 5 to 15 percent slopes	1,615	.7
Bluford silt loam, 2 to 4 percent slopes	10,200	4.1	Orthents, 15 to 60 percent slopes	6,320	2.6
Bonnie silt loam	13,460	5.6	Orthents, acid, 15 to 60 percent slopes	2,355	.9
Bonnie silt loam, wet	740	.3	Patton silty clay loam	7,755	3.1
Burnside silt loam	730	.3	Piopolis silty clay loam	1,160	.5
Cape silty clay loam	600	.2	Racoon silt loam	9,455	3.8
Colp silt loam, 1 to 4 percent slopes	4,185	1.7	Reesville silt loam	2,290	.9
Creal silt loam	3,905	1.6	Sharon silt loam	2,205	.9
Darwin silty clay	3,175	1.3	Stoy silt loam, 0 to 2 percent slopes	545	.2
Frondorf silt loam, 7 to 12 percent slopes, severely eroded	1,005	.4	Stoy silt loam, 2 to 4 percent slopes	1,675	.7
Frondorf silt loam, 12 to 18 percent slopes	1,230	.5	Uniontown silt loam, 0 to 2 percent slopes	350	.1
Frondorf silt loam, 18 to 45 percent slopes	350	.1	Uniontown silt loam, 2 to 6 percent slopes	875	.4
Grantsburg silt loam, 2 to 4 percent slopes	1,190	.5	Weir silt loam	2,045	.8
Grantsburg silt loam, 4 to 7 percent slopes, eroded	4,410	1.8	Wellston silt loam, 12 to 18 percent slopes	730	.3
Grantsburg silt loam, 7 to 12 percent slopes, eroded	935	.4	Wellston silt loam, 18 to 45 percent slopes	870	.4
Grantsburg silt loam, 7 to 12 percent slopes, severely eroded	1,220	.5	Wellston-Berks complex, 15 to 30 percent slopes	9,495	3.9
Harco silt loam	2,595	1.1	Zanesville silt loam, 7 to 12 percent slopes, eroded	740	.3
Hickory loam, 12 to 18 percent slopes	1,320	.5	Zanesville silt loam, 7 to 12 percent slopes, severely eroded	3,705	1.5
Hickory loam, 12 to 18 percent slopes, severely eroded	1,490	.6	Zanesville silt loam, 12 to 18 percent slopes, eroded	2,315	.9
Hickory loam, 18 to 45 percent slopes	870	.4	Zanesville silt loam, 12 to 18 percent slopes, severely eroded	3,250	1.3
Hosmer silt loam, 2 to 4 percent slopes	4,630	1.9	Zipp silty clay loam	10,670	4.3
Hosmer silt loam, 4 to 7 percent slopes, eroded	12,215	5.0	Zipp silt loam, overwash	1,365	.6
Hosmer silt loam, 7 to 12 percent slopes, eroded	3,340	1.3	Water	1,635	.7
Hosmer silt loam, 7 to 12 percent slopes, severely eroded	4,580	1.8	Cut and fill areas, levees, made land, mine dumps, quarries, and sewage lagoons	1,566	.6
			Total	[1] 245,056	100.0

[1] This acreage from the 1969 Census of Agriculture (*16*) does not include water areas larger than 40 acres.

is dark-brown silty clay loam that is coated with pale brown. The lower part of the subsoil, a firm and brittle fragipan, is multicolored silty clay loam and silt loam that has distinct mottles. The substratum to a depth of 61 inches is mottled yellowish-brown silt loam.

Permeability is moderate in the upper part of the subsoil and slow to very slow in the fragipan. Available water capacity is moderate. The fragipan impedes the growth of roots and the movement of water.

Most areas of these soils are used for cultivated crops and pasture. A few areas remain wooded. Crops respond well to lime and fertilizer. The soils are also well suited to openland wildlife.

Representative profile of Ava silt loam, 2 to 4 percent slopes, 1,270 feet north and 990 feet east of center of sec. 32, T. 7 S., R. 6 E., in a pasture:

Ap—0 to 7 inches, brown (10YR 5/3) and dark grayish-brown (10YR 4/2) silt loam that includes some mixing of yellowish brown (10YR 5/4); weak, fine, granular structure; friable; many roots; slightly acid; abrupt, smooth boundary.

A2—7 to 10 inches, yellowish-brown (10YR 5/4) silt loam; weak, medium, granular structure and massive; friable; many roots; strongly acid; clear, smooth boundary.

B1—10 to 12 inches, strong-brown (7.5YR 5/6) silt loam; weak, fine, subangular blocky structure; friable; many roots; very strongly acid; clear, smooth boundary.

B21t—12 to 19 inches, yellowish-brown (10YR 5/6) heavy silt loam; dark yellowish-brown (10YR 4/4) ped exteriors; moderate, fine and medium, subangular blocky structure; friable; common roots; very strongly acid; clear, smooth boundary.

B22t—19 to 22 inches, dark-brown (7.5YR 4/4) light silty clay loam that has pale-brown (10YR 6/3) silt grains coating faces of peds; moderate, medium, subangular blocky structure; firm; common roots; very strongly acid; clear, smooth boundary.

Bx1—22 to 32 inches, brown (7.5YR 5/4) and strong-brown (7.5YR 5/8) silty clay loam; common, fine, distinct, light brownish-gray (10YR 6/2) mottles; moderate, medium and coarse, subangular blocky structure; firm and brittle; dark-brown (7.5YR 4/4) continuous, thick clay films on vertical faces of peds; few roots; very strongly acid; clear, smooth boundary.

Bx2—32 to 41 inches, yellowish-brown (10YR 5/4) and dark yellowish-brown (10YR 4/4) light silty clay loam;

common, fine, distinct, light brownish-gray (10YR 6/2) mottles; weak, coarse, blocky structure; firm and brittle; discontinuous, thin, dark-brown (7.5YR 4/4) clay films on faces of peds; few roots; very strongly acid; gradual, smooth boundary.

IIBx3—41 to 51 inches, yellowish-brown (10YR 5/6) silt loam; few, fine, distinct, grayish-brown (10YR 5/2) mottles and common, fine, faint, yellowish-brown (10YR 5/4) mottles; weak, coarse prisms parting to weak, coarse, blocky structure; firm and brittle; patchy, thin, dark-brown (7.5YR 4/4) clay films on faces of peds and in root channels; common sand grains; few roots; gray (10YR 6/1) clean silt grains coating prisms; very strongly acid; gradual, smooth boundary.

IIC—51 to 61 inches, yellowish-brown (10YR 5/6) silt loam; common, fine, faint, yellowish-brown (10YR 5/4) and pale-brown (10YR 6/3) mottles; weak, coarse prisms parting to weak, medium, blocky structure and massive; friable and firm, discontinuous brittleness; common sand grains; gray (10YR 6/1) clean silt grains on faces of prisms; few dark stains (iron and manganese oxides); strongly acid.

The combined thickness of the A horizons ranges from 8 to 16 inches. The A2 horizon in most profiles is yellowish brown but ranges to pale brown or brown. Depth to the Bx horizon is about 18 to 30 inches in slightly eroded soils. The B horizons are about 3 to 4 feet thick, and their lower part formed in loamy material below the loess. The loamy material in most profiles is silt loam that is 10 to 20 percent sand, but in some profiles it is loam, clay loam, or light silty clay loam. Clay films are few to absent in the upper part of the B horizon and patchy to continuous in the lower part. The uncoated silt grains in the thin layer between the upper part of the B horizon and the fragipan are light brownish gray or light gray. This thin layer is generally absent in more sloping soils.

Ava soils generally are on similar parts of the landscape as Hickory loam and somewhat poorly drained Bluford soils. Ava soils have more brown and fewer gray colors and less clay in the B2t horizon than Bluford soils, and they contain less sand and gravel than the Hickory soils. Ava soils are similar to Grantsburg and Hosmer soils but have more sand in the lower part.

14B—Ava silt loam, 2 to 4 percent slopes. This gently sloping soil is generally on broad ridgetops. It has the profile described as representative of the series.

Included with this soil in mapping are small areas of somewhat poorly drained Bluford silt loam at the heads of drainageways and areas of Hoyleton silt loam. Also included are small areas of soils that have less than 7 inches but more than 3 inches of the original surface layer remaining.

Available water capacity is moderate. Permeability is moderate above the fragipan and slow or very slow within the fragipan. Runoff is medium, and the hazard of erosion is moderate.

This soil is well suited to commonly grown cultivated crops. Control of erosion and maintenance of organic matter, tilth, and fertility are needed. The soil is well suited to pasture and woodland crops, wildlife, and wildlife plantings. Capability unit IIe–2; woodland group 2o1.

14C2—Ava silt loam, 4 to 7 percent slopes, eroded. This sloping soil is on narrow ridgetops, side slopes, and foot slopes. It has a profile similar to the one described as representative of the series, but only 3 to 7 inches of the silty surface layer remains.

Included with this soil in mapping are small areas of somewhat poorly drained Bluford silt loam, mainly at the heads of drainageways. Also included are spots of severely eroded soils.

Available water capacity is moderate. Permeability is moderate above the fragipan and slow or very slow within the fragipan. Runoff is medium, and the hazard of erosion is moderate.

This soil is suited to cultivated crops, pasture, and wildlife. Control of erosion and maintenance of organic matter, tilth, and fertility are needed. Capability unit IIIe–1; woodland group 2o1.

14D2—Ava silt loam, 7 to 12 percent slopes, eroded. This strongly sloping soil is on side slopes and foot slopes. It has a profile similar to the one described as representative of the series, but the fragipan layer is closer to the surface.

Included with this soil in mapping are small areas of well-drained Hickory loam and Frondorf soils. Spots of severely eroded soils are in some areas. Also included are small wooded areas of soils that have a surface layer thicker than 7 inches.

Available water capacity is moderate. Permeability is moderate above the fragipan and slow or very slow within the fragipan. Runoff is medium or rapid, and the hazard of erosion is moderate or severe.

This soil is suited to cultivated crops if erosion is controlled. Maintenance of organic matter, tilth, and fertility is needed. The soil is well suited to hay, pasture, and woodland. It is also well suited to wildlife and wildlife plantings. Capability unit IIIe–1; woodland group 2o1.

14D3—Ava silt loam, 5 to 12 percent slopes, severely eroded. This strongly sloping soil is mainly on side slopes along drainageways. All or most of the original silty surface layer has been removed by erosion. The subsoil is at or near the surface, and gullies have formed in some places. The fragipan is generally within 1 foot of the surface.

Included with this soil in mapping are small areas of well-drained Hickory and Frondorf soils. Also included are small areas of soils that are not severely eroded and areas of soils that have slopes greater than 12 percent.

Permeability is slow or very slow within the fragipan. Runoff is rapid, and the hazard of further erosion is severe. Erosion has reduced the storage capacity of the soil for water, and the soil is droughty during periods of dryness.

This soil is suited to cultivated crops. It is well suited to pasture, woodland, wildlife, and wildlife plantings. Some areas that were once cleared are now growing back to brush or have been planted to pines. Capability unit IVe–2; woodland group 2o1.

Banlic Series

The Banlic series consists of somewhat poorly drained, nearly level soils on bottom lands. These soils formed in silty, acid alluvium. The native vegetation was deciduous hardwoods.

In a representative profile the surface layer is dark grayish-brown silt loam about 7 inches thick. The subsurface layer is pale-brown silt loam about 10 inches thick. The upper 8 inches of the subsoil is pale-brown silt loam that has light brownish-gray mottles. The rest of the subsoil, to a depth of about 62 inches, is a fragipan. It is pale-brown and light brownish-gray, firm and brittle silt loam that is hard when dry. It has

light brownish-gray and strong-brown mottles. The substratum is yellowish-brown silt loam that has strong-brown mottles.

Permeability is slow. Available water capacity is moderate. These soils are subject to overflow or flooding unless protected. The seasonal water table is 1 to 3 feet below the surface.

Most areas of Banlic soils are used for cultivated crops and pasture. A few areas remain wooded. Crops respond well to lime and fertilizer. These soils are well suited to openland wildlife.

Representative profile of Banlic silt loam, 2,526 feet west and 525 feet south of the northeast corner of sec. 21, T. 7 S., R. 6 E., in a cultivated field:

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam; weak, fine, granular structure; friable; slightly acid; abrupt, smooth boundary.

A2—7 to 17 inches, pale-brown (10YR 6/3) silt loam that has common, medium, or distinct, yellowish-brown (10YR 5/4) and dark yellowish-brown (10YR 4/3) mottles; weak, fine, subangular blocky structure and massive; friable; common, fine, short pores, some of which have clay linings; common, fine and very fine, very dark grayish-brown (10YR 3/2) stains and concretions (iron and manganese oxides); very strongly acid; clear, smooth boundary.

B2—17 to 25 inches, pale-brown (10YR 6/3) silt loam; common, fine, faint, light brownish-gray (10YR 6/2) mottles; weak, medium, subangular blocky structure and massive; friable; slightly hard when dry; common fine pores; common fine and very fine very dark grayish-brown (10YR 3/2) stains and concretions (iron and manganese oxides); very strongly acid; clear, smooth boundary.

Bx1—25 to 38 inches, pale-brown (10YR 6/3) silt loam; common, fine, faint, light brownish-gray (10YR 6/2) mottles increasing to many in the lower part; moderate, coarse, prismatic structure parting to weak, medium and coarse, subangular blocky and massive; firm and brittle, hard and very hard when dry; common fine short pores; common dark stains and concretions (iron and manganese oxides); light-gray (10YR 7/2) uncoated silt grains covering tops and vertical faces of peds; very strongly acid; gradual, smooth boundary.

Bx2—38 to 48 inches, light brownish-gray (10YR 6/2) and pale-brown (10YR 6/3) heavy silt loam; common to many, coarse, prominent, strong-brown (7.5YR 5/8) mottles; firm and brittle, hard when dry; patchy, weak, thin, grayish-brown (10YR 5/2) clay films and scattered thin horizontal clay seams; uncoated silt grains covering vertical faces of peds; common dark stains and concretions (iron and manganese oxides); very strongly acid; clear, smooth boundary.

Bx3—48 to 62 inches, yellowish-brown (10YR 5/4) to dark yellowish-brown (10YR 4/4) silt loam; common, coarse, distinct, light brownish-gray (10YR 6/2) mottles decreasing to few with depth; weak, coarse, subangular blocky structure; firm and brittle but with discontinous brittleness in lower part; light brownish-gray (10YR 6/2) to light-gray (10YR 7/2) uncoated silt grains covering vertical faces of peds in upper part; strongly acid; gradual, wavy boundary.

C—62 to 67 inches, yellowish-brown (10YR 5/4) silt loam; common, medium and coarse, distinct, strong-brown (7.5YR 5/8) mottles; massive; friable; many dark reddish stains and concretions (iron and manganese oxides); medium acid; clear boundary.

The Ap horizon ranges from dark grayish brown to brown. Reaction in the solum is strongly acid or very strongly acid except in parts of the Ap horizon where the soil has been limed.

Banlic soils are on the same flood plains as Belknap, Bonnie, and Sharon soils. Banlic soils are not so gray as the poorly drained Bonnie soils and are grayer than the moderately well drained or well drained Sharon soils. They have a fragipan layer that Belknap soils do not have.

787—Banlic silt loam (0 to 2 percent slopes). This nearly level soil is on flood plains adjacent to streams. It has a dense subsoil or fragipan layer that impedes root growth and water movement.

Included with this soil in mapping are areas of Belknap silt loam at slightly lower elevations commonly interspersed along overflow and old stream channels. Also included are small areas of Bonnie silt loam in low-lying spots and on the broader plains. Small wet areas, generally less than 1 acre, are shown by a conventional symbol on the soil map.

Available water capacity is moderate. Permeability is slow. Runoff is slow. Stream banks along an active channel are readily susceptible to slumping and erosion.

This soil is moderately productive and is suited to row crops, hay, and pasture. Removal of excess water and protection from overflow are needed. The soil is well suited to wildlife and wildlife plantings. A few areas are in timber or brush. Capability unit IIw–1; woodland group 3o1.

Belknap Series

The Belknap series consists of somewhat poorly drained, nearly level or gently sloping soils on bottom lands. These soils formed in silty acid alluvium. The native vegetation was deciduous hardwoods.

In a representative profile the surface layer is dark grayish-brown, grayish-brown, and brown silt loam about 13 inches thick. The upper 20 inches of the substratum is brown and grayish-brown silt loam. The lower part of the substratum is light brownish-gray and grayish-brown silt loam to a depth of 74 inches.

Permeability is moderately slow. Available water capacity is very high. These soils are susceptible to overflow or flooding unless protected. A seasonal water table is 1 to 3 feet below the surface.

Most areas of Belknap soils are used for cultivated crops and pasture. A few areas remain wooded. Crops respond well to lime and fertilizer. These soils are well suited to openland wildlife.

Representative profile of Belknap silt loam, 610 feet south and 1,050 feet east of the northwest corner of sec. 31, T. 10 S., T. 5 E., in a cultivated field:

Ap1—0 to 7 inches, dark grayish-brown (10YR 4/2) silt loam, gray (10YR 6/1) dry; weak, medium, granular structure; friable; slightly acid; abrupt, smooth boundary.

Ap2—7 to 10 inches, grayish-brown (10YR 5/2) silt loam that has horizontal bands of light gray (10YR 7/2); weak, thick, platy structure and massive; friable to firm; a plow sole; few brown (10YR 5/3) clay coatings in fine channels; common dark stains and concretions (iron and manganese oxides); medium acid; abrupt, smooth boundary.

A13—10 to 13 inches, brown (10YR 5/3) silt loam; 20 percent common, medium, distinct, light brownish-gray (10YR 6/2) and 80 percent yellowish-brown (10YR 5/8) mottles; weak, medium and coarse, subangular blocky structure; friable; few, thin, brown (10YR 5/3) clay films on faces of peds; common dark stains and concretions (iron and manganese oxides); medium acid; clear, smooth boundary.

C1—13 to 25 inches, 40 percent brown (10YR 5/3), 35 percent grayish-brown (10YR 5/2), and 25 percent light brownish-gray (10YR 6/2) silt loam; com-

mon, medium, distinct, yellowish-brown (10YR 5/8) mottles; weak, medium and coarse, subangular blocky structure; friable; few, thin, brown (10YR 5/3) clay films on faces of peds; common dark stains and concretions (iron and manganese oxides); strongly acid; clear, smooth boundary.

C2—25 to 33 inches, 50 percent grayish-brown (10YR 5/2), 30 percent light brownish-gray (10YR 6/2), and 20 percent brown (10YR 5/3) silt loam; massive; friable; patchy, thin, grayish-brown (10YR 5/2) clay films on faces of peds; vesicular, apparent weak, coarse, subangular blocky structure; common dark stains and concretions (iron and manganese oxides); strongly acid; clear, smooth boundary.

C3—33 to 47 inches, mixed, light brownish-gray (10YR 6/2), grayish-brown (10YR 5/2), gray (10YR 5/1), and yellowish-brown (10YR 5/4 and 5/8) silt loam; massive; friable; common dark stains and concretions (iron and manganese oxides); strongly acid; clear, smooth boundary.

C4—47 to 74 inches, light brownish-gray (10YR 6/2) heavy silt loam; many, medium, distinct, yellowish-brown (10YR 5/4 and 5/8) mottles; massive; friable to firm; common fine pores; common dark stains and concretions (iron and manganese oxides); medium acid.

The A horizon is brown, grayish brown, and dark grayish brown. The C horizon is medium acid to very strongly acid.

Belknap soils are on the same flood plains as poorly drained Bonnie soils and moderately well drained or well drained Sharon soils. Belknap soils are less gray and less wet in the solum than Bonnie soils and grayer and wetter than Sharon soils.

382—Belknap silt loam (0 to 3 percent slopes). This nearly level or very gently sloping soil is on flood plains along the larger drainageways and streams.

In broad areas of Belknap soil on bottom lands, areas of Bonnie silt loam are included in small depressional spots, mainly along old stream channels. Also included are areas of Banlic silt loam, that has a dense subsoil, and areas of moderately well drained to well drained Sharon silt loam. In some places along stream channels and uplands, sandy lenses are in the soil. Some areas, mainly along the eastern side of the county, are medium acid to slightly acid.

Available water capacity is very high. Permeability is moderately slow. Runoff is slow.

This soil is highly productive, and the larger open areas are commonly used for corn and soybeans and some wheat and hay. Removal of excess water and protection from overflow are needed. Other areas are in pasture or woodland. This soil is well suited to wildlife and wildlife plantings. Capability unit IIw–3; woodland group 2o4.

Berks Series

The Berks series consists of well-drained, moderately steep to very steep soils on upland side slopes. These soils formed in a channery or flaggy loam that weathered from sandstone, siltstone, and some shale. It is mainly 20 to 40 inches deep to bedrock. The native vegetation was deciduous hardwoods.

In a representative profile the surface layer is dark-brown and brown channery loam about 4 inches thick. The upper part of the subsoil is strong-brown and yellowish-brown very channery loam about 11 inches thick. The lower part of the subsoil is strong-brown very flaggy loam about 7 inches thick. It has reddish-yellow mottles. The substratum is yellowish-brown very flaggy loam about 6 inches thick. Bedrock is at a depth of 28 inches.

Available water capacity is low. Permeability is moderate or moderately rapid.

These soils are used for woodland. They are also well suited to woodland wildlife and paths and trails.

Representative profile of Berks channery loam in an area of Berks-Wellston complex, 30 to 60 percent slopes, about 865 feet north of the center of sec. 34, T. 10 S., R. 7 E., in woods:

A1—0 to 4 inches, dark-brown (10YR 4/3) and brown (10YR 5/3) channery and flaggy loam; moderate, very fine and fine, granular structure; friable; many roots; 25 to 50 percent coarse fragments; very strongly acid; clear, smooth boundary.

B21—4 to 15 inches, strong-brown (7.5YR 5/6) and yellowish-brown (10YR 5/6, 5/4) very channery loam; weak, very fine, subangular blocky structure; friable; many roots; about 50 percent coarse fragments; very strongly acid; clear, smooth boundary.

B22—15 to 22 inches, strong-brown (7.5YR 5/6) very flaggy loam; common, fine, faint, reddish-yellow (7.5YR 6/6) mottles; weak, very fine, subangular blocky structure; friable; common roots; about 75 percent coarse fragments; very strongly acid; gradual, wavy boundary.

C—22 to 28 inches, yellowish-brown (10YR 5/6) very flaggy loam; massive; about 80 percent sandstone fragments; very strongly acid.

R—28 inches, sandstone bedrock.

Depth to bedrock is 20 to 40 inches. Cracks and fissures filled with soil material are common in the bedrock. There is a yellowish-brown (10YR 5/4 and 5/6) channery A2 horizon in many profiles. The B2 horizon is strong brown to yellowish red and is either channery or flaggy silt loam or loam. It is strongly acid or very strongly acid. The C horizon is either very flaggy or stony loam or silt loam. It ranges from brownish hues of 10YR to reddish-brown hues of 5YR. Volume of coarse fragments ranges from 35 to 75 percent in most of the A and B horizons, but parts of these layers in many places are only 10 to 30 percent coarse fragments.

Berks soils are on the landscape with Wellston and Frondorf soils. Berks soils contain less clay and have a thinner B horizon than Wellston soils and have more coarse fragments in the A and B horizons than Frondorf soils.

986G—Berks-Wellston complex, 30 to 60 percent slopes. The very steep soils in this complex are on hillsides. Slopes are generally 200 to 350 feet long. Berks soils make up about 55 to 75 percent of the complex, and Wellston soils, 20 to 35 percent. The Berks soil is along small lateral drainways, at the base of the slope, or in one or more bands across the slopes. The Wellston soil is just above or below the Berks soils or in the area between drainageways. Within the unit, the percentage of Berks soil is commonly greater where slopes face south.

The Berks soil has the profile described as representative for the Berks series. The Wellston soil has a profile similar to the one described as representative of the Wellston series. In some places, the soil depth has been increased by soil creep.

Included with these soils in mapping are areas where surface stoniness, boulders, and rock ledges are common. The larger areas of bedrock outcrops are shown by a conventional symbol on the soil map. Bands of clayey material weathered from shale are in the subsoil in some places. Also included are small areas of the more silty Zanesville soil containing a fragipan. Also, there are some areas of soils that have slopes of less than 30 percent.

Available water capacity is low in Berks soils and

moderate in Wellston soils. Permeability is moderate or moderately rapid in Berks soils and moderate in Wellston soils. Runoff is rapid to very rapid, and the hazard of erosion is severe.

These soils are wooded. This complex is suited to woodland, wildlife, water yield, and paths and trails, and it has esthetic value. Steepness of slopes; presence of stones, boulders, and rock ledges; and droughtiness are the main concerns in soil use. Capability unit VIIe–1; woodland group 3r2.

Bluford Series

The Bluford series consists of somewhat poorly drained, nearly level and gently sloping soils on ridgetops and at the heads of drainageways on uplands. These soils have a dense layer at a depth of about 3 feet. They formed in loess and in the underlying loamy material. The native vegetation was deciduous hardwoods.

In a representative profile the surface layer is brown and dark grayish-brown silt loam 8 inches thick. The subsurface layer is yellowish-brown and light yellowish-brown silt loam 10 inches thick. It has gray and brownish mottles. The upper part of the subsoil is about 20 inches thick. It is yellowish-brown heavy silty clay loam that has grayish mottles. The lower part is yellowish-brown silty clay loam and heavy silt loam about 25 inches thick.

Available water capacity is high. Permeability is slow. A seasonal water table is 1 to 3 feet below the surface.

Most areas of these soils are used for cultivated crops and pasture. These soils are well suited to these crops. A few areas remain wooded. Crops respond well to lime and fertilizer. These soils are also well suited to openland wildlife.

Representative profile of Bluford silt loam, 0 to 2 percent slopes, 65 feet west and 460 feet south of the northeast corner of sec. 32, T. 7 S., R. 6 E., in a cultivated field:

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) and brown (10YR 5/3) silt loam; weak, fine, granular structure; friable; many roots; fine, dark, concretions (iron and manganese oxides); neutral; abrupt, smooth boundary.

A2—8 to 18 inches, yellowish-brown (10YR 5/4) and light yellowish-brown (10YR 6/4) silt loam; common, fine, faint, light brownish-gray (10YR 6/2), pale-brown (10YR 6/3) and yellowish-brown (10YR 5/6) mottles; weak, fine and medium, granular structure; friable, common roots; common very fine and fine pores; many fine dark concretions (iron and manganese oxides); very strongly acid; clear, smooth boundary.

B21t—18 to 23 inches, yellowish-brown (10YR 5/4) silty clay loam; common, fine, distinct, light brownish-gray (10YR 6/2) mottles; moderate, fine, prismatic structure parting to weak, fine and medium, subangular blocky; firm; common roots; many pale-brown (10YR 6/3) and light brownish-gray (10YR 6/2) clean silt grains on faces of peds; many fine dark concretions; very strongly acid; clear, smooth boundary.

B22—23 to 33 inches, yellowish-brown (10YR 5/4 and 5/6) heavy silty clay loam; common, fine, faint, light brownish-gray (10YR 6/2) mottles; moderate, medium, prismatic structure parting to moderate, fine and medium, subangular blocky; firm; few roots; continuous, thin, grayish-brown (10YR 5/2) and light brownish-gray (10YR 6/2) clay films on faces of peds; many, fine, dark stains and concretions (iron and manganese oxides); very strongly acid; clear, smooth boundary.

B23t—33 to 38 inches, yellowish-brown (10YR 5/4 and 5/6) silty clay loam; common, fine, faint, light brownish-gray (10YR 6/2) mottles; weak, medium prismatic structure parting to weak, fine and medium, subangular blocky; firm; few roots; continuous, thin, light brownish-gray (10YR 6/2) clay films on faces of peds; dark concretions (iron and manganese oxides); very strongly acid; clear smooth boundary.

IIBx1—38 to 46 inches, yellowish-brown (10YR 5/4 and 5/6) light silty clay loam; common, fine, distinct, light brownish-gray (10YR 6/2) mottles and common, fine, faint, brown (10YR 5/3) and pale-brown (10YR 6/3) mottles; weak, medium prismatic structure parting to weak, medium, subangular blocky; firm, dense and brittle; discontinuous, yellowish brown (10YR 5/4) clay films on faces of peds; common, fine, dark stains and concretions (iron and manganese oxides); common sand grains; very strongly acid; clear, smooth boundary.

IIBx2—46 to 55 inches, yellowish-brown (10YR 5/4 and 5/6) heavy silt loam; common, fine, distinct, light brownish-gray (10YR 6/2) mottles and common, fine, faint, brown (10YR 5/3) and pale-brown (10YR 6/3) mottles; weak, coarse prismatic structure parting to weak, coarse, subangular blocky; firm, dense and brittle; patchy, thin, yellowish-brown (10YR 5/4) clay films on faces of peds; common sand grains; common, fine, dark concretions (iron and manganese oxides); clean silt grains forming gray (10YR 6/1) streaks on faces of prisms; very strongly acid; clear, smooth boundary.

IIB3—55 to 63 inches, yellowish-brown (10YR 5/4 and 5/6) heavy silt loam; common, fine, distinct, light brownish-gray (10YR 6/2) mottles and common, fine, faint, brown (10YR 5/3) and pale-brown (10YR 6/3) mottles; weak, coarse, subangular blocky structure and massive; firm, discontinuous brittle; few yellowish-brown (10YR 5/4) clay films on faces of peds; clean silt grains forming gray (10YR 6/1) streaks; common dark stains and concretions; common sand grains; very strongly acid.

The combined thickness of the A horizons ranges from 12 to 20 inches. The B2t horizon is mainly yellowish-brown or grayish-brown heavy silty clay loam that has grayish mottles, but it is light silty clay in some profiles. The loamy material in most profiles is silt loam that is 10 to 20 percent sand, but in some profiles it is loam, clay loam, or light silty clay loam.

Bluford soils are on the same landscape as the poorly drained Weir soils and moderately well drained Ava soils. They have a profile similar to that of Stoy and Hoyleton soils, but they have a thinner and lighter colored A1 horizon than Hoyleton soils and have more clay in the B2t horizon and more sand in the lower part of the B horizon than Stoy soils.

13A—Bluford silt loam, 0 to 2 percent slopes. This nearly level soil is mainly on broad ridgetops and at the heads of drainageways. It has the profile described as representative of the series.

Included with this soil in mapping are small areas of poorly drained Weir silt loam, moderately well drained Ava silt loam, and the darker Hoyleton silt loam. Also included are small areas of soils that have slope of more than 2 percent in which depth to the subsoil is more than 20 inches. Small wet areas, generally less than 1 acre, are shown by a conventional symbol on the soil map.

Available water capacity is high. Permeability is slow. Runoff is slow, and the hazard of erosion is slight.

This soil is suited to common cultivated crops. Re-

moval of excess water is needed. It is well suited to pasture, woodland, and openland wildlife. In places, shallow surface drains are needed to remove excess water during rainy seasons. Capability unit IIw–1; woodland group 3o1.

13B—Bluford silt loam, 2 to 4 percent slopes. This gently sloping soil is on narrow to broad ridgetops, side slopes, foot slopes, and at the heads of drainageways. It has a profile similar to the one described as representative of the series, but the surface layer is generally 8 to 12 inches thick.

Included with this soil in mapping are small areas of poorly drained Weir silt loam, mainly at the heads of drainageways; moderately well drained Ava silt loam; and the darker Hoyleton silt loam. In a few places, slopes are less than 2 percent or more than 4 percent. In some places depth to the subsoil is more than 12 inches.

Available water capacity is high. Permeability is slow. Runoff is medium, and the hazard of erosion is slight to moderate.

This soil is well suited to cultivated crops. Control of erosion is needed. Also, removal of excess water at the heads of drainageways and from more level areas is needed. The soil is also well suited to pasture and woodland crops, wildlife, and wildlife plantings. Capability unit IIe–1; woodland group 3o1.

Bonnie Series

The Bonnie series consists of deep, poorly drained, nearly level and depressional soils on flood plains. These soils formed in silty acid alluvium. The native vegetation was deciduous hardwoods.

In a representative profile the surface layer is grayish-brown silt loam 8 inches thick over a gray silt loam plowsole 3 inches thick. Beneath this is a light-gray silt loam substratum to a depth of 62 inches. It is mottled with yellowish brown and strong brown.

Available water capacity is high. Permeability is slow. A seasonal water table is at or near the surface. These soils are susceptible to overflow unless protected.

Most areas are used for cultivated crops and pasture and are suited to these crops. Some areas remain wooded. Crops respond well to lime and fertilizer. These soils are also suited to wetland wildlife.

Representative profile of Bonnie silt loam, about 85 feet south and 312 feet east of the northwest corner of sec. 25, T. 7 S., R. 6 E., in a cultivated field:

Ap1—0 to 8 inches, grayish-brown (10YR 5/2) silt loam; few, fine, faint, gray (10YR 5/1) mottles; moderate, fine, granular structure; friable; common roots; common dark stains (iron and manganese oxides); slightly acid; abrupt, smooth boundary.

Ap2—8 to 11 inches, gray (10YR 6/1) silt loam; common, fine, faint, brown (10YR 4/3) mottles and few, fine, faint, light-gray (10YR 7/1) mottles; weak, thick, platy structure and massive; firm; a plowsole; few roots; common dark stains and concretions (iron and manganese oxides); very strongly acid; abrupt, smooth boundary.

C1g—11 to 24 inches, light-gray (10YR 7/1) silt loam; common, fine, distinct, yellowish-brown (10YR 5/4) mottles; weak, fine, subangular blocky structure and massive; friable; common roots; vesicular; common, fine, dark stains and concretions (iron and manganese oxides); very strongly acid; clear, smooth boundary.

C2g—24 to 34 inches, light-gray (10YR 6/1) silt loam; common, fine, distinct, yellowish-brown (10YR 5/6) mottles and common, fine, faint, light brownish-gray (10YR 6/2) mottles; massive; friable; few roots; vesicular; common, fine, dark concretions (iron and manganese oxides); very strongly acid; clear, smooth boundary.

C3g—34 to 54 inches, light-gray (10YR 6/1 and 7/1) silt loam; common, medium, distinct, strong-brown (7.5YR 5/6) mottles; massive; friable; few roots; vesicular; few, thin, light-gray (10YR 6/1) clay films along linings of root channels; common, medium, dark stains and concretions (iron and manganese oxides); very strongly acid; clear, smooth boundary.

C4g—54 to 62 inches, light-gray (10YR 7/1) silt loam; common, medium, distinct, yellowish-brown (10YR 5/4) and strong-brown (7.5YR 5/6) mottles; massive; friable; common, fine pores; common, fine, dark concretions (iron and manganese oxides); very strongly acid.

The A horizon in uncultivated areas is 4 to 19 inches thick and is grayish brown or dark grayish brown. It is commonly mottled with light gray or pale brown. The upper part of the C horizon is light gray or light brownish gray. The lower part of the C horizon is predominantly silt loam, but there are silty clay loam strata in some places.

Bonnie soils are on the same flood plains as Belknap and Piopolis soils and often lie adjacent to low-lying terraces with Racoon soils. Bonnie soils are grayer in the upper part of the solum than Belknap soils and are less clayey than Piopolis and Racoon soils.

108—Bonnie silt loam (0 to 1 percent slopes). This soil is on flat, generally wide to narrow, low-lying bottom lands. It has the profile described as representative of the series.

In about 40 percent of the area of this unit, there is a compact layer 10 to 20 inches thick and 20 to 40 inches below the surface. This layer is firm and brittle, but otherwise the profile is like the one described as representative of the series.

Included with this soil in mapping are small areas of somewhat poorly drained Belknap soils and poorly drained Racoon silt loam. Also included are short slopes along old stream channels where slopes are more than 1 percent. Wet areas, generally less than 1 acre in size, are shown by a conventional symbol on the soil map.

Available water capacity is high. Permeability is slow. Runoff is slow to ponded. This soil is susceptible to overflow unless protected, and floodwaters may stand for several days if the soil is not drained (fig. 5).

This soil is moderately to highly productive and is suited to row crops where protection from overflow and drainage have been provided. Capability unit IIIw–2; woodland group 2w5.

W108—Bonnie silt loam, wet (0 to 1 percent slopes). This soil is nearly level and much of it is in depressions. The water table is at or near the surface during most of the winter and spring, and some areas may be inundated. Swampy areas are shown by a conventional symbol on the soil map.

This soil remains wet too late in most years to allow the common cultivated crops to be grown. It is used mainly for woodland, but some areas are suitable for pasture. It is well suited to wetland wildlife. Where this soil can be adequately drained and protected from flooding, it can be used for cultivated crops. Capability unit Vw–1; woodland group 3w6.

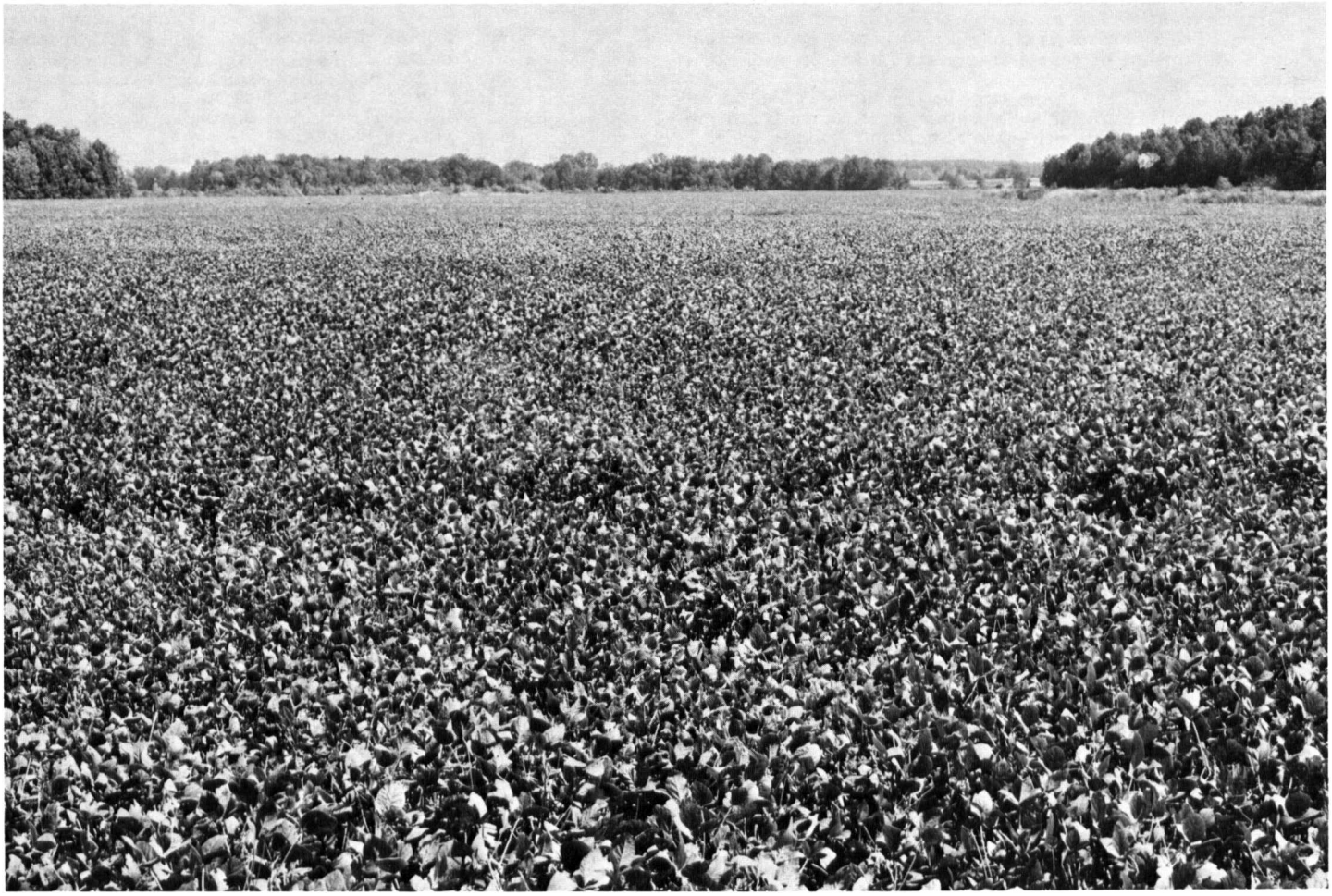

Figure 5.—**A system of surface ditches and land leveling is needed to provide adequate drainage on this Bonnie silt loam. Soybeans are commonly grown because they can be planted late and harvested early, and rainy weather will not interfere with cultivation and harvest.**

Burnside Series

The Burnside series consists of well drained and moderately well drained, very gently sloping or gently sloping soils that are mainly on narrow bottom lands. These soils formed in 12 to 24 inches of silty stream sediments and in the underlying channery or flaggy loam sediments. Bedrock is commonly at a depth of 4 to 7 feet. The native vegetation was deciduous hardwoods.

In a representative profile the surface layer is dark-brown and dark yellowish-brown silt loam 7 inches thick. The upper part of the subsoil is dark yellowish-brown and dark-brown silt loam 8 inches thick. The lower part of the subsoil is dark yellowish-brown and dark-brown very flaggy loam 7 inches thick. The substratum is dark yellowish-brown very flaggy loam. Bedrock is at a depth of 60 inches.

Permeability is moderate in the upper layers and moderately rapid in the lower, coarser textured layers. Available water capacity is moderate. These soils are susceptible to flash flooding and stream cutting unless protected.

Most areas of these soils are used for woodland. Some areas are used for pasture and crops or have been planted to pines. The soils are well suited to openland and woodland wildlife.

Representative profile of Burnside silt loam, about 1,650 feet west and 2,145 feet south of the center of sec. 22, T. 10 S., R. 7 E., in a wooded area:

A11—0 to 3 inches, dark-brown (10YR 4/3) silt loam; moderate, fine, granular structure; friable; few sandstone fragments; strongly acid; clear, smooth boundary.

A12—3 to 7 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, fine, granular and weak, very fine, subangular blocky structure; friable; few sandstone fragments; very strongly acid; clear, smooth boundary.

B21—7 to 15 inches, dark yellowish-brown (10YR 4/4) and dark-brown (7.5YR 4/4) silt loam; weak, fine, subangular blocky structure; friable; few sandstone fragments; very strongly acid; abrupt, smooth boundary.

IIB22—15 to 22 inches, dark yellowish-brown (10YR 4/4) dark-brown (7.5YR 4/4) very flaggy loam; weak, fine, subangular blocky structure; friable; very strongly acid; clear, smooth boundary.

IIC—22 to 60 inches, dark yellowish-brown (10YR 4/4) and dark-brown (7.5YR 4/4) very flaggy loam, massive; strongly acid; abrupt, smooth boundary.

R—60 inches, sandstone bedrock.

The silt loam upper horizons are 12 to 24 inches thick. Grayish mottles are in some profiles below a depth of 20 inches. The B horizon is strongly acid to very strongly acid, and the amount of coarse fragments ranges from 35 to 75 percent.

Burnside soils are in the same bottom lands as Sharon and Belknap soils. Burnside soils contain more coarse fragments within a depth of 40 inches than Sharon or Belknap soils.

427—Burnside silt loam. This very gently sloping or gently sloping soil generally has slopes of 1 to 3 percent, but slopes range up to 5 percent in a few places. It is mainly in narrow bottom lands associated with hilly uplands. The surface is stony along some stream and overflow channels.

Included with this soil in mapping are somewhat poorly drained soils that contain stony layers. Also included are areas of Sharon and Belknap soils and small areas of soils that have silty material more than 24 inches thick.

This soil is suited to many uses, but possible flash flooding, subsoil stoniness, and small size or narrowness of areas affect use and management. Most areas of this soil are in woodland or pasture and are well suited to these uses. Some areas have been planted to pines. The soil is well suited to wildlife and wildlife plantings. Capability unit IIs–1; woodland group 1o4.

Cape Series

The Cape series consists of poorly drained and very poorly drained, nearly level or depressional soils on bottom lands. These soils formed in clayey sediment. The native vegetation was mixed bottom land hardwoods.

In a representative profile the surface layer is dark-gray silty clay loam 10 inches thick. The subsoil, about 35 inches thick, is mainly mottled dark-gray silty clay loam and gray silty clay. The substratum to a depth of 60 inches is gray, light-gray, and grayish-brown silty clay loam.

Permeability is very slow. Available water capacity is moderate. The clayey soil material is sticky and plastic and difficult to till or excavate. It swells on wetting and shrinks on drying. The seasonal water table is at or near the surface, and most areas are susceptible to flooding or overflow.

Most areas of these soils are used for cultivated crops or pasture. A few areas remain wooded. Crop response to lime and fertilizer is limited. Yields of soybeans are generally more favorable than corn yields. Undrained areas are well suited to wetland wildlife.

Representative profile of Cape silty clay loam, about 1,290 feet north and 660 feet west of the center of sec. 10, T. 10 S., R. 5 E., in idle cropland:

Ap—0 to 10 inches, dark-gray (10YR 4/1) silty clay loam; weak, medium, angular blocky structure; very firm; neutral; abrupt, smooth boundary.

B1g—10 to 22 inches; dark-gray (10YR 4/1) heavy silty clay loam; common, medium, distinct, dark-brown (10YR 4/3) mottles; moderate, coarse, prismatic structure parting to weak, medium, angular blocky; very firm; common, dark stains (iron and manganese oxides); strongly acid; clear, smooth boundary.

B21g—22 to 28 inches, gray (10YR 5/1) silty clay; common, medium, distinct, dark-brown (10YR 4/3) mottles; weak, coarse, prismatic structure parting to weak, medium, angular blocky; very firm; dark stains (iron and manganese oxides) in root channels; strongly acid; clear, smooth boundary.

B22g—28 to 35 inches; gray (10YR 5/1), dark-gray (10YR 4/1), and light-gray (10YR 6/1) silty clay; common, medium, prominent, dark reddish-brown (5YR 3/3) mottles; weak, coarse, prismatic structure parting to weak, medium and coarse, angular blocky; very firm; few dark stains (iron and manganese oxides) in root channels; strongly acid; clear, smooth boundary.

B3g—35 to 45 inches, gray (10YR 5/1) and grayish-brown (10YR 5/2) light silty clay; common, medium, distinct, pale-brown (10YR 6/3) and dark grayish-brown (10YR 4/2) mottles; weak, coarse, angular blocky structure; firm; common, dark stains (iron and manganese oxides); strongly acid; gradual, smooth boundary.

Cg—45 to 60 inches; gray (10YR 6/1), light-gray (10YR 7/1), and grayish-brown (10YR 5/2) silty clay loam; common, medium, distinct, pale-brown (10YR 6/3) mottles; massive; firm; common, dark stains (iron and manganese oxides); strongly acid.

The silty clay loam horizons are 20 to 30 inches thick. The B2g horizon ranges from strongly acid to extremely acid. The C horizon is commonly silty clay loam, but some profiles contain loam and silty clay strata.

Cape soils are near and have profiles similar to those of Piopolis and Karnak soils. Cape soils contain more clay in the solum than Piopolis soils and are more acid than Karnak soils.

422—Cape silty clay loam (0 to 2 percent slopes). This nearly level or depressional soil is on low-lying bottom lands. It is susceptible to overflow and standing water.

Included with this soil in mapping are small areas of Karnak silty clay and Piopolis silty clay loam.

Available water capacity is moderate. Permeability is very slow. Runoff is slow to ponded. Removal of excess water, protection from overflow, and maintenance of fertility are needed. Favorable tilth is difficult to maintain, and timeliness of tillage is important.

This soil is moderately productive and is mainly used for cultivated crops. A few areas are wooded. Some cleared areas have grown back to brush. This soil is suited to pasture, woodland, or wildlife. Capability unit IIIw–2; woodland group 2w5.

Colp Series

The Colp series consists of moderately well drained, nearly level and gently sloping soils on broad ridgetops and side slopes along drainageways on terraces. These soils formed in thin loess or silty wash and in clayey lakebed sediment. The native vegetation was deciduous hardwoods.

In a representative profile the surface layer is dark-brown silt loam 9 inches thick. The subsoil is yellowish-brown silty clay about 46 inches thick. It has grayish mottles in the lower part. The substratum to a depth of 61 inches is yellowish-brown and gray heavy silty clay loam.

Permeability is slow. Available water capacity is moderate to high. The seasonal water table is commonly at a depth of 3 to 5 feet. Some areas of Colp soils are susceptible to occasional flooding.

Most areas of these soils are used for crops and pasture. Some areas remain wooded. Crops respond well to lime and fertilizer. These soils are well suited to openland and woodland wildlife.

Representative profile of Colp silt loam, 1 to 4 per-

cent slopes, 1,900 feet south and 80 feet west of the northeast corner of sec. 35, T. 9 S., R. 7 E., in a meadow:

Ap—0 to 9 inches, dark-brown (10YR 4/3) silt loam; moderate, fine, granular structure; friable; slightly acid; abrupt, smooth boundary.

B1—9 to 11 inches, yellowish-brown (10YR 5/6) silty clay loam; weak, fine, subangular blocky structure; firm, few, fine, dark concretions (iron and manganese oxides); slightly acid; clear, smooth boundary.

IIB21t—11 to 21 inches, yellowish-brown (10YR 5/6) silty clay; moderate, fine, subangular blocky structure; very firm; many, thin and medium, yellowish-brown (10YR 5/4) coatings and clay films on faces of peds; fine dark concretions (iron and manganese oxides); very strongly acid; clear, smooth boundary.

IIB22t—21 to 32 inches, yellowish-brown (10YR 5/6) silty clay; moderate, medium, prismatic structure parting to moderate, fine, subangular blocky; very firm; common dark stains (iron and manganese oxides) on faces of peds; continuous, thin, light olive-brown (2.5Y 5/4) and brown (10YR 5/3) clay films on faces of peds; very strongly acid; clear, smooth boundary.

IIB23t—32 to 42 inches, yellowish-brown (10YR 5/4) silty clay; common, fine, distinct, grayish-brown (10YR 5/2) mottles; moderate, fine, prismatic structure parting to weak, fine, subangular blocky; very firm; discontinuous, thin, medium brown (10YR 5/3) clay films on faces of peds; common dark stains (iron and manganese oxides) on faces of peds, common, fine concretions; medium acid; clear, smooth boundary.

IIB31—42 to 49 inches, yellowish-brown (10YR 5/6) silty clay; common, fine, distinct, grayish-brown (10YR 5/2) mottles; weak, medium, prismatic structure parting to weak, fine, subangular blocky; very firm; patchy, thin, brown (10YR 5/3) clay films on faces of peds; common, fine, dark concretions (iron and manganese oxides); neutral; clear, smooth boundary.

IIB32—49 to 55 inches, yellowish-brown (10YR 5/4, 5/6) silty clay; few fine, distinct, light-gray (10YR 6/1) mottles; weak, medium, prismatic structure parting to weak, fine, subangular blocky; very firm; patchy, thin, grayish-brown (10YR 5/2) and brown (10YR 5/3) clay films on faces of peds; dark stains (iron and manganese oxides); weak effervescence; moderately alkaline; clear, smooth boundary.

IIC—55 to 61 inches, 60 percent yellowish-brown (10YR 5/6) and 40 percent gray (10YR 6/1) heavy silty clay loam; massive; firm; patchy, thin, grayish-brown (10YR 5/2), brown (10YR 5/3), and light-gray (10YR 7/1), continuous, thin calcium carbonate lenses; strong effervescence; moderately alkaline.

The silty cap is 8 to 20 inches thick. Where it is thickest, both the A horizon and the upper part of the B horizon formed in this material. A yellowish-brown or grayish-brown A2 horizon 2 to 5 inches thick is commonly present if it has not been mixed into the plow layer. The B2t horizon is predominantly silty clay but includes some silty clay loam. The upper part of the B2t horizon ranges from strongly acid to very strongly acid. The lower part of the B2t horizon is medium acid to neutral and commonly has carbonates at a depth of 45 to 60 inches. The C horizon is silty clay or silty clay loam that has strata of silt loam in some profiles.

Colp soils are commonly associated with Hurst and Markland soils and are next to Reesville and Creal soils. Colp soils are less gray in the upper part of the B horizon than Hurst soils, are more acid and deeper to carbonates than Markland soils, and are more clayey in the B2t horizon and C horizon than Reesville and Creal soils.

122B—Colp silt loam, 1 to 4 percent slopes. This nearly level and gently sloping soil is on broad ridgetops and side slopes along drainageways.

Included with this soil in mapping are small areas of somewhat poorly drained Hurst silt loam and moderately well drained Markland silt loam. Also included are small areas of soils that have less than 7 inches of the surface layer remaining and that have slopes of more than 4 percent.

Available water capacity is moderate to high. Permeability is slow. Runoff is medium, and the hazard of erosion is slight or moderate. The clayey subsoil material is difficult to excavate.

This soil has moderate productivity and is mainly used for soybeans, wheat, hay, and pasture. Control of erosion and maintenance of organic matter, tilth, and fertility are needed. A few areas are still in woodland. The soil is suited to woodland, wildlife, and wildlife plantings. Capability unit IIIe–2; woodland group 3o1.

Creal Series

The Creal series consists of somewhat poorly drained, nearly level soils mainly at the bottom of side slopes and on alluvial fans below drainageways. These soils formed in loess and silty overflow sediments. The native vegetation was deciduous hardwoods.

In a representative profile the surface layer is brown silt loam 10 inches thick. The subsurface layer is mainly mottled yellowish-brown silt loam 14 inches thick. The subsoil, about 34 inches thick, is yellowish-brown, brown, and pale-brown silt loam and silty clay loam that has many grayish mottles. The substratum to a depth of 68 inches is mixed light brownish-gray and yellowish-brown silt loam.

Available water capacity is high. Permeability is moderately slow. Runoff is slow to medium, and the hazard of erosion is slight. Most areas of Creal soils are susceptible to overflow from higher ground, and some areas are susceptible to occasional flooding.

Most areas of these soils are used for cultivated crops or pasture. Crops respond well to lime and fertilizer. These soils are well suited to openland wildlife.

Representative profile of Creal silt loam, 108 feet north and 1,998 feet east of the southwest corner of sec. 22, T. 8 S., R. 6 E., in a cultivated field:

Ap—0 to 10 inches, brown (10YR 4/3) silt loam; moderate, fine, granular structure; friable; many roots; slightly acid; abrupt, smooth boundary.

A21—10 to 18 inches, brown (10YR 5/3) and yellowish-brown (10YR 5/4) silt loam that has common, very fine, faint, grayish-brown (10YR 5/2) mottles; weak, fine, subangular blocky structure parting to moderate, fine, granular; friable; many roots; very strongly acid; clear, smooth boundary.

A22—18 to 24 inches, yellowish-brown (10YR 5/4) silt loam; many, fine, faint, grayish-brown (10YR 5/2) mottles are in 30 percent of horizon; moderate, fine and medium, subangular blocky structure parting to weak, fine, granular; friable; many roots; many, thin, light brownish-gray (10YR 6/2) clean silt grains on faces of peds; common, fine, dark stains (iron and manganese oxides); very strongly acid; clear, smooth boundary.

B1—24 to 33 inches, yellowish-brown (10YR 5/4) and pale-brown (10YR 6/3) heavy silt loam; very fine, faint, light brownish-gray (10YR 6/2) mottles are in 30 percent of horizon; weak, medium, prismatic structure parting to weak, fine, subangular blocky; friable; common roots; many fine stains (iron and manganese oxides); very strongly acid; clear, smooth boundary.

B21t—33 to 40 inches, brown (10YR 5/3) and yellowish-

brown (10YR 5/4) silty clay loam; common, fine, distinct, light brownish-gray (10YR 6/2) mottles are in 10 percent of the horizon and faint, yellowish-brown (10YR 5/6) mottles are in 10 percent of the horizon; moderate, medium, prismatic structure parting to moderate, fine and medium, subangular blocky; friable; common roots; discontinuous, thin, brown (10YR 5/3) clay films on faces of peds; dark stains (iron and manganese oxides); very strongly acid; clear, smooth boundary.

B22t—40 to 51 inches, pale-brown (10YR 6/3), brown (10YR 5/3), and yellowish-brown (10YR 5/4) silty clay loam; common, fine, faint, light brownish-gray (10YR 6/2) mottles are in 20 percent of the horizon; weak, medium, prismatic structure parting to weak, fine and medium, subangular blocky; friable; few roots; common dark stains (iron and manganese oxides); very strongly acid; clear, smooth boundary.

B3—51 to 58 inches, yellowish-brown (10YR 5/4 and 5/6) light silty clay loam that is 30 percent fine, distinct, light brownish-gray (10YR 6/2) mottles; weak, fine, subangular blocky structure; friable; many, fine, dark stains (iron and manganese oxides); medium acid; clear, smooth boundary.

C—58 to 68 inches, light brownish-gray (10YR 6/2) and yellowish-brown (10YR 5/4 and 5/6) silt loam; massive; friable; neutral.

The Ap or A1 horizon is brown and dark grayish brown. The combined thickness of the A horizons ranges from 24 to 36 inches. The B2t horizon is 8 to 22 inches thick.

Creal soils are commonly along the break between soils of the uplands and soils of the terraces or bottom lands. Creal soils have a profile similar to those of Bluford, Stoy, and Racoon soils, but Creal soils have a thicker A horizon than Bluford and Stoy soils and are not so gray in the B horizon as Racoon soils.

337—Creal silt loam (1 to 3 percent slopes). This nearly level or gently sloping soil is at the bases of upland slopes and on alluvial fans below drainageways.

Included with this soil in mapping are small areas of poorly drained Racoon silt loam and somewhat poorly drained Belknap silt loam and Bluford silt loam. Also included are small areas of soils that have slopes greater than 3 percent.

Available water capacity is high. Permeability is moderately slow. Runoff is slow to medium. The hazard of erosion is slight.

This soil is highly productive and well suited to corn, soybeans, wheat, pasture, or woodland. It is also well suited to wildlife and wildlife plantings. Control of seepage water and runoff from adjoining uplands and maintenance of fertility, organic matter, and tilth are needed. Capability unit IIw–1; woodland group 3o1.

Darwin Series

The Darwin series consists of poorly drained to very poorly drained, nearly level to depressional soils on bottom lands. These soils formed in clayey lake-deposited sediments. The native vegetation was mainly grasses, sedges, and deciduous hardwoods.

In a representative profile the surface layer is mainly very dark grayish-brown and black light silty clay 18 inches thick. The subsoil is mainly mottled dark-gray and light brownish-gray silty clay 35 inches thick. The substratum is mottled gray light silty clay to a depth of 74 inches.

Permeability is very slow. Available water capacity is moderate.

Most areas of these soils are used for cultivated crops. A few areas remain wooded. Darwin soils are susceptible to winter and spring flooding, and the natural seasonal water table is at or near the surface. These soils are well suited to wetland wildlife.

Representative profile of Darwin silty clay, 39 feet north and 1,485 feet east of the center of sec. 22, T. 7 S., R. 7 E., in a cultivated field:

Ap—0 to 8 inches, very dark grayish-brown (10YR 3/2) light silty clay, grayish-brown (10YR 5/2) when dry; moderate, medium and coarse, granular structure; firm; mildly alkaline; abrupt, smooth boundary.

A12—8 to 11 inches; black (10YR 2/1) light silty clay; moderate, fine and medium, angular blocky and subangular blocky structure; firm; mildly alkaline; clear, smooth boundary.

A13—11 to 18 inches, very dark gray (10YR 3/1) silty clay; moderate and strong, medium and coarse, prismatic structure parting to moderate, medium, angular blocky; very firm; mildly alkaline; clear, smooth boundary.

B21g—18 to 25 inches, dark-gray (10YR 4/1) silty clay; common, medium, distinct, yellowish-brown (10YR 5/4) mottles; moderate, medium, prismatic structure parting to moderate, medium, angular blocky; very firm; mildly alkaline; clear, smooth boundary.

B22g—25 to 36 inches, dark-gray (10YR 4/1) and grayish-brown (2.5Y 5/2) silty clay; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; moderate, medium, prismatic structure parting to weak and moderate, medium, angular blocky; very firm; mildly alkaline; clear, smooth boundary.

B3g—36 to 53 inches, light brownish-gray (2.5Y 6/2) light silty clay; many, medium, distinct, yellowish-brown (10YR 5/4) mottles; weak, medium and coarse, angular blocky structure; firm; slight effervesence; mildly alkaline; few lime accumulations; gradual, smooth boundary.

Cg—53 to 74 inches, gray (2.5Y 6/1) light silty clay; many, medium, distinct, light olive-brown (2.5Y 5/4) mottles; massive; firm; strong effervesence; moderately alkaline; many lime accumulations.

The combined thickness of the dark-colored Ap and A1 horizons ranges from 10 to 20 inches. The B horizon is typically slightly acid to neutral but ranges to mildly alkaline. The C horizon is mainly silty clay but includes strata of silty clay loam.

Darwin soils formed in similar material and have profiles similar to Karnak and Zipp soils, but they have thicker or darker A horizons than either of these soils.

71—Darwin silty clay (0 to 2 percent slopes). This nearly level or depressional soil is on bottom lands.

Included with this soil in mapping are small areas of Zipp heavy silty clay loam and areas of soils that have silty overwash, mainly along the eastern side of the county. Wet areas, generally less than 1 acre, are shown by a conventional symbol on the soil map.

Available water capacity is moderate. Permeability is very slow. Runoff is very slow to ponded.

Wetness and spring flooding are problems in most areas. The clayey material is sticky and plastic and is difficult to till or excavate. In areas having a silty overwash, the tilth of the surface layer is favorable.

This soil is suited to row crops where drainage and protection from flooding are adequate. Undrained areas are suited to wetland wildlife. Capability unit IIIw–2; woodland group 3w6.

Frondorf Series

The Frondorf series consists of well-drained,

strongly sloping to steep soils on side slopes of the uplands. They are about 20 to 40 inches thick overlying bedrock. These soils formed in loess and loamy material weathered from sandstone and siltstone. The native vegetation was deciduous hardwoods.

In a representative profile the surface layer, 1 inch thick, is black, very dark gray, and yellowish-brown silt loam. The subsurface layer is yellowish-brown silt loam 5 inches thick. The subsoil is 32 inches thick. The upper 15 inches is strong-brown loam, and the lower 17 inches is reddish-brown, strong-brown, and yellowish-brown channery and very channery heavy loam. Beneath this is sandstone bedrock.

Available water capacity is moderate. Permeability is moderate in most of the soil and moderately rapid in the lower part of the subsoil.

Most areas of these soils are used for woodland. A few areas are in pasture, and the soils are well suited to both of these uses. They are also well suited to openland or woodland wildlife.

Representative profile of Frondorf silt loam, 12 to 18 percent slopes, about 1,330 feet east and 500 feet north of the southwest corner of sec. 31, T. 8 S., R. 5 E., in woodland:

A1—0 to 1 inch, mixed, black (N 2/0), very dark gray (10YR 3/1), and yellowish-brown (10YR 5/4) silt loam; moderate, fine, granular structure; friable; many roots; slightly acid; abrupt, smooth boundary.

A2—1 to 6 inches, yellowish-brown (10YR 5/4) silt loam; weak, fine, granular structure; friable; many roots, dark-gray (10YR 4/1) organic coatings on faces of peds; very strongly acid; clear, smooth boundary.

IIB1—6 to 9 inches, strong-brown (7.5YR 5/6) loam; weak, fine, subangular blocky structure; friable; many roots; patchy, thin, yellowish-brown (10YR 5/4) clay films on faces of peds and root channels; very strongly acid; clear, smooth boundary.

IIB21t—9 to 21 inches, strong-brown (7.5YR 5/6) heavy loam; moderate, medium, prismatic structure parting to weak, fine, subangular blocky; friable; common roots; discontinuous, thin, brown (7.5YR 5/4) clay films on faces of peds; common fine concretions (iron and manganese oxides); very strongly acid; clear, smooth boundary.

IIB22t—21 to 29 inches, reddish-brown (7.5YR 6/6), strong-brown (7.5YR 5/6), and light yellowish-brown (10YR 6/4) channery heavy loam; weak, coarse, prismatic structure parting to moderate, medium and fine, subangular blocky; firm; common roots; continuous, thin and medium, dark-brown (7.5YR 6/4) clay films on faces of peds; very strongly acid; clear, wavy boundary.

IIB23t—29 to 34 inches, reddish-brown (7.5YR 6/6), strong-brown (7.5YR 5/6), and light yellowish-brown (10YR 6/4) very channery heavy loam; weak, medium and fine, subangular blocky structure; firm; few roots; discontinuous, thin, dark-brown (7.5YR 4/4) clay films on faces of peds; very strongly acid; clear, wavy boundary.

IIB3—34 to 38 inches, strong-brown (7.5YR 5/6), reddish-yellow (7.5YR 6/6), and yellowish-brown (10YR 5/4) loam in interstices of weathered fractured sandstone; patchy, thin, light-brown (7.5YR 6/4) clay films on faces of sandstone fragments; very strongly acid; abrupt, irregular boundary.

R—38 inches, brownish fine-grained sandstone containing noticeable mica flakes.

Depth to bedrock ranges from 20 to 40 inches. The combined thickness of the A horizons is 4 to 10 inches. The A horizon is silt loam or loam. The B2t horizon is loam or silty clay loam that is gravelly or channery in the lower part.

Frondorf soils are on the same hillsides with Hickory, Wellston, and Zanesville soils. Frondorf soils differ from Hickory and Wellston soils in having bedrock at a depth of less than 40 inches. They do not have a fragipan, and Zanesville soils do.

786D3—Frondorf silt loam, 7 to 12 percent slopes, severely eroded. This strongly sloping soil is on side slopes and at the heads of drainageways. It has a profile similar to the one described as representative for the series, but the surface layer and subsurface layer have been removed by erosion.

Included with this soil in mapping are small areas of moderately well drained Ava silt loam and Hosmer silt loam and well-drained Hickory loam, mainly along the upper side slopes. Also included are a few areas of soils that have more than 3 inches of subsurface layer remaining and areas of soils that have slopes of less than 7 percent or of more than 12 percent.

Available water capacity is moderate. Permeability is moderate. Runoff is rapid, and the hazard of erosion is severe.

This soil is mainly used for pasture. It has moderate productivity because it is droughty during hot, dry weather. Control of further erosion and maintenance of fertility, organic matter, and tilth are needed. Some areas are in brush, and a few areas have been planted to pine trees. The soil is well suited to wildlife and wildlife plantings. Capability unit IVe–2; woodland group 3r2.

786E—Frondorf silt loam, 12 to 18 percent slopes. This moderately steep soil is on side slopes. It has the profile described as representative of the series.

Included with this soil in mapping are small areas of moderately well drained Ava silt loam and Hosmer silt loam and of well-drained Hickory loam, mainly along the upper slopes. There are a few severely eroded spots. Also included are some areas of soils that have slopes of less than 12 percent or of more than 18 percent.

Available water capacity is moderate. Permeability is moderate. Runoff is rapid, and the hazard of erosion is moderate to severe.

This soil is well suited to woodland or pasture. It is also well suited to wildlife and wildlife plantings and has esthetic value. It is droughty during hot, dry weather. Control of erosion is needed for open areas and for logging or similar trails. Capability unit IVe–1; woodland group 3r2.

786F—Frondorf silt loam, 18 to 45 percent slopes. This steep soil is on side slopes. It has a profile similar to the one described as representative of the series, but the surface and subsurface layers are generally thinner. In some places the surface layer is loam.

Included with this soil in mapping are small areas of well-drained Hickory loam, mainly along the upper slopes. Also included are a few severely eroded spots and some areas of soils that have slopes of less than 18 percent or of more than 45 percent.

Available water capacity is moderate. Permeability is moderate. Runoff is rapid, and the hazard of erosion is high.

This soil is well suited to woodland. It is also well suited to wildlife and wildlife plantings and has esthetic value. It is droughty during hot, dry weather. Control of erosion is needed for open areas and for

logging or similar trails. Steepness of slope affects use. Capability unit VIIe–1; woodland group 3r2.

Grantsburg Series

The Grantsburg series consists of moderately well drained, gently sloping to strongly sloping soils that have a dense fragipan layer at a depth of 18 to 30 inches. These soils are on ridgetops and side slopes of the uplands in the southern part of the county. Grantsburg soils formed in loess. The native vegetation was deciduous hardwoods.

In a representative profile the surface layer is brown silt loam about 7 inches thick. The subsurface layer is a yellowish-brown and brown silt loam 2 inches thick. The subsoil is about 52 inches thick. Its upper 14 inches is mainly strong-brown light silty clay loam, the next 3 inches is brown silty clay loam and pale-brown silt loam, and the lower 35 inches is a fragipan of firm and brittle, strong-brown silty clay loam and heavy silt loam that has mottles and streaks in shades of gray. The substratum to a depth of 72 inches is dark yellowish-brown silt loam.

Permeability is moderate in the upper part of the subsoil and slow to very slow in the fragipan. Available water capacity is moderate. The fragipan impedes the movement of water and the growth of roots.

Most areas of these soils are used for cultivated crops. Crops respond well to lime and fertilizer. A few areas remain wooded. The soils are well suited to openland or woodland wildlife.

Representative profile of Grantsburg silt loam, 2 to 4 percent slopes, about 150 feet south and 375 feet west of the center of sec. 36, T. 10 S., R. 5 E., in a cultivated field:

Ap—0 to 7 inches, brown (10YR 4/3) silt loam; moderate, fine, granular structure; friable; slightly acid; abrupt, smooth boundary.

A2—7 to 9 inches, 60 percent yellowish-brown (10YR 5/6) and 40 percent brown (7.5YR 4/4) silt loam; weak, fine, granular structure and massive; firm; medium acid; abrupt, smooth boundary.

B1—9 to 12 inches, yellowish-brown (10YR 5/6) heavy silt loam; weak, fine, subangular blocky structure; friable; patchy, thin, brown (7.5YR 4/4) films of clay on faces of peds; strongly acid; clear, smooth boundary.

B21t—12 to 17 inches, strong-brown (7.5YR 5/6) light silty clay; weak, fine, subangular blocky structure; friable; patchy, thin, strong-brown (7.5YR 5/6) films of clay on faces of peds; strongly acid; clear, smooth boundary.

B22t—17 to 23 inches, strong-brown (7.5YR 5/6) light silty clay loam; weak, fine and medium, subangular blocky structure; friable to firm; common discontinuous, thin, yellowish-brown (10YR 5/6, 5/8) films of clay on faces of peds; very strongly acid; abrupt, smooth boundary.

B23t—23 to 26 inches, brown (7.5YR 4/4) silty clay loam ped interiors and pale-brown (10YR 6/3) silt loam ped exteriors; moderate, fine and medium, angular and subangular blocky structure; firm; patchy, thin, brown (7.5YR 4/4) and grayish-brown (10YR 5/2) films of clay on faces of peds; very strongly acid; abrupt, irregular boundary.

Bx1—26 to 37 inches, strong-brown (7.5YR 5/6) silty clay loam; common, medium, distinct, light brownish-gray (10YR 6/2) and strong-brown (7.5YR 5/8) mottles; moderate, coarse, prismatic structure parting to weak, medium, angular and subangular blocky; very firm, brittle; discontinuous, medium, brown (7.5YR 4/4) and grayish-brown (10YR 5/2) films of clay on vertical faces of prisms and patchy, thin films on other faces of peds; many, thin, pale-brown (10YR 6/3) clean grains of silt on faces of peds; common, fine, dark concretions (iron and manganese oxides); very strongly acid; clear, smooth boundary.

Bx2—37 to 61 inches, strong-brown (7.5YR 5/6) heavy silt loam; common, medium, distinct, light brownish-gray (10YR 6/2) mottles; weak, coarse, prismatic structure parting to weak, coarse, subangular and angular blocky; firm and brittle; patchy, thin, brown (10YR 5/3) films of clay on faces of peds; pale-brown (10YR 6/3) clean grains of silt on faces of large prisms forming grayish streaks; common, fine, dark concretions and coarse stains (iron and manganese oxides); very strongly acid; gradual, smooth boundary.

C—61 to 72 inches, dark yellowish-brown (10YR 4/4) silt loam; few, fine, distinct, light brownish-gray (10YR 6/2) mottles; massive; friable and firm and discontinuous brittleness; few pale-brown (10YR 6/3) streaks extending down from B horizon; medium acid.

The solum is strongly acid to very strongly acid throughout, except in the A horizon, which is less acid, especially where limed. Depth to the fragipan ranges from 18 to 30 inches in uneroded soil.

The Ap horizon is 7 to 9 inches thick and in places is dark grayish brown. In areas that remain wooded, the A1 horizon is very dark gray or very dark grayish brown and is 1 to 4 inches thick. The A2 horizon is 2 to 8 inches thick and is brown, yellowish brown, or pale brown. The B horizon above the fragipan is 13 to 18 inches thick. The B23t horizon is 1 to 4 inches thick. In places it is dark yellowish brown and has continuous coatings of light brownish gray on clean silt grains and discontinuous films of clay on faces of peds. The Bx1 horizon is dark yellowish brown or strong brown and has a few silt grains in the upper part. Also, the place of maximum content of clay is commonly the upper part of this horizon.

Grantsburg soils are similar to Hosmer and Zanesville soils. They have a thicker, denser fragipan than Hosmer soils and contain less sand and coarse fragments in the lower part of the solum than Zanesville soils.

301B—Grantsburg silt loam, 2 to 4 percent slopes. This gently sloping soil is on narrow to broad ridgetops of the uplands. It has the profile described as representative of the series. The surface layer is generally 7 to 12 inches thick.

Included with this soil in mapping are small areas of somewhat poorly drained soil at the heads of drainageways and some areas of eroded soils that have less than 7 inches of surface layer remaining. Also included are soils that have slopes of less than 2 percent or of more than 4 percent.

Available water capacity is moderate. Permeability is moderate above the fragipan and slow or very slow within the fragipan. Runoff is medium, and the hazard of erosion is slight.

This soil is moderately productive and is well suited to cultivated crops. It is also well suited to pasture or woodland and to wildlife and wildlife plantings. Control of erosion is needed. Capability unit IIe–2; woodland group 3d2.

301C2—Grantsburg silt loam, 4 to 7 percent slopes, eroded. The sloping soil is mainly on ridgetops but is also on some foot slopes and side slopes. It has a profile similar to the one described as representative of the series, but the surface layer is generally only 3 to 7 inches thick.

Included with this soil in mapping are small areas of somewhat poorly drained soil at the heads of drainageways and small areas of severely eroded soils. Also

included are soils that have slopes of less than 4 percent or of more than 7 percent.

Available water capacity is moderate. Permeability is moderate above the fragipan and slow or very slow within the fragipan. Runoff is medium, and the hazard of erosion is moderate.

This soil is moderately productive and is suited to cultivated crops. It is well suited to pasture or woodland and to wildlife and wildlife plantings. Control of erosion and maintenance of fertility and tilth are needed. Capability unit IIIe–1; woodland group 3d2.

301D2—Grantsburg silt loam, 7 to 12 percent slopes, eroded. This strongly sloping soil is on side slopes and long foot slopes. It has a profile similar to the one described as representative of the series, but the surface layer is thinner, and depth to the fragipan is generally only 12 to 24 inches.

Included with this soil in mapping are small areas of moderately well drained Zanesville silt loam along the lower side slopes and at the heads of some drainageways. Also included are spots of severely eroded soils and some areas of soils that have slopes of less than 7 percent or of more than 12 percent.

Available water capacity is moderate. Permeability is moderate above the fragipan and very slow within the fragipan. Runoff is medium or rapid, and the hazard of erosion is moderate or severe. In rainy seasons, seepage spots form on some hillsides.

This soil is suited to row crops if erosion control practices are used. Maintenance of fertility and tilth are needed. The soil is well suited to pasture or woodland and to wildlife and wildlife plantings. Some areas once cleared are now in brush or planted to pines. Capability unit IIIe–1; woodland group 3d2.

301D3—Grantsburg silt loam, 7 to 12 percent slopes, severely eroded. This strongly sloping soil is mainly on side slopes along drainageways and on narrow bottom lands of the uplands. All or most of the original surface layer has been removed by erosion. The subsoil is now at or near the surface, and gullies have formed in some places. The fragipan is generally about 1 foot or less beneath the surface.

Included with this soil in mapping are small areas of Zanesville soil. Also included are a few areas of soils that have more than 3 inches of the silty surface layer and slopes of less than 7 percent or of more than 12 percent.

Available water capacity is low because of the shallow depth to the fragipan. Permeability is slow or very slow within the fragipan. Runoff is rapid, and the hazard of erosion is severe. This soil is droughty during dry spells, and during rainy seasons seepage spots form on some hillsides.

This soil is suited to pasture or woodland. It is not suited to cultivated crops but is suited to wildlife and wildlife planting. Some areas once cleared have now grown back to brush or have been planted to pines. Management practices needed for this soil are control of erosion and maintenance of fertility, organic matter, and tilth. Capability unit IVe–2; woodland group 3d2.

Harco Series

The Harco series consists of somewhat poorly drained, nearly level soils on broad terraces. These soils formed in silty outwash sediments. The native vegetation was mainly native grasses.

In a representative profile the surface layer is very dark gray silt loam 12 inches thick. The upper part of the subsoil is very dark gray, dark-brown, and dark yellowish-brown silty clay loam 8 inches thick. The lower part of the subsoil is mottled dark-gray, yellowish-brown, and dark yellowish-brown silty clay loam 19 inches thick. The substratum is mixed gray, grayish-brown, and yellowish-brown silt loam to a depth of 72 inches.

Available water capacity is very high. Permeability is moderate. The seasonal water table is 1 to 3 feet below the surface. Most areas of this soil are susceptible to occasional flooding or overflow.

Most areas of these soils are used for row crops. Crops respond well to lime and fertilizer. These soils are well suited to openland wildlife.

Representative profile of Harco silt loam, 240 feet west and 1,400 feet south of the center of sec. 20, T. 9 S., R. 7 E., in a cultivated field:

Ap—0 to 8 inches, very dark gray (10YR 3/1) silt loam, gray (10YR 5/1) when dry; moderate, fine, granular structure; friable; many roots; neutral; abrupt, smooth boundary.

A12—8 to 12 inches, very dark gray (10YR 3/1) heavy silt loam; weak, fine, subangular blocky structure parting to moderate, fine, granular; friable; many roots; slightly acid; clear, smooth boundary.

B1—12 to 17 inches, very dark gray (10YR 3/1) light silty clay loam; common, fine, faint, dark-brown (10YR 3/3) mottles; moderate, fine and medium, subangular blocky structure; friable; many roots; common fine dark concretions (iron and manganese oxides); slightly acid; clear, smooth boundary.

B21t—17 to 20 inches, 50 percent very dark gray (10YR 3/1), 40 percent dark-brown (10YR 3/3), and 10 percent dark yellowish-brown (10YR 4/4) silty clay loam; moderate, fine and medium, subangular blocky structure; friable; discontinuous, thin, very dark gray (10YR 3/1) clay films on faces of peds; common fine dark concretions (iron and manganese oxides); slightly acid; clear, smooth boundary.

B22t—20 to 24 inches, dark-gray (10YR 4/1) silty clay loam; many, medium and coarse, distinct, yellowish-brown (10YR 5/4) mottles; weak, fine, prismatic structure parting to moderate, fine and medium, subangular blocky; friable; common roots; discontinuous, thin, very dark gray (10YR 3/1) clay films on faces of peds; many, fine, dark stains and concretions (iron and manganese oxides); neutral; clear, smooth boundary.

B23t—24 to 34 inches, 60 percent yellowish-brown (10YR 5/4) and 40 percent dark-gray (10YR 4/1) silty clay loam; moderate, medium, prismatic structure parting to moderate, fine and medium, subangular blocky; friable; few roots; continuous, thin, gray (10YR 5/1) and yellowish-brown (10YR 5/4) clay films on faces of peds; few, fine, dark stains and concretions (iron and manganese oxides); neutral; clear, smooth boundary.

B3—34 to 39 inches, yellowish-brown (10YR 5/4), dark yellowish-brown (10YR 4/4), and gray (10YR 5/1) silty clay loam; weak, medium, subangular blocky structure; friable; patchy, thin gray (10YR 5/1) and yellowish-brown (10YR 5/4) clay films on faces of peds; few roots; dark-gray (10YR 4/1) krotovina; many, fine, dark concretions (iron and manganese oxides); neutral; clear, smooth boundary.

C1—39 to 52 inches, gray (10YR 5/1), grayish-brown (10YR 5/2), and yellowish-brown (10YR 5/4) heavy silt loam; massive; friable; weak effervescence; mildly alkaline; clear, smooth boundary.

C2—52 to 72 inches, gray (10YR 5/1), grayish-brown (10YR 5/2), and yellowish-brown (10YR 5/4, 5/6) heavy silt loam; massive; friable; strong effervescence; white patches of lime; moderately alkaline.

The dark-colored A horizon is commonly 12 to 16 inches thick, but thickness ranges from 10 to 18 inches. The B2t horizon is slightly acid to neutral, and carbonates are at a depth of 30 to 40 inches.

Harco soils are on terraces with Reesville, Patton, and McGary soils. Harco soils have better drainage than Patton soils and have a thicker and darker A or Ap horizon than Reesville and McGary soils. Also, Harco soils have less clay in the Bt horizon than McGary soils.

484—Harco silt loam (0 to 3 percent slopes). This nearly level to gently sloping soil is on broad terraces.

Included with this soil in mapping are small areas of somewhat poorly drained Reesville silt loam, moderately well drained Uniontown silt loam, and poorly drained Patton silty clay loam. Also included are some small areas of soils where the depth to carbonates is greater than 40 inches. In some places the underlying material has strata of loam or silty clay.

Available water capacity is very high. Permeability is moderate. Runoff is slow.

This soil is highly productive and is well suited to row crops and to pasture, hay, woodland, wildlife, and wildlife planting. In some years artificial drainage may increase crop yields. Capability unit I–3; woodland group 2o1.

Hickory Series

The Hickory series consists of moderately well drained or well drained, moderately steep to very steep soils. These soils formed in glacial drift. The native vegetation was deciduous hardwoods.

In a representative profile the surface layer is dark grayish-brown loam mottled with brown and is 1 inch thick. The subsurface layer is yellowish-brown, dark-brown, and dark grayish-brown loam 5 inches thick. The upper part of the subsoil is strong-brown loam 18 inches thick. The lower part of the subsoil is strong-brown and yellowish-brown loam about 26 inches thick mottled with brownish yellow, yellowish brown, and pale brown. The substratum to a depth of 60 inches is yellowish-brown loam.

Available water capacity is moderate to high. Permeability is moderate.

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

Representative profile of Hickory loam, 18 to 45 percent slopes, about 408 feet north and 945 feet east of the center of sec. 7, T. 8 S., R. 6 E., in a wooded area:

A1—0 to 1 inch, dark grayish-brown (10YR 4/2) loam; common, fine, faint, brown (10YR 5/3) mottles; moderate, fine, granular structure; friable; many roots; strongly acid; abrupt, smooth boundary.

A2—1 to 6 inches, yellowish-brown (10YR 5/4), dark-brown (10YR 4/3), and dark grayish-brown (10YR 4/2) loam; weak, fine, subangular blocky structure; friable; many roots; strongly acid; clear, smooth boundary.

B1—6 to 12 inches, strong-brown (7.5YR 5/6) loam; weak, fine, subangular blocky structure; friable; common roots; common, thin, yellowish-brown (10YR 5/6) clay films on faces of peds; few, fine, dark stains (iron and manganese oxides) on peds and root channels; common, fine, dark concretions; common mica flakes, quartz grains, and pebbles; strongly acid; clear, smooth boundary.

B21t—12 to 24 inches, strong-brown (7.5YR 5/6) heavy loam; weak, fine, prismatic structure parting to moderate, fine and medium, subangular blocky; friable to firm; common roots; common, fine, dark concretions (iron and manganese oxides); few quartz grains and pebbles; strongly acid; abrupt, wavy boundary.

B22—24 to 28 inches, strong-brown (7.5YR 5/6) sandy loam; weak, fine, prismatic structure parting to weak, fine, subangular blocky; firm; common roots; discontinuous, thin, dark-brown (7.5YR 4/4) and yellowish-brown (10YR 5/6) clay films on faces of peds; common, fine, dark concretions (iron and manganese oxides); common pebbles; strongly acid; clear, wavy boundary.

B23t—28 to 42 inches, strong-brown (7.5YR 5/6) heavy loam that has common, fine, faint, brownish-yellow (10YR 6/6) and yellowish-brown (10YR 5/4) mottles; weak, medium, subangular blocky structure; firm to friable; few roots; patchy, thin brown (7.5YR 5/4) clay films on faces of peds; patches of clean silt grain coatings of light brownish-gray (10YR 6/2) and pale brown (10YR 6/3) along root channels; common, fine, dark stains (iron and manganese oxides); many pebbles; medium acid; clear, smooth boundary.

B3—42 to 50 inches, yellowish-brown (10YR 5/4) loam; common, fine, faint, yellowish-brown (10YR 5/6) mottles and few, fine, distinct, pale-brown (10YR 6/3), yellowish-brown (10YR 5/8), and light brownish-gray (10YR 6/2) mottles; weak, medium subangular blocky structure; firm; few roots; patchy, thin, dark yellowish-brown (10YR 4/4) clay films on faces of peds; dark stains (iron and manganese oxides) on faces of peds; slightly acid; abrupt, irregular boundary.

C—50 to 60 inches, yellowish-brown (10YR 5/4, 5/6) loam; few, fine, faint, pale-brown (10YR 6/3) mottles; massive; neutral.

The Hickory soils in Saline County formed in glacial drift containing a large mixing of local bedrock material. The A horizon and B1 horizon in some profiles formed in loess and are silt loam. The B2t horizon is mainly loam or clay loam but includes thin layers of sandy clay loam and silty clay loam in the upper part. The B2t horizon is commonly strongly acid or medium acid in the upper part and medium acid or slightly acid in the lower part. The C horizon is mainly loam but includes strata of silt loam, light clay loam, and sandy loam.

Hickory soils are commonly on the same hillsides as Ava soils and, in some places, Frondorf soils. Hickory and Frondorf soils have similar profiles, but Hickory soils are deeper to bedrock. Hickory soils do not have a fragipan, and Ava soils do.

8E—Hickory loam, 12 to 18 percent slopes. This moderately steep soil is on side slopes along natural drainageways on uplands. In the vicinity of Harco village, there are soils similar to Hickory loam but in which much of the subsoil is slightly acid to mildly alkaline.

Included with this soil in mapping are small areas of Ava silt loam, mainly along the upper side slopes, and Frondorf silt loam. Also included are areas of soils that have slopes of less than 12 or of more than 18 percent and spots of severely eroded soils.

Available water capacity is moderate to high. Permeability is moderate. Runoff is rapid, and the hazard of erosion is severe.

This soil is mainly in woodland. Some cleared areas are used for pasture. Control of erosion is needed. Steepness of slopes affects use. The soil is well suited to wildlife, wildlife plantings, and recreation, and it

has esthetic value. Capability unit IVe–1; woodland group 1r2.

8E3—Hickory loam, 12 to 18 percent slopes, severely eroded. This moderately steep soil is on side slopes along natural drainageways on uplands. All or most of the original surface layer has been eroded away, and the subsoil is at or near the surface. Gullies have formed in some places. In the vicinity of the village of Harco, there are soils similar to Hickory loam but in which much of the subsoil is slightly acid to mildly alkaline.

Included with this soil in mapping are small areas of Ava and Frondorf soils. Also included are areas of soils that have slopes of less than 12 percent or of more than 18 percent and small areas of soils that have more than 3 inches of the surface layer remaining.

Available water capacity is moderate to high. Permeability is moderate. Runoff is rapid, and the hazard of further erosion is severe.

This soil is mainly used as pasture. A few areas are cultivated. Control of erosion is needed. Steepness of slope affects use. In some places, formerly cultivated fields and pasture are in brush or have been planted to pines. This soil is suited to hay, pasture, wildlife and wildlife plantings, and woodland, and it has esthetic value. Capability unit VIe–2; woodland group 1r2.

8F—Hickory loam, 18 to 45 percent slopes. This steep to very steep soil is on side slopes along natural drainageways and adjacent to bottom lands on uplands. It has the profile described as representative of the series. In some places along the upper side slopes of this unit, a buried reddish subsoil is within a depth of 50 inches.

Included with this soil in mapping are small areas of Frondorf loam that has slopes of less than 18 percent and areas of severely eroded soil.

Available water capacity is moderate. Permeability is moderate. Runoff is rapid to very rapid, and the hazard of erosion is severe.

This soil is mainly used for and suited to woodland. It is also well suited to wildlife, wildlife plantings, and recreation, and it has esthetic value. Control of erosion is needed. Steepness of slope and droughtiness during dry summer weather affect use. Capability unit VIe–1; woodland group 1r2.

Hosmer Series

The Hosmer series consists of moderately well drained, gently sloping to moderately steep soils that are about 24 to 36 inches deep to a fragipan. These soils are on ridgetops, side slopes, and foot slopes of the uplands. They formed in loess. The native vegetation was deciduous hardwoods.

In a representative profile the surface layer is dark-brown silt loam 5 inches thick. The subsoil is about 44 inches thick. The upper 21 inches is strong-brown silt loam and light silty clay loam. The next 2 inches is strong-brown heavy silt loam coated with light brownish gray. The rest of the subsoil, a fragipan, is firm and brittle, dark-brown heavy silt loam and silt loam that has pale-brown streaks. The substratum to a depth of 62 inches is dark-brown and strong-brown silt loam.

Permeability is moderate in the upper part of the subsoil and slow within the fragipan. Available water capacity is moderate to high. Growth of roots and movement of water are impeded by the fragipan.

Most areas of these soils are used for cultivated crops or pasture. A few areas remain wooded. Crops respond well to lime and fertilizer.

Representative profile of Hosmer silt loam, 4 to 7 percent slopes, eroded, about 1,345 feet south and 630 feet west of the northeast corner of sec. 28, T. 10 S., R. 7 E., in a meadow field:

Ap—0 to 5 inches, dark-brown (10YR 4/3) silt loam; weak, fine and medium, granular structure; friable; many roots; slightly acid; abrupt, smooth boundary.

B1—5 to 13 inches, strong-brown (7.5YR 5/6) heavy silt loam; weak, fine and medium, subangular blocky structure; friable; many roots; patchy, thin, brown (7.5YR 4/4) clay films on faces of peds; common fine pores; common dark stains and concretions (iron and manganese oxides); strongly acid; clear, smooth boundary.

B21t—13 to 20 inches, strong-brown (7.5YR 5/6) light silty clay loam; moderate, medium, subangular blocky structure; friable; many roots; patchy, thin, dark-brown (7.5YR 4/4) clay films on faces of peds; common dark stains and concretions (iron and manganese oxides); very strongly acid; clear, smooth boundary.

B22t—20 to 26 inches, strong-brown (7.5YR 5/6) light silty clay loam; common, fine, distinct, pale-brown 10YR 6/3) mottles; moderate, medium, subangular blocky structure; friable; common roots; patchy, thin, dark-brown (7.5YR 4/4) clay films on faces of peds; common dark stains and concretions (iron and manganese oxides); very strongly acid; clear, smooth boundary.

B23t—26 to 28 inches, strong-brown (7.5YR 5/6) heavy silt loam; common, fine, distinct, pale-brown (10YR 6/3) and light brownish-gray (10YR 6/2) mottles; moderate, medium, subangular blocky structure; friable and firm; few roots; patchy, thin, brown (7.5YR 5/4) clay films on faces of peds; thin, light brownish gray (10YR 6/2), uncoated silt grains on faces of peds; many dark stains and concretions (iron and manganese oxides); very strongly acid; abrupt, smooth boundary.

Bx1—28 to 36 inches, dark-brown (7.5YR 4/4) heavy silt loam; common, fine, distinct, pale-brown (10YR 6/3) mottles and few, fine, distinct, light brownish-gray (10YR 6/2) mottles; weak, coarse, prismatic structure parting to weak, coarse, angular and subangular blocky; firm and brittle; few roots; light brownish-gray (10YR 6/2) clean silt grains coating prisms; patchy, thin, dark-brown (7.5YR 4/4) clay films on vertical faces of prisms; common dark stains and concretions (iron and manganese oxides); very strongly acid; clear, smooth boundary.

Bx2—36 to 49 inches, dark-brown (7.5YR 4/4) silt loam; few, fine, distinct, pale-brown (10YR 6/3) mottles; weak, coarse, prismatic structure; firm and brittle; few, thin, dark-brown (7.5YR 4.4) clay films on vertical faces of prisms; light brownish-gray (10YR 6/2) clean silt grains coating prisms; common dark stains and concretions (iron and manganese oxides); very strongly acid; gradual, smooth boundary.

C—49 to 62 inches, dark-brown (7.5YR 4/4) and strong-brown (7.5YR 5/6) silt loam; friable and firm, discontinuous brittleness; light yellowish-brown (10YR 6/4) and gray (10YR 6/1) streaks; common dark stains and concretions (iron and manganese oxides); strongly acid.

In cultivated areas, the Ap horizon is dark grayish brown, dark brown, or yellowish brown. Depth to the fragipan ranges from 24 to 36 inches in slightly eroded soils. A thin, distinct Bx1 horizon is absent in some of the more sloping soils.

Hosmer soils are on a landscape similar to that of

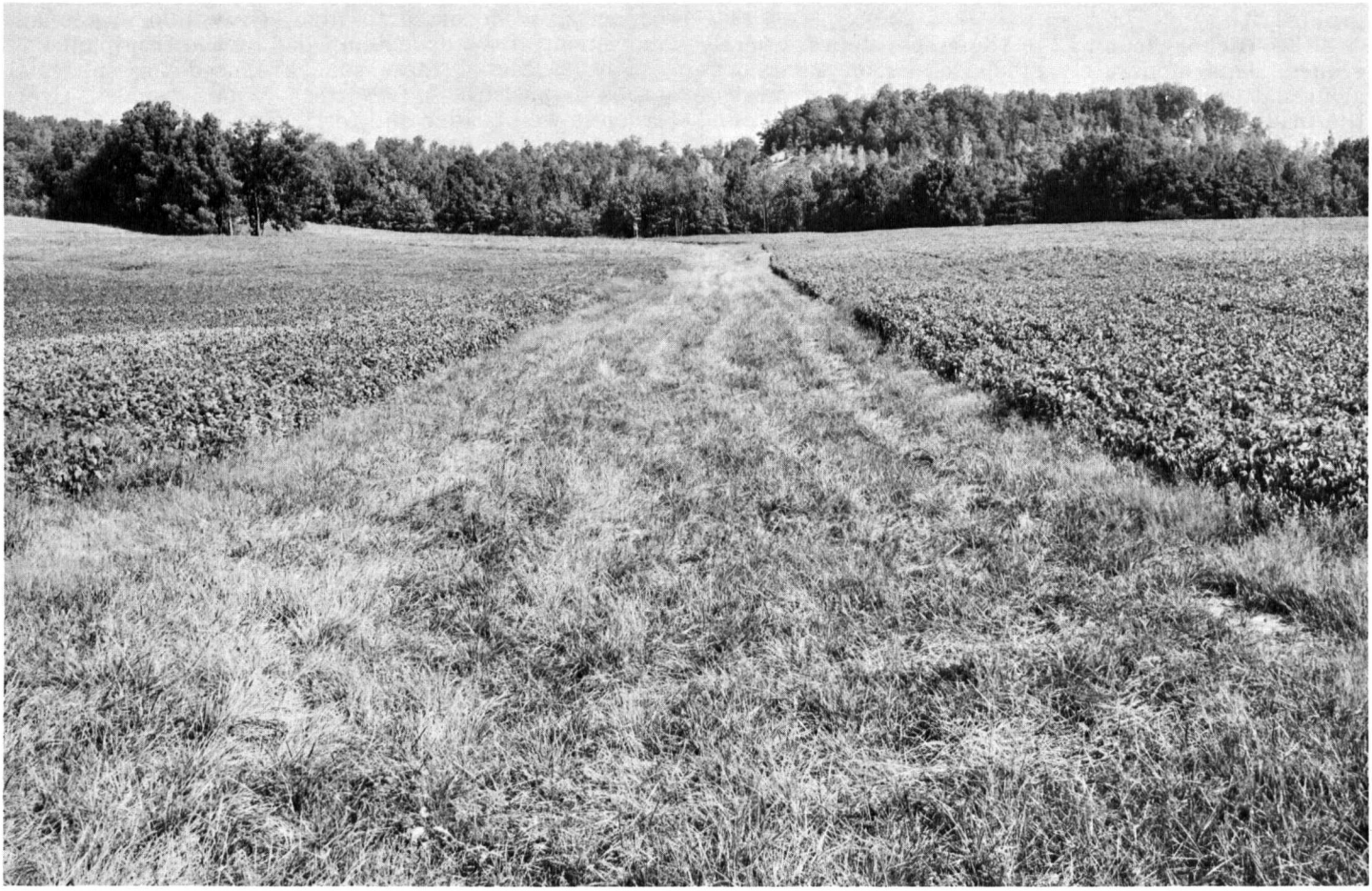

Figure 6.—**Planting soybeans in wheat stubble and using a grassed waterway to carry concentrated runoff in order to control erosion and sediment and help keep this area of Hosmer silt loam, 4 to 7 percent slopes, eroded, productive for future use.**

Grantsburg, Zanesville, and Ava soils. Hosmer soils have a fragipan that is not so thick and dense as the one in Grantsburg soils. They have a B horizon formed entirely in loess, whereas the lower part of the B horizon in Zanesville soils formed in material weathered from bedrock and the one in Ava soils formed in loamy material.

214B—Hosmer silt loam, 2 to 4 percent slopes. This gently sloping soil is on broad to narrow ridgetops. It has a profile similar to the one described as representative of the series, but the surface layer is thicker.

Included with this soil in mapping are small areas of somewhat poorly drained Stoy silt loam, mainly at the heads of drainageways and in low-lying areas. Also included are small areas of soils that have less than 7 inches of the original surface layer remaining or slopes of less than 2 percent or of more than 4 percent.

Available water capacity is moderate to high. Permeability is moderate in the upper part of the soil and slow within the fragipan. Runoff is medium, and the hazard of erosion is slight.

This soil is well suited to cultivated crops, pasture, or woodland and to wildlife and wildlife plantings. Control of erosion is needed. Capability unit IIe–2; woodland group 2o1.

214C2—Hosmer silt loam, 4 to 7 percent slopes, eroded. This sloping soil is on narrow ridgetops, foot slopes, and side slopes. It has the profile described as representative of the series.

Included with this soil in mapping are small areas of somewhat poorly drained Stoy silt loam at the heads of drainageways. Also included are severely eroded spots and small areas of soils that have more than 7 inches of surface layer remaining or that have slopes of less than 4 or of more than 7 percent.

Available water capacity is moderate. Permeability is moderate in the upper part of the soil and slow within the fragipan. Runoff is medium, and the hazard of erosion is moderate (fig. 6).

This soil is suited to cultivated crops and well suited to pasture or woodland and wildlife and wildlife plantings. Control of erosion and maintenance of tilth and fertility are needed. Capability unit IIIe–1; woodland group 2o1.

214D2—Hosmer silt loam, 7 to 12 percent slopes, eroded. This strongly sloping soil is on side slopes or hillsides and on a few foot slopes. It has a profile similar to the one described as representative of the series, but depth to the fragipan is generally only 15 to 24 inches.

Included with this soil in mapping are small areas of Frondorf loam or Zanesville silt loam, in both of

which the lower subsoil formed in material weathered from bedrock. Also included are severely eroded spots and small areas of soils that have slopes of less than 7 percent or of more than 12 percent.

Available water capacity is moderate. Permeability is moderate in the upper part of the soil and slow within the fragipan. Runoff is medium or rapid, and the hazard of erosion is moderate or severe.

This soil is mainly used as pasture. It is suited to cultivated crops if erosion control practices are used. Maintenance of tilth and fertility is needed. The soil is well suited to timber and to wildlife and wildlife plantings. Capability unit IIIe–1; woodland group 2o1.

214D3—Hosmer silt loam, 7 to 12 percent slopes, severely eroded. This strongly sloping soil is on side slopes or hillsides. All or most of the original surface layer has been removed by erosion. The subsoil is now at or near the surface, and gullies have cut back into the soil in some places. The fragipan is generally within 18 inches of the surface.

Included with this soil in mapping are small areas of Zanesville soils commonly at the heads of drainageways and along the lower side slopes. Also included are a few small areas of less eroded soils that have slopes of less than 7 percent or more than 12 percent.

Permeability is slow within the fragipan. Runoff is rapid, and the hazard of erosion is severe. Control of further erosion is particularly important because of shallow depth to the fragipan.

This soil is suited to pasture or woodland and can be used for limited cropping if erosion control practices are used. Maintenance of organic matter, tilth, and fertility is needed. Some areas that were once cleared are now brushland or have been planted to pines. This soil is well suited to wildlife. Capability unit IVe–2; woodland group 2o1.

Hoyleton Series

The Hoyleton series consists of somewhat poorly drained, dark-colored, nearly level or gently sloping soils mainly on small drainage divides, but also on some foot slopes. These soils formed in loess and in the underlying loamy material. The native vegetation was grasses and scattered trees and shrubs.

In a representative profile the surface layer is very dark grayish-brown silt loam 9 inches thick. The subsurface layer is yellowish-brown and brown silt loam 4 inches thick. The subsoil is 47 inches or more thick. The upper 17 inches is brown, grayish-brown, light brownish-gray, and yellowish-brown silty clay loam and silty clay that has reddish mottles. The middle 10 inches is dense light brownish-gray and yellowish-brown silt loam. The lower 20 inches is dark yellowish-brown, yellowish-brown, light brownish-gray, dark-brown, brown, and pale-brown silt loam.

Available water capacity is high. Permeability is slow. The surface layer is very favorable for growth of roots. The seasonal water table is 1 to 3 feet below the surface.

Most areas of Hoyleton soils are well suited to and are used for cultivated crops or pasture. Crops respond well to lime and fertilizer.

Representative profile of Hoyleton silt loam, 1 to 4 percent slopes, about 742 feet north and 2,297 feet east of the center of sec. 21, T. 8 S., R. 6 E., in a meadow field:

Ap—0 to 9 inches, very dark grayish-brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) where dry; weak and moderate, medium and coarse, granular structure; friable; neutral; abrupt, smooth boundary.

A2—9 to 13 inches, yellowish-brown (10YR 5/4) and brown (10YR 5/3) silt loam; common, fine, faint, grayish-brown (10YR 5/2) and yellowish-brown (10YR 5/6) mottles; weak, medium and thick, platy structure and massive; friable; patchy, thin coatings of clean silt grains on faces of peds; dark grayish-brown (10YR 4/2) worm casts and channel linings; few, fine, dark stains and concretions (iron and manganese oxides); slightly acid; abrupt, smooth boundary.

B1t—13 to 16 inches, brown (10YR 5/3) silty clay loam; common, fine and medium, faint, grayish-brown (10YR 5/2) mottles and common, medium, prominent, dark-red (2.5YR 3/6) mottles; moderate, fine, subangular blocky structure; firm; patchy, thin, brown (10YR 5/3) and dark grayish-brown (10YR 4/2) clay films on faces of peds; common, fine and medium, dark stains and concretions (iron and manganese oxides); strongly acid; clear, smooth boundary.

B21t—16 to 20 inches, grayish-brown (10YR 5/2) light silty clay; many, medium, prominent, yellowish-red (5YR 5/6) and few dark-red (2.5YR 3/6) mottles; moderate, medium, prismatic structure parting to moderate and strong, medium, angular and subangular blocky; firm; continuous, thin grayish-brown (10YR 5/2) and brown (10YR 5/3) clay films on faces of peds; few, fine, dark stains and concretions (iron and manganese oxides); very strongly acid; clear, smooth boundary.

B22t—20 to 25 inches, 50 percent grayish-brown (10YR 5/2) and 30 percent light brownish gray (10YR 6/2) heavy silty clay loam; many, medium and coarse, prominent, strong-brown (7.5YR 5/6) and yellowish-red (5YR 5/6) mottles; strong, medium and coarse, prismatic structure parting to moderate and strong, medium and coarse, subangular and angular blocky; firm; continuous, medium, dark grayish-brown (10YR 4/2) and very dark gray (10YR 3/1) clay-organic films on vertical faces of peds and patchy thin clay films on other faces; roots growing mainly down vertical faces of macropeds on the clay films; common dark stains and concretions (iron and manganese oxides); very strongly acid; clear, smooth boundary.

B23t—25 to 30 inches, 60 percent grayish-brown (10YR 5/2) and 25 percent yellowish-brown (10YR 5/4) light silty clay loam; many, medium and coarse, distinct, strong-brown (7.5YR 5/6) mottles and few, fine, distinct, yellowish-red (5YR 5/6) mottles; moderate coarse, prismatic structure parting to weak, medium and coarse, subangular blocky; firm; continuous, medium, dark grayish-brown (10YR 4/2) and brown (10YR 5/3) clay films on vertical faces of peds and patchy thin clay films on other faces; roots growing mainly down vertical faces of macropeds on the clay films; common dark stains and concretions (iron and manganese oxides); strongly acid; clear, smooth boundary.

B31—30 to 40 inches, light brownish-gray (10YR 6/2) and yellowish-brown (10YR 5/4 and 5/6) silt loam; weak, coarse, subangular blocky structure; firm and discontinuous brittleness; patchy, thin brown (10YR 5/3) clay films on faces of peds; many coarse, dark stains and few fine concretions (iron and manganese oxides); slightly acid; gradual, wavy boundary.

B32—40 to 48 inches, dark yellowish brown (10YR 4/4), yellowish-brown (10YR 5/4), and light brownish-gray (10YR 6/2) silt loam; few coarse, distinct, strong-brown (7.5YR 5/6) mottles; weak, coarse, angular blocky structure; friable; common, fine, dark stains; neutral; clear, smooth boundary.

IIIB33—48 to 60 inches, dark-brown (7.5YR 4/4), brown (7.5YR 5/4), and pale-brown (10YR 6/3) silt loam; weak, coarse, angular blocky structure; friable; common sand grains; neutral.

The Ap or A1 horizon is commonly 8 to 10 inches thick. The upper part of the B2t horizon, the most clayey part, is heavy silty clay loam or light silty clay. The reddish mottles are few to absent in some profiles. The B2t horizon is mainly strongly acid or very strongly acid, and the B3 horizon is medium acid to mildly alkaline. Part or all of the B3 horizon formed in loamy material below the loess. This material in most profiles is silt loam that is 10 to 20 percent sand but includes loam, clay loam, or light silty clay loam in some profiles.

This soil is grayer in the B horizon than is defined in the range for the Hoyleton series, but this difference does not alter its use or behavior.

Hoyleton soils generally lie on small drainage divides adjoining Bluford and Ava soils. Hoyleton soils have a profile similar to Bluford soils, but the A horizon and clay films are darker. These soils have a grayer B horizon and are more clayey than Ava soils.

3B—Hoyleton silt loam, 1 to 4 percent slopes. This gently sloping soil is on narrow to broad upland plains and on foot slopes. In this unit are some soils that have a subsoil of medium silty clay loam.

Included with this soil in mapping are small areas of Bluford silt loam and Creal silt loam. Also included are some areas of soils that have slopes of more than 4 percent.

Available water capacity is high. Permeability is slow. Runoff is slow to medium and the hazard of erosion is slight to moderate. Control of erosion and maintenance of fertility are needed. Also, removal of excess water at the heads of drainageways and from more level areas is needed.

This soil is productive and is used mainly for cultivated crops. It is also suited to pasture and wildlife and wildlife plantings. Capability unit IIe–1; woodland group 3o1.

Huey Series

The Huey series consists of poorly drained, nearly level or gently sloping soils on low-lying foot slopes of the uplands. These soils have a high content of exchangeable sodium in the subsoil. Huey soils formed in loess overlying loamy material. The native vegetation was probably mixed woodland and grasses.

In a representative profile the surface layer is dark grayish-brown silt loam 8 inches thick. The subsurface layer is grayish-brown and light brownish-gray silt loam 4 inches thick. The subsoil is about 29 inches thick. It is mainly grayish-brown and light brownish-gray silty clay loam that has brownish mottles. The substratum is light brownish-gray silt loam to a depth of 58 inches.

Available water capacity is low. Permeability is very slow. The subsoil has a high sodium content, which impedes growth of roots and uptake of nutrients and causes the soil material to have a dispersed or puddled condition. Sloping areas are highly erodible. The seasonal water table is within 1 foot of the surface.

Most areas of Huey soils are used for cultivated crops or pasture. Crop response to fertilizer is limited. Wheat and soybean crops generally have more favorable yields than corn.

Representative profile of Huey silt loam, about 20 feet south and 2,300 feet east of the center of sec. 24, T. 8 S., R. 6 E., in a cultivated field:

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, medium, granular structure; friable; slightly acid; abrupt, smooth boundary.

A2—8 to 12 inches, 75 percent grayish-brown (10YR 5/2) and 25 percent light brownish-gray (10YR 6/2) silt loam; weak, medium, platy structure and massive; friable; neutral; abrupt, smooth boundary.

B1—12 to 16 inches, gray (10YR 5/1) and dark-gray (10YR 4/1) heavy silt loam; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak and moderate, medium, subangular and angular blocky structure; friable; patchy, thin, dark grayish-brown (10YR 4/2) clay-organic films on faces of peds; neutral; abrupt, smooth boundary.

B21t—16 to 23 inches, grayish-brown (10YR 5/2) and brown (10YR 5/3) silty clay loam; common to many, distinct, strong-brown (7.5YR 5/6) mottles; weak, medium, prismatic structure parting to moderate, medium and coarse, angular and subangular blocky; firm; discontinuous, thin and medium, dark grayish-brown (10YR 4/2) clay films on faces of peds in upper part and brown (10YR 5/3) and dark-brown (10YR 4/3) clay films in lower part; few pale-brown (10YR 6/3) clean silt grains on faces of peds in upper part and common silt grains in lower part; mildly alkaline; abrupt, smooth boundary.

B22t—23 to 32 inches, light brownish-gray (10YR 6/2) light silty clay loam; many, fine and medium, distinct, yellowish-brown (10YR 5/4) and strong-brown (7.5YR 5/6) mottles; weak and moderate, medium and coarse, subangular blocky structure; firm; patchy, thin, grayish-brown (10YR 5/2) clay films on faces of peds; few dark stains and concretions (iron and manganese oxides); slight effervescence; moderately alkaline; clear, smooth boundary.

B3—32 to 41 inches, light brownish-gray (2.5Y 6/2) heavy silt loam; many, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, medium and coarse, subangular blocky structure; friable; few, thin, grayish-brown (10YR 5/2) clay films on faces of peds; strong effervescence; moderately alkaline; clear, smooth boundary.

IIC—41 to 58 inches, light brownish-gray (2.5Y 6/2) silt loam; many, coarse, prominent, strong-brown (7.5YR 5/6) mottles; massive; friable; common sand grains; strong effervescence; moderately alkaline.

The combined thickness of the Ap and A2 horizons ranges from 6 to 14 inches. In some cultivated areas, the A2 horizon has been mixed into the plow layer. The B2t horizon is commonly light silty clay loam but includes layers of heavy silt loam and heavy silty clay loam. The B horizons are about 24 to 36 inches thick. The lower part commonly formed in loamy material below the loess. This material in most profiles is silt loam that is 10 to 20 percent sand, but in some places it is loam, clay loam, or light silty clay loam.

Huey soils generally are on low-lying foot slopes associated with Hoyleton, Bluford, and Ava soils. Huey soils have a B horizon that is high in exchangeable sodium, which is lacking in these other soils.

120—Huey silt loam (1 to 3 percent slopes). This nearly level to gently sloping soil is on low-lying foot slopes.

Included with this soil in mapping are small areas of Weir silt loam, Bluford silt loam, and Hoyleton silt loam. "Scald spots" are common. In these spots the alkali subsoil is at or near the surface, and there is a whitish crust on the surface when dry. In many places the vegetation is sparse.

Available water capacity is low. Permeability is very slow. Runoff is slow to medium, and hazard of

erosion is slight to moderate. Removal of excess water and maintenance of organic matter, tilth, and fertility are needed. Control of erosion is needed in some areas.

This soil is low in productivity. It is used mainly for cultivated crops and pasture. Capability unit IVw–1; woodland group 4t3.

Hurst Series

The Hurst series consists of somewhat poorly drained, nearly level or very gently sloping soils mainly on broad terraces. These soils formed in thin loess or silty sediments over clayey lacustrine sediment. The native vegetation was deciduous hardwoods.

In a representative profile the surface layer is dark grayish-brown and brown silt loam 6 inches thick. The subsurface layer is light brownish-gray heavy silt loam 7 inches thick. The subsoil is about 33 inches thick. It is mainly grayish-brown and brown silty clay. The substratum is brown, grayish-brown, yellowish-brown, and pale-brown silty clay loam to a depth of 62 inches.

Available water capacity is moderate to high. Permeability is very slow. The sticky and plastic material of the subsoil is difficult to excavate. The seasonal water table is 1 to 3 feet below the surface. Most areas of these soils are susceptible to occasional flooding or overflow.

These soils are used for cultivated crops or pasture. Many areas remain wooded. Crop response to lime and fertilizer is limited. Yields of soybeans are generally more favorable than corn yields. These soils are suited to openland and woodland wildlife and wildlife plantings.

Representative profile of Hurst silt loam, about 50 feet north and 265 feet east of the center of sec. 27, T. 9 S., R. 7 E., in a cultivated field:

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) and brown (10YR 4/3) silt loam; moderate, fine, granular structure; friable; common concretions (iron and manganese oxides); medium acid; abrupt, smooth boundary.

A2—6 to 13 inches, light brownish-gray (10YR 6/2) heavy silt loam; few, fine, faint, light-gray (10YR 7/1) mottles and common, fine, distinct, brown (10YR 5/3) and yellowish-brown (10YR 5/6) mottles; weak, thin and medium, platy structure parting to weak, fine, granular; friable; vesicular; many, fine, dark concretions (iron and manganese oxides); strongly acid; clear, smooth boundary.

B1—13 to 18 inches, light brownish-gray (10YR 6/2) silty clay loam; common, fine, distinct, yellowish-brown (10YR 5/6 and 5/8) and brown (10YR 5/3) mottles; weak, fine, prismatic structure parting to weak, fine and medium, subangular blocky; friable; common fine pores; patchy, thin, light brownish-gray (10YR 6/2) clay films on faces of peds; common dark concretions (iron and manganese oxides); very strongly acid; clear, smooth boundary.

IIB21t—18 to 23 inches, grayish-brown (10YR 5/2) silty clay; many, fine, distinct, yellowish-brown (10YR 5/6 and 5/8) and brown (10YR 5/3) mottles; moderate, medium prismatic structure parting to moderate, medium, angular blocky; very firm; discontinuous, thin, grayish-brown (10YR 5/2) clay films on faces of peds; dark concretions (iron and manganese oxides); very strongly acid; clear, smooth boundary.

IIB22t—23 to 31 inches, 45 percent grayish-brown (10YR 5/2) and 40 percent brown (10YR 5/3) silty clay; common, fine and medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, medium, prismatic structure parting to moderate, medium, angular blocky; very firm; discontinuous, grayish-brown (10YR 5/2) clay films on faces of peds; common, fine, dark concretions (iron and manganese oxides); very strongly acid; clear, smooth boundary.

IIB3t—31 to 46 inches, grayish-brown (10YR 5/2) and brown (10YR 5/3) silty clay; many, fine and medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, medium and coarse, angular blocky structure; very firm; patchy, thin, grayish-brown (10YR 5/2) clay films on faces of peds; common, fine, dark concretions (iron and manganese oxides); very strongly acid; clear, smooth boundary.

IIC1—46 to 53 inches, brown (10YR 5/3) and grayish-brown (10YR 5/2) heavy silty clay loam; many, medium, distinct, yellowish-brown (10YR 5/6) mottles and few, medium, faint, light brownish-gray (10YR 6/2) mottles; massive; firm; many, fine, dark concretions (iron and manganese oxides); slightly acid; clear, smooth boundary.

IIC2—53 to 62 inches, yellowish-brown (10YR 5/6), pale-brown (10YR 6/3), and grayish-brown (10YR 5/2) silty clay loam; massive; firm; common, fine, dark concretions (iron and manganese oxides); mildly alkaline.

The silty cap is 8 to 24 inches thick. In places where this cap is thin, the B1 horizon is often absent. The IIB2t horizon is mainly silty clay but includes heavy silty clay loam. Strata of silt loam and silty clay are in the C horizon in some profiles. The IIB3 horizon is commonly medium acid and ranges from strongly acid to neutral. Depth to carbonates is about 45 to 65 inches.

Hurst soils are generally with Colp soils on the landscape and are on terraces near Zipp, McGary, Racoon, and other soils. Hurst soils are more poorly drained and grayer in the IIB2t horizon than Colp soils. They are more acid in the solum than McGary and Zipp soils. Hurst soils have a thinner A2 horizon and a more clayey IIB2t horizon and are better drained than Racoon soils.

338—Hurst silt loam (1 to 3 percent slopes). This soil is mainly on broad, nearly level plains and very gently sloping side slopes along drainageways of terraces.

Included with this soil in mapping are small areas of Colp silt loam, McGary silt loam, and Zipp silty clay loam. Also included are a few areas of eroded soil. In some places the surface layer is silty clay loam. Wet areas, generally less than 1 acre, are shown by a conventional symbol on the soil map.

Available water capacity is moderate to high. Permeability is very slow. Runoff is slow. Removal of excess water and maintenance of fertility and tilth are needed. Control of erosion is needed in the more sloping areas.

This soil is moderately productive. It is used for cultivated crops, pasture, or timber. Capability unit IIIw–1; woodland group 3o1.

Karnak Series

The Karnak series consists of poorly drained and very poorly drained, nearly level or depressional soils on low-lying bottom lands. These soils formed in clayey lake-deposited sediment. The native vegetation was mixed bottom land hardwoods.

In a representative profile the surface layer is dark grayish-brown and grayish-brown silty clay 14 inches thick. The subsoil, about 39 inches thick, is mottled gray silty clay. The substratum is light brownish-gray silty clay to a depth of 67 inches.

Available water capacity is moderate. Permeability

is very slow. The clayey soil material is sticky and plastic and difficult to till or excavate. It swells on wetting and shrinks on drying. The seasonal water table is at or near the surface, and most areas are susceptible to flooding or overflow.

Most areas of these soils are used for cultivated crops or pasture. A few areas remain wooded. Crop response to lime and fertilizer is limited. Yields of soybeans are generally more favorable than corn yields. Undrained areas are well suited to wetland wildlife.

Representative profile of Karnak silty clay, about 990 feet south and 1,905 feet west of the center of sec. 34, T. 8 S., R. 6 E., in a wooded area:

A11—0 to 5 inches, dark grayish-brown (10YR 4/2) silty clay; moderate, fine, subangular blocky structure; firm; slightly acid; abrupt, smooth boundary.

A12—5 to 14 inches, grayish-brown (10YR 5/2) silty clay; dark-gray (10YR 4/1) ped exteriors and few, fine, distinct, yellowish-brown (10YR 5/6) mottles; moderate, medium, angular blocky structure; very firm; slightly acid; clear, smooth boundary.

B2g—14 to 36 inches, gray (N 5/0) silty clay; common, coarse, distinct, strong-brown (7.5YR 5/6) mottles; weak, medium, prismatic structure parting to weak, medium, angular blocky; very firm; slightly acid; gradual, smooth boundary.

B3g—36 to 53 inches; gray (N 5/0) silty clay; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, medium, angular blocky structure and massive; very firm; slightly acid; gradual, smooth boundary.

Cg—53 to 67 inches, light brownish-gray (2.5Y 6/2) light silty clay; many, coarse, prominent, yellowish-brown (10YR 5/6 and 5/8) mottles; massive; firm; mildly alkaline.

In wooded areas, a thin A1 horizon, 2 to 5 inches thick, of very dark grayish brown is common. The Bg horizon in mainly slightly acid to medium acid. The C horizon is commonly silty clay or silty clay loam.

Karnak soils are near and are similar to Zipp and Darwin soils and to Cape and Piopolis soils. Karnak soils have somewhat more clay in the solum, have weaker structure in the Bg horizon, and are somewhat more acid than Zipp soils. Karnak soils do not have thick, dark A1 horizon, as Darwin soils have. They contain more clay in the solum than Piopolis soils and are less acid than Cape soils.

426—Karnak silty clay (0 to 2 percent slopes). This nearly level or depressional soil is generally in large, rounded or oblong areas but is also in narrow sloughs.

Included with this soil in mapping are small areas of Zipp heavy silty clay loam and Piopolis silty clay loam and less commonly Cape silty clay loam. A few areas have a thin silty overwash.

This soil is wet late in spring, and most areas are susceptible to overflow and standing water.

This soil is suited to most of the commonly grown grain crops if drainage and protection from overflow are adequate. Favorable tilth is difficult to maintain, and timeliness of tillage is important. Capability unit IIIw–2; woodland group 3w6.

Markland Series

The Markland series consists of moderately well drained or well drained, sloping or strongly sloping soils on side slopes or breaks of terraces. These soils formed in shallow, silty over clayey lake-deposited sediment. The native vegetation was deciduous hardwoods.

In a representative profile the surface layer is dark-brown heavy silt loam 7 inches thick. The subsoil is yellowish-brown and pale-brown silty clay and silty clay loam 28 inches thick. The substratum, to a depth of 55 inches, is light brownish-gray silty clay that has flakes and nodules of lime in the upper 20 inches. The lower part of the substratum is light brownish-gray and pale-brown silty clay loam.

Available water capacity is moderate to high. Permeability is slow. The subsoil material is clayey and plastic and difficult to excavate. The seasonal water table is 3 to 5 feet below the surface. Most areas of these soils are susceptible to rare flooding or overflow.

These soils are mainly used for pasture and cultivated crops. Many areas remain wooded. Crop response is moderate to lime and fertilizer. These soils are well suited to openland or woodland wildlife.

Representative profile of Markland silt loam, 3 to 7 percent slopes, eroded, 750 feet west and 75 feet north of the southeast corner of sec. 21, T. 7 S., R. 7 E., in a meadow:

Ap—0 to 7 inches, dark-brown (10YR 4/3) heavy silt loam; weak, medium, granular structure and massive; friable; neutral; abrupt, smooth boundary.

B21t—7 to 21 inches, yellowish-brown (10YR 5/6) silty clay; moderate, medium and coarse, prismatic structure parting to moderate, medium and coarse, angular blocky; very firm; continuous, medium, dark-brown (7.5YR 4/4) clay films on faces of peds; common dark stains and concretions (iron and manganese oxides); medium acid; clear, smooth boundary.

B22t—21 to 29 inches, yellowish-brown (10YR 5/6) light silty clay; weak and moderate, medium and coarse, prismatic structure parting to moderate, medium and coarse, angular blocky; very firm; continuous, thin and medium, dark-brown (10YR 4/3) clay films on faces of peds; common dark stains and concretions (iron and manganese oxides); neutral; clear, wavy boundary.

B3—29 to 35 inches, yellowish-brown (10YR 5/4) and pale-brown (10YR 6/3) silty clay loam that has lenses of heavy silt loam and heavy silty clay loam; common, fine and medium, distinct, strong-brown (7.5YR 5/8) mottles and few, medium, distinct, grayish-brown (10YR 5/2) mottles; weak and moderate, medium and coarse, subangular and angular blocky structure; firm; patchy, thin, dark-brown (10YR 4/3) clay films on faces of peds; slight effervescence; mildly alkaline; abrupt, smooth boundary.

C1—35 to 55 inches, light brownish-gray (10YR 6/2) silty clay; many, fine and medium, distinct, brown (10YR 5/3), yellowish-brown (10YR 5/4), and dark-brown (10YR 3/3) mottles; moderate, medium, prismatic structure parting to weak, medium, angular blocky; very firm; many flakes and nodules of lime; strong effervescence; moderately alkaline; gradual, smooth boundary.

C2—55 to 65 inches, light brownish-gray (10YR 6/2) and pale-brown (10YR 6/3) silty clay loam; many, medium, distinct, yellowish-brown (10YR 5/6) and strong-brown (7.5YR 5/8) mottles; massive; firm; slight effervescence; mildly alkaline.

The A horizon is commonly 5 to 8 inches thick, but it ranges up to 12 inches in thickness in some wooded areas. In areas that have a thick A horizon, a yellowish-brown A2 horizon 2 to 5 inches thick is present. A B1 horizon of silty clay loam is in a few profiles. The B2t horizon is dominantly silty clay or heavy silty clay loam. Few to common grayish mottles are in the lower part of the B2t horizon of many profiles. Depth to carbonates ranges from about 20 to 40 inches. The C horizon is commonly silty clay loam, but strata of silt loam and silty clay are in some profiles.

Markland soils are associated with McGary soils and occur on breaks beside Colp, Hurst, Uniontown, and other

soils on terraces. Markland soils are better drained and are browner in the B2t horizon than McGary soils. Markland soils have profiles similar to those of Colp, Hurst, and Uniontown soils but are less acid in the solum than Colp and Hurst soils and have a more clayey B2t horizon than Uniontown soils.

467C2—Markland silt loam, 3 to 7 percent slopes, eroded. This sloping soil is on narrow terrace breaks and side slopes along drainageways. Three to 7 inches of the silt loam surface layer remains. This soil has the profile described as representative of the series.

Included with this soil in mapping are areas, mainly wooded, of Markland soil in which the silty surface layer is more than 7 inches thick. Depth to carbonates or calcareous material is variable within any mapped area. Also included are small areas of severely eroded soils, some areas of soils that have slopes greater than 7 percent, and small areas of Colp silt loam.

Available water capacity is moderate to high. Permeability is slow. Runoff is medium, and the hazard of erosion is moderate. Control of erosion and maintenance of tilth and fertility are needed.

This soil is suited to cultivated crops. It is well suited to woodland, wildlife, and wildlife plantings. Capability unit IIIe–2; woodland group 2o1.

467D3—Markland soils, 7 to 15 percent slopes, severely eroded. This strongly sloping soil is on short, narrow side slopes and longer slopes along drainageways adjacent to bottom lands. Erosion has removed most of the original silt loam surface layer. The surface layer ranges from silt loam to silty clay and is less permeable than the original surface layer.

Included with this soil in mapping are areas of soils, mainly wooded, that have more than 3 inches of the silty surface layer remaining. Also included are small areas of soil that have slopes of less than 7 percent or of more than 12 percent, and small areas of Colp silt loam. Carbonates are at or near the surface in some spots.

Available water capacity is moderate. Permeability is slow. Runoff is rapid, and the hazard of erosion is high. Control of erosion and maintenance of tilth and fertility are needed.

This soil is suited to pasture, hay, or woodland and to wildlife and wildlife plantings. Capability unit VIe–3; woodland group 2o1.

McGary Series

The McGary series consists of somewhat poorly drained, nearly level or very gently sloping soils on broad, level terrace areas. These soils formed in thin loess or silty sediment over clayey lake-deposited sediment. The native vegetation was deciduous hardwoods.

In a representative profile the surface layer is dark grayish-brown and grayish-brown silt loam 9 inches thick, and the subsurface layer is grayish-brown and light brownish-gray heavy silt loam 7 inches thick. The subsoil is mainly mottled grayish-brown and brown silty clay and silty clay loam about 36 inches thick. The substratum to a depth of 65 inches is grayish-brown and light brownish-gray silty clay loam containing white patches of lime.

Available water capacity is moderate or high. Permeability is slow or very slow. The subsoil material is clayey and plastic and is difficult to excavate. The seasonal water table is 1 to 3 feet below the surface. Some areas are susceptible to occasional flooding or overflow.

These soils are mainly used for cultivated crops, pasture, and hay, and are suited to these uses. A few areas remain wooded. The soils are also suited to openland or woodland wildlife.

Representative profile of McGary silt loam, about 48 feet south and 1,240 feet west of the northeast corner of sec. 28, T. 7 S., R. 7 E., in a cultivated field:

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) and grayish-brown (10YR 5/2) silt loam; weak, medium, granular structure and massive; friable; few dark stains and concretions (iron and manganese oxides); neutral; abrupt, smooth boundary.

A2—9 to 16 inches, grayish-brown (10YR 5/2) and light brownish-gray (10YR 6/2) heavy silt loam; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, medium and thick, platy structure and massive; friable; common dark stains and concretions (iron and manganese oxides); slightly acid; abrupt, smooth boundary.

B21t—16 to 29 inches, grayish-brown (10YR 5/2) and brown (10YR 5/3) silty clay; common, fine, distinct, strong-brown (7.5YR 5/8) mottles; moderate and strong, medium, prismatic structure; very firm; continuous, thin, dark-brown (10YR 4/3) clay films on faces of peds; common dark stains and concretions (iron and manganese oxides); slightly acid; gradual, smooth boundary.

B22t—29 to 38 inches, brown (10YR 5/3) and grayish-brown (10YR 5/2) silty clay; common, medium, distinct, strong-brown (7.5YR 5/8) mottles; moderate and strong, medium, prismatic structure; very firm; continuous, medium, dark-brown (10YR 4/3) clay films on vertical faces of peds and patchy, thin clay films on other faces; common dark stains and concretions (iron and manganese oxides); neutral; clear, smooth boundary.

B3—38 to 52 inches, grayish-brown (10YR 5/3) heavy silty clay loam; many, medium and coarse, yellowish-brown (10YR 5/4) and strong-brown (7.5YR 5/6) mottles; weak, medium and coarse, prismatic structure parting to weak, coarse, angular blocky; firm; patchy, thin, brown (10YR 5/3) clay films on faces of peds; few dark stains and concretions (iron and manganese oxides); slight effervescence; mildly alkaline; clear, smooth boundary.

C—52 to 65 inches, grayish-brown (10YR 5/2) and light brownish-gray (10YR 6/2) silty clay loam; many, medium and coarse, yellowish-brown (10YR 5/4) and strong-brown (7.5YR 5/6) mottles; massive; firm; white patches of lime, strong effervescence; moderately alkaline.

The combined thickness of A horizons ranges from 8 to 20 inches. These horizons are silt loam or silty clay loam. A silty clay loam B1 horizon, 2 to 5 inches thick, is in some profiles. The B2t horizon is dominantly silty clay but includes heavy silty clay loam. Depth to carbonates ranges from about 20 to 40 inches. The C horizon is commonly silty clay loam but includes strata of silt loam and silty clay.

McGary soils are associated with Markland soils and have natural drainage similar to that of Hurst and Reesville soils. McGary soils are more poorly drained and are grayer in the B2t horizon than Markland soils, are less acid in the solum than Hurst soils, and have more clay in the B2t horizon than Reesville soils.

173—McGary silt loam (1 to 3 percent slopes). This soil is on nearly level plains and very gently sloping side slopes along drainageways of terraces.

Included with this soil in mapping are small areas of Hurst silt loam and Zipp silty clay loam.

Available water capacity is moderate to high. Per-

meability is slow to very slow. Runoff is slow, and wetness is a concern. Erosion is a hazard on some of the more sloping areas. Maintenance of fertility and tilth is needed for good crop growth. Capability unit IIIw–1; woodland group 3o1.

Orthents

Orthents are somewhat excessively drained or well drained, sloping to very steep soils mainly on rugged ridges and narrow depressions of spoil banks in areas of strip mined land. In areas of more recent mining, the ridges have been struck off and a few areas have been leveled to grade. The soil material is derived predominantly from shale and siltstone bedrock, but also contains sandstone, limestone, and disturbed soil.

These soils are made up of predominantly silty or loamy material and of shaly fragments that have common flags and stones. A representative site is approximately 495 feet north of the southeast corner of sec. 19, T. 9 S., R. 5 E.

These soils are variable, but generally they are medium acid to neutral. Permeability is moderately rapid, and available water capacity is low or moderate. Growth of roots is impeded, and tillage is hindered by coarse fragments and stones.

Most areas of these soils have a vegetative cover of grasses and legumes or cottonwood, sycamore, and pine trees.

803C—Orthents, 5 to 15 percent slopes. This sloping to moderately steep soil is on spoil banks of strip mined land where the ridges have been struck off or have been leveled to grade.

In a few small areas of this soil are clayey material from a buried soil that formed in limestone and sandy material that weathered from bedrock. In some places, reaction has a wide range within a short distance. In spots where the extremely acid shale is at or near the surface, vegetation is sparse.

Runoff is medium, and the hazard of erosion is moderate except in the steeper areas.

Nearly all of this soil is in meadow. Some areas are used as pasture. Coarse fragments and stones in the surface layer generally hinder tillage. Capability unit VIs–1; not assigned to a woodland group.

803F—Orthents, 15 to 60 percent slopes. This moderately steep to very steep soil is on ridges and side slopes and in narrow depressions of spoil banks in strip mined land. In some areas, the peaks of the ridges have been struck off.

In a few areas of this soil are clayey material from a buried soil that formed in limestone and sandy material that weathered from bedrock. In some places, reaction has a wide range within a short distance. In spots where the extremely acid shale is at or near the surface, vegetation is sparse.

Runoff is rapid, and the hazard of erosion is severe. The narrow ridgetops and the steep side slopes are droughty. Sediment accumulates and, in some places, water stands in the narrow depressions.

Nearly all of this soil is in meadow or woodland. Steepness of slope, presence of stones, and droughtiness restrict the use of this soil. Capability unit VIIs–2; not assigned to a woodland group.

Orthents, Acid

Orthents, acid, are somewhat excessively drained, moderately steep to very steep soils on ridges and side slopes and in narrow depressions of spoil banks in areas of strip mined land. The soil material is predominantly derived from shale, siltstone, and some sandstone bedrock. Much of the shale in the soil is from bedrock associated with two veins of coal. This shale contains pyritic material which becomes extremely acid upon exposure and weathering.

These soils are composed of silty or loamy material and of shaly fragments that have common flags and stones. A representative site is approximately 1,000 feet south of the northeast corner of sec. 20, T. 10 S., R. 5 E.

These soils are variable, but generally permeability is moderately rapid and available water capacity is low. Root growth is impeded, and tillage is prohibited by coarse fragments and stones. Also, the root growth of many plants is restricted by the extremely acid soil condition.

Vegetation on these soils is generally sparse and consists mainly of river birch, pines, a few oaks, and shrubs. Drainage water is commonly acid and contains concentrations of iron, manganese, and sulfur.

804F—Orthents, acid, 15 to 60 percent slopes. This moderately steep to very steep soil is on ridges, side slopes, and narrow depressions of spoil banks in strip mined land. In a few areas of more recent mining, the peaks have been struck off or have been leveled to grade.

Vegetation on these soils is generally sparse and consists mainly of river birch, pines, oak, and shrubs.

Included with this soil in mapping are small areas of less acid soil. Vegetation is more abundant in these areas.

This soil is droughty. Runoff is rapid, and the hazard of erosion is severe. Sediment accumulates and, in some places, water stands in narrow depressions.

Steepness of slope, presence of stones, droughtiness, and extremely acid soil condition severely restrict the use of this soil. Capability unit VIIIs–1; not assigned to a woodland group.

Patton Series

The Patton series consists of poorly drained, nearly level soils on broad terraces. These soils formed in silty sediment. The native vegetation was mainly grasses, sedges, and scattered trees.

In a representative profile the surface layer is very dark gray silty clay loam 13 inches thick. The subsoil is silty clay loam 27 inches thick. The upper part is dark gray, and the lower part is grayish brown and light olive brown. The substratum to a depth of 76 inches is grayish-brown and light brownish-gray silt loam containing lime concretions.

Available water capacity is very high. Permeability is moderate. Most areas of this soil are tiled and drained, and plant roots readily penetrate the soil. In undrained areas, the seasonal water table is within 1 foot of the surface. Some areas of this soil are susceptible to occasional flooding.

Patton soils are well suited to and mainly used for

growing corn and soybeans. Crops respond well to fertilizer. These soils also are well suited to openland wildlife.

Representative profile of Patton silty clay loam, about 855 feet south and 1,340 feet east of the center of sec. 2, T. 9 S., R. 6 E., in a cultivated field:

Ap—0 to 6 inches, very dark gray (10YR 3/1) light silty clay loam, grayish brown (10YR 5/2) when dry; moderate, fine and medium, granular structure; friable to firm; neutral; abrupt, smooth boundary.

A1—6 to 13 inches, very dark gray (10YR 3/1) silty clay loam; grayish brown (10YR 5/2) when dry; moderate, fine and medium, subangular blocky structure; firm; neutral; clear, smooth boundary.

B21g—13 to 27 inches, dark-gray (10YR 4/1) silty clay loam; common, medium, faint, brown (10YR 5/3) mottles; moderate, medium, prismatic structure parting to moderate, medium, subangular blocky; firm; mildly alkaline; clear, smooth boundary.

B22g—27 to 34 inches, 50 percent grayish-brown (2.5Y 5/2) and 30 percent light olive-brown (2.5Y 5/4) silty clay loam; dark-gray (10YR 4/1) ped exteriors; weak, medium and coarse, prismatic structure parting to moderate, medium and coarse, subangular blocky; firm; mildly alkaline; clear, smooth boundary.

B23g—34 to 40 inches, 45 percent grayish-brown (2.5Y 5/2) and 45 percent light olive-brown (2.5Y 5/4) silty clay loam; dark-gray (10YR 4/1) ped exteriors; weak, medium and coarse, prismatic structure parting to weak, medium and coarse, subangular blocky; firm; mildly alkaline; clear, smooth boundary.

C1g—40 to 52 inches, grayish-brown (2.5Y 5/2) and light olive-brown (2.5Y 5/4) silt loam; few gray (10YR 5/1) and dark-gray (10YR 4/1) accumulations; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, medium and coarse, subangular blocky structure; firm; common flakes and nodules of lime accumulation; slight to strong effervescence; mildly alkaline; gradual, smooth boundary.

C2g—52 to 76 inches, light brownish gray (2.5Y 6/2) heavy silt loam; many, medium and coarse, prominent, yellowish-brown (10YR 5/6) and strong-brown (7.5YR 5/6) mottles; massive; friable to firm; scattered lime concretions; strong effervescence; moderately alkaline.

The A horizon ranges from 10 to 20 inches thick. It is commonly silty clay loam but includes heavy silt loam. The B2 horizon is predominantly medium silty clay loam but includes some heavy silty clay loam. The B2 horizon is slightly acid to mildly alkaline. Carbonates are commonly in the B3 (if present) and C horizons. In some profiles the C horizon is weakly stratified silt loam and silty clay loam.

Patton soils are associated with Harco, Reesville, Zipp, and McGary soils on terrace plains. Patton soils are more poorly drained and are grayer in the B horizon than Harco and Reesville soils. They have a thicker and darker A1 horizon than Reesville, Zipp, and McGary soils. They also have less clay in the B horizon than Zipp and McGary soils.

142—Patton silty clay loam (0 to 2 percent slopes). This nearly level soil is on broad terraces.

Included with this soil in mapping are small areas of Harco silt loam and Reesville silt loam and areas of thin silty overwash. Also included are small areas of Zipp silty clay loam in depressional areas.

Available water capacity is very high. Permeability is moderate. Runoff is slow.

This soil is highly productive and mainly used for corn, soybeans, and some wheat. The surface layer is somewhat clayey. Timeliness of tillage operations is needed. Drainage is needed for optimum crop growth. Tiling can be used. Capability unit IIw–2; woodland group 2w5.

Piopolis Series

The Piopolis series consists of nearly level, poorly drained soils that formed in silty clay loam alluvium. The native vegetation was mostly mixed bottom land hardwoods.

In a representative profile the surface layer is dark grayish-brown silty clay loam 6 inches thick. The substratum extends to a depth of 69 inches. The upper part is grayish-brown, light brownish-gray, and pale-brown, mottled silty clay loam. The lower part is light brownish-gray, light-gray, and grayish-brown, mottled silty clay loam.

Available water capacity is high. Permeability is slow. The seasonal water table is at or near the surface, and most areas are susceptible to overflow.

These soils are suited to and mainly used for cultivated crops. Crops respond moderately well to fertilizer. Undrained areas are well suited to wetland wildlife.

Representative profile of Piopolis silty clay loam, about 1,220 feet north and 300 feet west of the southeast corner of sec. 10, T. 10 S., R. 5 E., in a cultivated field:

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) light silty clay loam; weak, medium, granular structure; friable; medium acid; abrupt, smooth boundary.

C1—6 to 18 inches, 35 percent grayish-brown (10YR 5/2), 25 percent light brownish-gray (10YR 6/2), and pale-brown (10YR 6/3) light silty clay loam; many, medium and coarse, distinct, yellowish-brown (10YR 5/6) and strong-brown (7.5YR 5/6) mottles; weak, coarse, subangular blocky structure and massive; friable to firm; strongly acid; clear, smooth boundary.

C2g—18 to 31 inches; 40 percent light brownish-gray (2.5Y 6/2) and 30 percent grayish-brown (2.5Y 5/2) silty clay loam that has lenses of heavy silt loam; many, medium, coarse, prominent, yellowish-brown (10YR 5/6) and strong-brown (7.5YR 5/6) mottles; weak and moderate, medium and coarse, subangular blocky structure; firm; patchy, thin, grayish-brown (10YR 5/2) clay films on faces of peds; scattered, thin, light-gray (10YR 7/2) coatings of clean silt grains on faces of peds; strongly acid; clear, wavy boundary.

C3g—31 to 43 inches, light brownish-gray (2.5YR 6/2) silty clay loam that has lenses of heavy silt loam; many, medium and coarse, prominent, strong-brown (7.5YR 5/6) and yellowish-red (5YR 4/6) mottles; weak, medium and coarse, subangular blocky structure; friable and firm; patchy, thin, grayish-brown (10YR 5/2) clay films on faces of peds; scattered, thin, light-gray (10YR 7/2) coatings of clean silt grains on faces of peds; medium acid; gradual, smooth boundary.

C4g—43 to 69 inches, light-gray (2.5Y 6/2) silty clay loam; medium and coarse, prominent, yellowish-red (5YR 4/6) mottles; massive; firm; slightly acid.

The A horizon is dark gray in places and ranges from 6 to 20 inches in thickness. The soil is dominantly silty clay loam to a depth of 40 inches or greater but includes some heavy silt loam. The soil is commonly strongly acid or very strongly acid in the upper part of the C horizon and medium acid to neutral in the lower part.

These soils are not so acid in the lower part as defined in the range for the Piopolis series, but this difference does not alter their use or behavior.

Piopolis soils generally are associated with Cape soils and in places as pockets in Bonnie soils or in sloughs. Piopolis soils contain less clay in the solum than Cape soils and more clay than Bonnie soils.

420—Piopolis silty clay loam (0 to 2 percent slopes). This soil is nearly level or depressional. The largest

area of this soil is on the South Fork Saline River bottom land south of Carrier Mills.

Included with this soil in mapping are small areas of Bonnie silt loam and Cape silty clay. Also included are a few areas where the lower part of the substratum is silty clay.

Wetness and spring overflow are concerns in most areas of Piopolis soils. This soil is suited to annual crops, but overwintering crops or hay are seldom grown. The surface layer is somewhat clayey, and timeliness of tillage operations is needed. Capability unit IIIw–2; woodland group 2w5.

Racoon Series

The Racoon series consists of poorly drained, nearly level soils generally lying at the bases of foot slopes or on terrace plains but also in depressional areas on uplands. These soils formed mainly in loess and silty wash where silty sediments from overflow are occasionally received from higher ground or from nearby streams. The native vegetation was mainly deciduous hardwoods.

In a representative profile the surface layer is dark grayish-brown silt loam 10 inches thick. The subsurface layer is dark grayish-brown and gray silt loam 20 inches thick. The subsoil, about 29 inches thick, is mottled gray silty clay loam. The substratum is gray silt loam to a depth of 73 inches.

Permeability is slow. Available water capacity is high. The seasonal water table is at or near the surface. Most areas are susceptible to occasional flooding or overflow.

Most areas of these soils are used for cultivated crops or pasture. A few areas remain wooded. Crops respond well to lime and fertilizer. These soils are suited to openland wildlife and well suited to wetland wildlife.

Representative profile of Racoon silt loam, about 135 feet north and 2,095 feet east of the center of sec. 30, T. 7 S., R. 5 E., in a cultivated field:

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, fine, granular structure; friable; common very fine dark accumulations (iron and manganese oxides); neutral; abrupt, smooth boundary.

A12—6 to 10 inches, dark grayish-brown (10YR 4/2) and some very dark grayish-brown (10YR 3/2) silt loam; weak, thin, platy structure; dense; common, very fine, dark accumulations (iron and manganese oxides); neutral; abrupt, smooth boundary.

A21—10 to 14 inches, dark grayish-brown (10YR 4/2) silt loam; common, fine, faint, grayish-brown (10YR 5/2) mottles and few, fine, faint, light-gray (10YR 7/1) mottles; very weak, medium, platy structure parting to very weak, fine, granular; friable; common, very fine, dark accumulations (iron and manganese oxides); strongly acid; clear, smooth boundary.

A22g—14 to 30 inches, gray (10YR 6/1) silt loam; very weak, medium, platy structure parting to very weak, fine, granular; friable; many, fine and very fine, dark accumulations (iron and manganese oxides) and yellowish-brown (10YR 5/6) and brownish-yellow (10YR 6/6) stains; common, very fine, short, round pores; few grayish-brown (10YR 5/2) krotovina; very strongly acid; clear, smooth boundary.

B21tg—30 to 37 inches, gray (10YR 6/1) silty clay loam; weak, medium, prismatic structure parting to weak, fine, subangular blocky; firm; thin, discontinuous, gray (10YR 6/1) and dark grayish-brown (10YR 4/2) clay films on faces of peds; few, very fine, short pores; common, fine, distinct, yellowish-brown and brownish-yellow stains around dark concretions (iron and manganese oxides); very strongly acid; clear, smooth boundary.

B22tg—37 to 47 inches, gray (10YR 6/1) silty clay loam; few, fine, faint, light-gray (10YR 7/1) mottles; moderate, medium, prismatic structure parting to weak, medium, subangular blocky; firm; thin discontinuous gray (10YR 5/1) and dark grayish-brown (10YR 4/2) clay films on faces of peds; many, fine, distinct, yellowish-brown (10YR 5/6) stains around dark concretions (iron and manganese oxides); very strongly acid; clear, smooth boundary.

B3tg—47 to 59 inches, gray (2.5Y 6/1 and 10YR 6/1) silty clay loam; weak, medium, prismatic structure parting to very weak, medium, subangular blocky; firm; thin, discontinuous, gray (10YR 5/1) clay films on faces of peds; moderately thick, dark olive-gray (5Y 3/2) coatings on faces of peds and strong-brown (7.5YR 5/6) and dark-brown (7.5YR 4/4) stains around dark concretions (iron and manganese oxides); strongly acid; clear, smooth boundary.

Cg—59 to 73 inches, gray (5Y 6/1 and 10YR 6/1) silt loam; many, coarse, distinct, grayish-brown (10YR 5/2) mottles and many, coarse, prominent, dark-brown (7.5YR 4/4) mottles; massive; friable; slightly acid increasing to neutral in the lower part.

The combined thickness of the A horizons ranges from 24 to 36 inches. The B2t horizon is predominantly silty clay loam but includes thin layers of heavy silt loam and silty clay. The C horizon is mainly silt loam or silty clay loam, but strata of silty clay are in some profiles.

Racoon soils are mainly associated with Creal, Bonnie, and Belknap soils on terraces and bottom lands and Weir and Bluford soils on uplands. Racoon soils are more poorly drained and are more gray in the B horizon than Creal, Blueford, and Belknap soils. They have a thicker A horizon than Weir or Bluford soils and have more clay below the surface layer than Belknap and Bonnie soils.

109—Racoon silt loam (0 to 2 percent slopes). This nearly level soil is on broad, smooth areas that are generally large. In about 15 percent of this unit, the surface layer is less than 24 inches thick. Included with this soil in mapping are areas of Weir silt loam, Bonnie silt loam, and somewhat poorly drained Creal silt loam.

Available water capacity is high. Permeability is slow. Runoff is slow to ponded, and the soil has occasional overflow and silty deposition from higher ground or nearby streams. Removal of excess water, protection from overflow, and maintenance of fertility, organic matter, and tilth are needed.

This soil is moderately productive and suited to the commonly grown crops if adequately drained. Suited plants are limited by the natural poor drainage. This soil is suited to woodland, and undrained areas are well suited to wetland wildlife. Capability unit IIIw–1; woodland group 3w6.

Reesville Series

The Reesville series consists of somewhat poorly drained, nearly level or very gently sloping soils generally along terrace breaks or as bands surrounding other, more clayey soils on terrace plains. These soils formed in silty outwash. The native vegetation was deciduous hardwoods.

In a representative profile the surface layer is dark grayish-brown silt loam 8 inches thick. The subsurface

layer is grayish-brown and light brownish-gray silt loam 5 inches thick. The subsoil, about 36 inches thick, is mottled brown and grayish-brown silty clay loam. The substratum is yellowish-brown silt loam to a depth of 75 inches.

Available water capacity is high to very high. Permeability is moderate to moderately slow. Plant roots readily penetrate the soil. The seasonal water table is 1 to 3 feet below the surface. Some areas of these soils are susceptible to occasional flooding or overflow.

These soils are well suited to and mainly used for row crops. A few areas are used for pasture or hay. Crops respond well to lime and fertilizer. These soils are also well suited to openland or woodland wildlife.

Representative profile of Reesville silt loam, about 30 feet north and 1,820 feet east of the southwest corner of sec. 34, T. 7 S., R. 7 E., in a cultivated field:

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; moderate, medium, granular structure; friable; neutral; abrupt, smooth boundary.

A2—8 to 13 inches, grayish-brown (10YR 5/2) and light brownish-gray (10YR 6/2) silt loam; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, medium and thick, platy structure and massive; friable; common, thin, light-gray (10YR 7/2) clean silt grains on faces of peds; common, dark stains and concretions (iron and manganese oxides); slightly acid; abrupt, smooth boundary.

B21t—13 to 24 inches, brown (10YR 5/3) and grayish-brown (10YR 5/2) silty clay loam; common, medium, distinct, strong-brown (7.5YR 5/6) mottles; moderate, fine and medium, prismatic structure parting to moderate, medium, subangular blocky; firm; patchy, thin, grayish-brown (10YR 5/2) clay films on faces of peds; common, thin, light-gray (10YR 7/2) clean silt grains on faces of peds; common, dark stains and concretions (iron and manganese oxides); strongly acid; clear, smooth boundary.

B22t—24 to 33 inches, grayish-brown (10YR 5/2) and brown (10YR 5/3) light silty clay loam; few, medium, distinct, strong-brown (7.5YR 5/8) mottles; weak, medium, prismatic structure parting to moderate, medium, subangular blocky; firm; patchy, thin, grayish-brown (10YR 5/2) and brown (10YR 5/3) clay films on faces of peds; common, thin, light-gray (10YR 7/2) clean silt grains on faces of peds; common dark stains and concretions (iron and manganese oxides); medium acid; clear, wavy boundary.

B23t—33 to 38 inches, brown (10YR 5/3) light silty clay loam; many, medium, faint, grayish-brown (10YR 5/2) mottles and few, distinct, strong-brown (7.5YR 5/6) mottles; weak, medium, prismatic structure parting to moderate, medium, subangular blocky; firm; continuous, medium, brown (10YR 5/3) and dark-brown (7.5YR 4/4) clay films on vertical faces of peds, and patchy, thin, clay films on other faces; common dark stains and concretions (iron and manganese oxides); slightly acid; clear, smooth boundary.

B3—38 to 49 inches, brown (10YR 5/3) light silty clay loam; common, medium, faint, grayish-brown (10YR 5/2) mottles and few, distinct, yellowish-brown (10YR 5/6) mottles; weak, coarse, subangular blocky structure; firm to friable; patchy, thin, brown (10YR 5/3) clay films on faces of peds; common dark stains and concretions (iron and manganese oxides); mildly alkaline; gradual, smooth boundary.

C—49 to 75 inches, yellowish-brown (10YR 5/4) silt loam; common, medium, faint, yellowish-brown (10YR 5/8) mottles; massive; friable; common sand grains; common dark stains and concretions (iron and manganese oxides); slight effervescence; mildly alkaline.

The B horizon is commonly strongly acid in the upper part and slightly acid to neutral in the lower part. Depth to carbonates ranges from 36 to 48 inches. The B horizon is dominantly medium silty clay loam but includes heavy silt loam and heavy silty clay loam. The C horizon in some profiles is weakly stratified silt loam, loam, and light silty clay loam.

Reesville soils are commonly at the edges of terrace plains that contain areas of Patton, Zipp, or Harco soils and just above the lower terrace level of McGary or Hurst soils. Reesville soils have less clay in the B horizon than Zipp, Hurst, or McGary soils and have a thinner, lighter colored A1 horizon than Patton and Harco soils. They are similar to Uniontown soils, but Reesville soils are less well drained and are more gray and more mottled in the B horizon.

723—Reesville silt loam (1 to 3 percent slopes). This nearly level or very gently sloping soil is generally along terrace breaks. A few areas are on broad terrace plains.

Included with this soil in mapping are small areas of Harco silt loam, Patton silty clay loam, Uniontown silt loam, and McGary silt loam. Also included are short, steeper slopes along terrace breaks of drainageways.

Available water capacity is high to very high. Permeability is moderate to moderately slow. Runoff is slow. Removal of excess water and maintenance of fertility and tilth are needed. Erosion needs to be controlled where the soils are more sloping.

This soil is highly productive and is used mainly for row crops. Capability unit IIw–1; woodland group 2o1.

Sharon Series

The Sharon series consists of moderately well drained or well drained, nearly level and gently sloping soils on flood plains mainly in the small bottom lands that are surrounded by hilly terrain. These soils are also on natural levees along some of the larger streams. They formed in silty alluvium. The native vegetation was mainly deciduous hardwoods.

In a representative profile the surface layer is very dark grayish-brown, dark-brown, and dark yellowish-brown silt loam about 9 inches thick. The upper part of the substratum is dark yellowish-brown silt loam about 13 inches thick. The lower part of the substratum to a depth of about 60 inches is dark-brown and brown silt loam.

Permeability is moderate. Available water capacity is very high. Plant roots readily penetrate the soil. The seasonal water table is 3 to 5 feet below the surface. Most areas of these soils are susceptible to flash flooding or overflow.

Most of these soils are used for crops and pasture and are well suited to these uses. Some areas remain wooded. Crops respond well to lime and fertilizer. These soils are also well suited to woodland and wildlife.

Representative profile of Sharon silt loam, about 1,424 feet south and 150 feet west of the center of sec. 26, R. 10 S., R. 5 E., in a wooded area:

A11—0 to 3 inches, very dark grayish-brown (10YR 3/2) and dark-brown (10YR 4/3) silt loam; fine, granular structure; friable; many roots; very strongly acid; clear, smooth boundary.

A12—3 to 9 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, fine, granular structure; friable; many roots; common fine pores; common, dark-brown

(10YR 4/3) worm casts; very strongly acid; clear, smooth boundary.

C1—9 to 22 inches, dark yellowish-brown (10YR 4/4) silt loam; weak, medium, subangular blocky structure parting to weak, fine, granular; friable; common roots; common fine pores; patchy, thin, dark yellowish-brown (10YR 4/4) clay films; few old root channels of mixed colors; very strongly acid; clear, wavy boundary.

C2—22 to 30 inches, dark-brown (10YR 4/3) silt loam; few, fine, faint, brown (10YR 5/3) mottles; massive; friable; common roots; common fine pores; few, fine, dark concretions (iron and manganese oxides); very strongly acid; clear, wavy boundary.

C2—30 to 36 inches, dark-brown (7.5YR 4/4) silt loam; common, fine, faint, brown (10YR 5/3) mottles; massive; friable; few roots; many, fine pores; common dark stains (iron and manganese oxides); scattered patches of thin, pale-brown (10YR 6/3), clean silt grain coatings; very strongly acid; gradual, smooth boundary.

C3—36 to 60 inches, brown (10YR 5/3) and dark-brown (10YR 4/3) (7.5YR 3/2) silt loam; massive; friable; few roots; many fine pores; few dark stains (iron and manganese oxides); very strongly acid.

The solum is dominantly silt loam but includes lenses of loam and sandy loam. It is strongly acid or very strongly acid except where the surface has been limed. In some profiles, the C horizon below a depth of 40 inches is stony or gravelly loam. Few to common grayish mottles are in most profiles below a depth of about 20 inches.

Sharon soils generally are in the same bottom lands as Belknap and Burnside soils. Sharon soils are better drained and have browner colors to a greater depth than Belknap soils. They do not have gravelly or stony layers within a depth of 40 inches as Burnside soils have.

72—Sharon silt loam (1 to 3 percent slopes). This nearly level to gently sloping soil is on narrow bottom lands and natural levees along some of the larger streams.

Included with this soil in mapping are small areas of Belknap silt loam and Burnside silt loam. Some small areas of Sharon soils along the bases of hillsides have slopes as steep as 5 percent.

Available water capacity is very high. Permeability is moderate. Runoff is slow.

This soil is highly productive and well suited to row crops. However, flash flooding, shape, and small size of many areas of this soil affect the use. This soil is also well suited to hay, pasture, woodland, and wildlife. Capability unit I–1; woodland group 1o4.

Stoy Series

The Stoy series consists of somewhat poorly drained, nearly level and gently sloping soils that are 30 to 45 inches deep to a fragipan. These soils are on the broader ridgetops and also at the heads of some drainageways on uplands. These soils formed in loess. The native vegetation was mainly deciduous hardwoods.

In a representative profile the surface layer is dark-grayish brown silt loam 8 inches thick. The subsurface layer is light brownish-gray silt loam 9 inches thick. The subsoil is 39 inches thick. The upper 24 inches is mainly grayish-brown and brown silty clay loam. The lower part is a fragipan of pale-brown and yellowish-brown dense or compact heavy silt loam. The substratum to a depth of about 75 inches is dark yellowish-brown and dark-brown silt loam.

Permeability is slow. Available water capacity is high. A seasonal water table is within 3 feet of the surface.

Most areas of these soils are used for cultivated crops and pasture. A few areas remain wooded. Crops respond well to lime and fertilizer. These soils are well suited to openland or woodland wildlife.

Representative profile of Stoy silt loam, 0 to 2 percent slopes, about 635 feet south and 135 feet west of the northeast corner of sec. 20, T. 9 S., R. 5 E., in an idle crop field:

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) silt loam; weak, medium, granular structure and massive; friable; slightly acid; abrupt, smooth boundary.

A2—8 to 17 inches, light brownish-gray (10YR 6/2) silt loam that has streaks of grayish brown (10YR 5/2) and light gray (10YR 7/2); common, fine, distinct, yellowish-brown (10YR 5/6) mottles; weak, medium, platy structure and massive; friable; common, dark stains and concretions (iron and manganese oxides); very strongly acid; clear, wavy boundary.

B1—17 to 22 inches, grayish-brown (10YR 5/2) silt loam; common, medium, distinct, strong-brown (7.5YR 5/6) mottles; weak and moderate, fine and medium, subangular blocky structure; friable; thick, light-gray (10YR 7/2), clean silt grains on faces of peds; common, dark stains and concretions (iron and manganese oxides); strongly acid; clear, wavy boundary.

B21t—22 to 32 inches, brown (10YR 5/3) and grayish-brown (10YR 5/2) light silty clay loam; common, medium, distinct, strong-brown (7.5YR 5/6) mottles; moderate, medium, subangular blocky structure; firm; patchy, thin and medium, grayish-brown (10YR 5/2) and dark-brown (10YR 4/3) clay films on faces of peds; common dark stains and concretions (iron and manganese oxides); very strongly acid; clear, smooth boundary.

B22t—32 to 41 inches, yellowish-brown (10YR 5/4) and grayish-brown (10YR 5/2) silty clay loam; common, medium, distinct, yellowish-brown (10YR 5/8) mottles; moderate and strong, medium, prismatic structure parting to moderate, medium, angular and subangular blocky; firm; continuous, thin and medium, dark-brown (10YR 4/3) clay films and patchy, thin, light-gray (10YR 7/2) clean silt grains on faces of peds; common dark stains and concretions (iron and manganese oxides); very strongly acid; clear, smooth boundary.

Bx—41 to 56 inches, pale-brown (10YR 6/3) and yellowish-brown (10YR 5/4) silt loam; common, medium, distinct, yellowish-brown (10YR 5/8) mottles; weak, coarse, subangular blocky structure; firm and brittle; patchy, thin, dark-brown (10YR 4/3) clay films and thin and medium discontinuous coatings of light brownish-gray (10YR 6/2) clean silt grains on faces of peds; common dark stains and concretions (iron and manganese oxides); very strongly acid; gradual, smooth boundary.

C—56 to 75 inches, dark yellowish-brown (10YR 4/4) and dark-brown (7.5YR 4/4) silt loam that has streaks of brown (7.5YR 5/4); apparent thick, platy structure; firm and discontinuous brittleness; dark stains (iron and manganese oxide) mainly in pores and channels; common sand grains; neutral.

The combined thickness of the A horizons ranges from about 10 to 20 inches. In some profiles the A2 horizon is yellowish brown or pale brown, and the B1 horizon is brown or yellowish brown. Depth to the fragipan ranges from 30 to 45 inches. The C horizon is loess or silty material.

Stoy soils are mainly associated with Hosmer soils and have a profile similar to those of Creal and Bluford soils. Stoy soils are more poorly drained and are more gray in the B2t horizon than Hosmer soils. They have a thinner A horizon than Creal soils and less clay in the B2 horizon than Bluford soils.

164A—Stoy silt loam, 0 to 2 percent slopes. This nearly level soil is mainly on the broader upland ridge-

tops. It has the profile described as representative of the series. In some small areas, the boundary between the subsurface layer and subsoil is abrupt, and the upper part of the subsoil is heavy silty clay loam.

Included with this soil in mapping are small areas of Hosmer silt loam and Creal silt loam.

Available water capacity is high. Permeability is slow. Runoff is slow, and the hazard of erosion is slight.

This soil is productive and is mainly used for cultivated crops. Removal of excess water and maintenance of fertility and tilth are needed. This soil is suited to hay, pasture, or woodland, and to wildlife and wildlife plantings. Capability unit IIw–1; woodland group 3o1.

164B—Stoy silt loam, 2 to 4 percent slopes. This gently sloping soil is on narrow to broad upland ridgetops, on gently sloping side slopes along drainageways, on foot slopes, and also at heads of drainageways. It has a profile similar to the one described as representative of the series, but the combined surface and subsurface layers are generally 8 to 12 inches thick.

Included with this soil in mapping are small areas of Hosmer silt loam, Creal silt loam, and Hoyleton silt loam. Also included are small areas of soils that have slopes of less than 2 percent or of more than 4 percent and eroded spots.

Available water capacity is high. Permeability is slow. Runoff is slow to medium, and the hazard of erosion is slight.

This soil is productive and is used mainly for cultivated crops. Control of erosion and maintenance of fertility and tilth are needed. Wetness is sometimes a concern at the heads of drainageways and on the more level areas. This soil is suited to hay, pasture, or woodland, and to wildlife plantings. Capability unit IIe–1; woodland group 3o1.

Uniontown Series

The Uniontown series consists of moderately well drained, nearly level to sloping soils on ridges and side slopes and along drainageways of terraces. These soils formed in silty sediment. The native vegetation was deciduous hardwoods.

In a representative profile the surface layer is dark grayish-brown and dark-brown silt loam 7 inches thick. The subsoil, 35 inches thick, is mainly yellowish-brown and brown silty clay loam that has grayish mottles in the lower part. The substratum to a depth of about 71 inches is grayish-brown, brown, and dark yellowish-brown silt loam.

Available water capacity is high or very high. Permeability is moderate or moderately slow. Plant roots readily penetrate the soil. The seasonal water table is 3 to 5 feet below the surface. Some areas of these soils are susceptible to occasional flooding or overflow.

Uniontown soils are well suited to and mainly used for row crops. A few areas are used for pasture. Crops respond well to lime and fertilizer. These soils are also well suited to openland wildlife.

Representative profile of Uniontown silt loam, 2 to 6 percent slopes, about 2,070 feet south and 564 feet east of the center of sec. 19, T. 7 S., R. 7 E., in a cultivated field:

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) and dark-brown (10YR 4/3) silt loam; weak, medium, granular structure and massive; friable; slightly acid; abrupt, smooth boundary.

B21t—7 to 14 inches, yellowish-brown (10YR 5/6) silty clay loam; moderate, medium, subangular blocky structure; firm; patchy, thin, dark-brown (7.5YR 4/4) clay films on faces of peds; strongly acid; clear, smooth boundary.

B22t—14 to 23 inches, yellowish-brown (10YR 5/6) silty clay loam; common, medium, distinct, strong-brown (7.5YR 5/8) mottles; moderate to strong, medium and coarse, subangular blocky structure; firm; continuous, medium and thin, dark-brown (7.5YR 4/4) clay films on faces of peds; slightly acid; clear, smooth boundary.

B23t—23 to 34 inches, brown (10YR 5/3) and yellowish-brown (10YR 5/4) heavy silty clay loam; common, medium, distinct, strong-brown (7.5YR 5/8) mottles; moderate, medium and coarse, subangular blocky structure; firm; continuous, thin, dark-brown (7.5YR 4/4) clay films on faces of peds; common, dark stains and concretions (iron and manganese oxides); neutral; clear, smooth boundary.

B3—34 to 42 inches, brown (10YR 5/3) silty clay loam; common, medium, distinct, yellowish-brown (10YR 5/8) and light brownish-gray (10YR 6/2) mottles; weak, medium and coarse, subangular blocky structure; friable to firm; patchy, thin, dark-brown (7.5YR 4/4) clay films on faces of peds; common dark stains and concretions (iron and manganese oxides); slight effervescence; mildly alkaline, clear, smooth boundary.

C1—42 to 55 inches, grayish-brown (10YR 5/2) and brown (10YR 5/3) silt loam; common, medium, distinct, yellowish-brown (10YR 5/8) mottles; massive; friable; common sand grains; slight effervescence; mildly alkaline; clear, smooth boundary.

C2—55 to 71 inches, brown (10YR 5/3) and dark yellowish-brown (10YR 4/4) silt loam; common, medium, distinct, grayish-brown (10YR 5/2) mottles; massive; friable; few dark concretions (iron and manganese oxides); weakly stratified; common sand grains; slight effervescence; mildly alkaline.

Thickness of the A horizons ranges from about 5 to 12 inches. Where the A horizon is thicker, a thin A2 horizon and also a B1 horizon are commonly present. The B2t horizon is predominantly light to medium silty clay loam but includes thin strata of heavy silty clay loam. The B horizon is strongly acid to slightly acid in the upper part and slightly acid to mildly alkaline in the lower part. Carbonates are commonly at depths of 30 to 40 inches. The C horizon is commonly silt loam, but some profiles have strata of loam and silty clay loam.

Uniontown soils are commonly associated with Reesville, Harco, and Markland soils. Uniontown soils are better drained and less gray in the B horizon than Reesville and Harco soils and have less clay in the B horizon than Markland soils. They also have a thinner A1 horizon than Harco soils.

482A—Uniontown silt loam, 0 to 2 percent slopes. This nearly level soil is on the broader terrace ridges in oblong or irregular areas. It has a profile similar to the one described as representative of the series, but the surface layer is generally 8 to 12 inches thick.

Included with this soil in mapping are small areas of Reesville silt loam, Harco silt loam, and Markland silt loam.

Available water capacity is very high to high. Permeability is moderate to moderately slow. Runoff is slow. Maintenance of fertility and tilth is needed.

This soil is highly productive and mainly used for corn, soybeans, and some wheat. Capability unit I–2; woodland group 2o1.

482B—Uniontown silt loam, 2 to 6 percent slopes. This gently sloping and moderately sloping soil is on

ridges and side slopes along drainageways and terrace breaks. The surface layer is generally 5 to 9 inches thick. This soil has the profile described as representative of the series.

Included with this soil in mapping are small areas of Markland silt loam. Also included are areas where the subsoil is mixed with the plow layer and a few severely eroded spots.

Available water capacity is very high to high. Permeability is moderate to moderately slow. Runoff is slow to medium, and the hazard of erosion is slight to moderate.

This soil is well suited to most uses. It is highly productive and mainly used for row crops. Control of erosion and maintenance of tilth and fertility are needed. Capability unit IIe-3; woodland group 2o1.

Weir Series

The Weir series consists of poorly drained, nearly level soils on drainage divides or plains of the uplands. These soils formed in loess overlying loamy material. The native vegetation was deciduous hardwoods. These claypan soils commonly are in areas locally referred to as "post oak flats."

In a representative profile the surface layer is grayish-brown silt loam 7 inches thick. The subsurface layer, 13 inches thick, is light brownish-gray and light-gray silt loam. The subsoil, 44 inches thick, is mainly mottled light brownish-gray, grayish-brown, pale-brown, and brown silty clay, silty clay loam, and silt loam. The substratum to a depth of about 71 inches is light brownish-gray and brown silt loam.

Permeability is very slow. Available water capacity is moderate to high. A seasonal water table is at or near the surface.

Most of these soils are used for cultivated crops and pasture. A few areas remain wooded. Crops respond well to lime and fertilizer. These soils are suited to woodland and wildlife.

Reprentative profile of Weir silt loam, 855 feet south and 190 feet west of the northeast corner of sec. 32, T. 7 S., R. 6 E., in a pasture field:

Ap—0 to 7 inches, grayish-brown (10YR 5/2) silt loam; common, medium, distinct, yellowish-brown (10YR 5/4 and 5/8) mottles; weak, medium, coarse, granular structure and massive; friable; common dark stains and concretions (iron and manganese oxides); slightly acid; abrupt, smooth boundary.

A21—7 to 15 inches, light brownish-gray (10YR 6/2) silt loam; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, medium, platy structure; friable; common dark stains and concretions (iron and manganese oxides); very strongly acid; clear, smooth boundary.

A22—15 to 20 inches, light-gray (10YR 7/2) silt loam; common, medium, distinct, yellowish-brown (10YR 5/6) mottles; weak, medium, platy structure; friable; vesicular; common dark stains and concretions (iron and manganese oxides); very strongly acid; abrupt, smooth boundary.

B21t—20 to 27 inches, light brownish-gray (10YR 6/2) heavy silty clay loam; common, medium, distinct, strong-brown (7.5YR 5/6) mottles; weak, medium, prismatic structure parting to moderate, medium and coarse, angular blocky; firm; patchy, thin, grayish-brown (10YR 5/2) clay films on faces of peds; many, medium, light-gray (10YR 7/2), clean silt grains on faces of peds; common, dark stains and concretions (iron and manganese oxides); very strongly acid; clear, smooth boundary.

B22t—27 to 32 inches, light brownish-gray (10YR 6/2) light silty clay; many, coarse, distinct, strong-brown (7.5YR 5/6) mottles; moderate, medium, prismatic structure parting to moderate, medium, angular blocky; very firm; patchy, thin and medium, grayish-brown (10YR 5/2) clay films on faces of peds; few, light-gray (10YR 7/2), clean silt grains on faces of peds; common dark stains and concretions (iron and manganese oxides); very strongly acid; clear, smooth boundary.

B23t—32 to 38 inches, grayish-brown (10YR 5/2) silty clay; common, fine, distinct, yellowish-brown (10YR 5/6) mottles; moderate, medium and coarse, prismatic structure parting to moderate, medium, angular blocky; very firm; continuous, medium, grayish-brown (10YR 5/2) clay films on vertical faces of peds and patchy, thin, clay films on other faces; few light-gray (10YR 7/2), clean silt grains on faces of peds; common dark stains and concretions (iron and manganese oxides); very strongly acid; clear, smooth boundary.

B24t—38 to 43 inches, grayish-brown (10YR 5/2) silty clay loam; many, medium, distinct, strong-brown (7.5YR 5/6) mottles; moderate, medium and coarse, subangular blocky structure; firm; discontinuous, medium, grayish-brown (10YR 5/2) clay films on vertical ped faces in upper part and patchy, thin, clay films on other ped faces; common dark stains and concretions (iron and manganese oxides); very strongly acid; clear, smooth boundary.

B3—43 to 64 inches, mixed pale-brown (10YR 6/3), brown (10YR 5/3), and light brownish-gray (10YR 6/2) heavy silt loam; many, medium and coarse, distinct, strong-brown (7.5YR 5/6) mottles; moderate, medium and thick, platy structure; firm and discontinuous brittleness; common sand grains; few, thin, brown (10YR 5/3) clay films on faces of peds; common dark stains and concretions (iron and manganese oxides); very strongly acid; gradual, wavy boundary.

IIC—64 to 71 inches, light brownish-gray (2.5Y 6/2) and brown (10YR 5/3) silt loam; few to common, medium, distinct, strong-brown (7.5YR 5/6) mottles; massive; friable; common sand grains; medium acid.

The combined thickness of the A horizons ranges from about 10 to 24 inches. The B2t horizon is heavy silty clay loam or silty clay. It is strongly acid or very strongly acid. The B3 horizon is light silty clay loam or heavy silt loam that has a noticeable content of sand. It is mainly strongly acid or medium acid. In some places, a buried horizon of clay loam (Bb) underlies the solum.

Weir soils commonly are on the same upland plains as Bluford and Racoon soils. Weir soils are more poorly drained and have grayer colors in the B horizon than Bluford soils. They have a thinner A horizon and more clay in the B2t horizon than Racoon soils.

165—Weir silt loam (0 to 2 percent slopes). This nearly level soil is on broad drainage divides or plains of the uplands.

Included with this soil in mapping are small areas of Racoon silt loam and Bluford silt loam.

Available water capacity is moderate to high. Permeability is very slow. Runoff is slow. The clayey subsoil material is sticky and plastic and difficult to excavate.

This soil is suited to row crops if drainage is adequate. Maintenance of fertility and tilth is needed. Capability unit IIIw-1; woodland group 4w2.

Wellston Series

The Wellston series consists of well-drained, mod-

erately steep to very steep soils that formed in loess or silty material and material weathered from sandstone, siltstone, and shale. Depth to bedrock is mainly 4 to 7 feet. In a number of places the soil material has apparently undergone some downslope movement in the form of slips and slides. Wellston soils are mostly on wooded hillsides of the uplands in the southern part of the county.

In a representative profile the surface layer is very dark grayish-brown, dark-brown, and dark yellowish-brown silt loam 7 inches thick. The subsoil, about 26 inches thick, is dark-brown and brown heavy silt loam or light silty clay loam and is channery in the lower part. The substratum is reddish-brown and strong-brown channery clay loam overlying bedrock at a depth of 60 inches.

Available water capacity is moderate. Permeability is moderate.

Most areas of these soils are wooded. A few areas are in pasture or pine plantations. Pastures respond well to lime and fertilizer. These soils are well suited to woodland wildlife.

Representative profile of Wellston silt loam, 18 to 45 percent slopes, about 460 feet south and 1,800 feet east of the northwest corner of sec. 1, T. 10 S., R. 7 E., in a wooded area:

O2—1 inch to 0, very dark gray (10YR 3/1) and black (N 2/0) partly decomposed stems and leaves; friable; slightly acid; abrupt, smooth boundary.

A11—0 to 3 inches, very dark grayish-brown (10YR 3/2), dark-brown (10YR 3/3), and dark yellowish-brown (10YR 4/4) silt loam; moderate, fine, granular structure; friable; slightly acid; abrupt, smooth boundary.

A12—3 to 7 inches, dark yellowish-brown (10YR 4/4) and dark-brown (10YR 3/3) silt loam; moderate, fine, granular structure; friable; medium acid; clear, smooth boundary.

B1—7 to 10 inches, dark-brown (7.5YR 4/4) silt loam; weak, fine and medium, subangular blocky structure; friable; patchy, thin, dark-brown (7.5YR 4/4) clay films on faces of peds; strongly acid; clear, smooth boundary.

B21t—10 to 16 inches, dark-brown (7.5YR 4/4) heavy silt loam; weak, fine and medium, subangular blocky structure; friable; discontinuous, thin, dark-brown (7.5YR 4/4) clay films on faces of peds; common, thin, pale-brown (10YR 6/3), clean silt grains on faces of peds; very strongly acid; clear, smooth boundary.

B22t—16 to 20 inches, dark-brown (7.5YR 4/4) and strong-brown (7.5YR 5/6) light silty clay loam; moderate, medium and fine, subangular blocky structure; friable; discontinuous, thin, brown (7.5YR 5/4) clay films on faces of peds and in root channels; very strongly acid; clear, smooth boundary.

B23t—20 to 27 inches, dark-brown (7.5YR 4/4), brown (7.5YR 5/4), and strong-brown (7.5YR 5/6) light silty clay loam; moderate, medium and fine, subangular blocky structure; friable; discontinuous, thin, brown (7.5YR 4/4) clay films on faces of peds; common dark stains (iron and manganese oxides); very strongly acid; clear, smooth boundary.

IIB3—27 to 33 inches, brown (7.5YR 5/4) and dark-brown (7.5YR 4/4) channery light silty clay loam; weak, fine and medium, subangular blocky structure; friable; patchy, thin, dark-brown (7.5YR 4/4) clay films on faces of peds and on stone fragments; common, thin, light-brown (7.5YR 6/4), clean silt grains on faces of peds; common, thin, dark stains (iron and manganese oxides); very strongly acid; clear, irregular boundary.

IIC—33 to 60 inches, reddish-brown (5YR 4/4) and strong-brown (7.5YR 5/6) channery clay loam; friable; strongly acid; abrupt, smooth boundary.

R—60 inches, fine-grained, thin-bedded sandstone and siltstone bedrock.

Depth to bedrock ranges from 40 to 60 inches, but fractures and cracks often extend deeper. Coarse fragments make up 5 to 25 percent of the solum of most profiles. These coarse fragments are mainly few to absent in the A horizon and increase in content with depth, although there is a stone line at about the level of the B1 horizon in some profiles.

The combined thickness of the A horizons is commonly 5 to 12 inches. The B horizon is mainly heavy silt loam or light silty clay loam, but the lower part of the IIB horizon includes loam and clay loam. Sandy and clayey lenses weathered from bedrock are in some profiles. The C horizon is commonly loam, clay loam, or silt loam that is channery or flaggy.

Wellston soils are mainly on the same slopes as Berks and Zanesville soils. Wellston soils have fewer coarse fragments and more clay in the B horizon than Berks soils, and they do not have the fragipan in the lower parts of the B horizon that is characteristic of Zanesville soils. Wellston soils have a profile similar to those of Frondorf and Hickory soils but are deeper to bedrock than Frondorf soils and contain less sand in the upper part of the solum than Hickory soils.

339E—Wellston silt loam, 12 to 18 percent slopes. This moderately steep soil is mainly on side slopes and long foot slopes. It has a profile similar to the one described as representative for the series, but the subsoil is commonly thicker. The subsoil is more clayey in areas where the soil has formed in material weathered mainly from shale.

Included with this soil in mapping are common small areas of Zanesville silt loam. Also included are small areas of Grantsburg silt loam or Hosmer silt loam near the tops of many slopes, and small areas of Berks channery loam along the steeper drainageways or across slopes over shallow bedrock. A few small areas of severely eroded soils are shown by a conventional symbol on the soil map.

This soil has moderate available water capacity, moderate permeability, rapid runoff, and a severe erosion hazard.

Most areas of this soil are wooded. Control of erosion is needed for cleared spaces and for logging trails or other trails. This soil is well suited to woodland and wildlife. Capability unit IVe-1; woodland group 2r2.

339F—Wellston silt loam, 18 to 45 percent slopes. This steep and very steep soil is on hillsides. Slopes are generally 200 to 400 feet long. This soil has the profile described as representative of the series. The subsoil is more clayey where the soil formed in material weathered mainly from shale.

Included with this soil in mapping are common small areas of Zanesville silt loam and Berks channery loam. The Zanesville silt loam is along the tops of slopes, at the bottoms of slopes where the gradient is not so great, and also on ridges between lateral draws. The Berks loam is mainly along the steeper drainageways and as strips across slopes where bedrock is at a shallow depth. Rock ledges and boulders are in a few places.

Runoff is rapid, and the hazard of erosion is severe.

Nearly all of this soil is in woodland. Steepness of slope hinders logging operations. Control of erosion is needed on logging trails and other trails. This soil is well suited to woodland and wildlife and has scenic value. Capability unit VIe-1; woodland group 2r2.

986F—Wellston-Berks complex, 15 to 30 percent

slopes. This complex of moderately steep and steep soils is on hillsides. Slopes are generally 250 to 600 feet long. The Wellston soil makes up about 50 to 70 percent of the unit, and the Berks soil, 25 to 35 percent. The Wellston soil is generally on upper slopes in intervening areas between drainageways and in a few places across the slope above and below areas of Berks soil. The Berks soil is along small lateral drainageways, at the bases of slopes, or in one or more bands across slope. The Berks soil is commonly of greater extent on south-facing slopes. Generally, the Berks soil is somewhat steeper than the Wellston soil.

Included with these soils in mapping are areas where surface stoniness, boulders, and rock ledges are common. The larger areas of bedrock outcrops are shown by a conventional symbol on the soil map. Bands of clayey material weathered from shale are in some soils. Also included are small areas of the more silty Zanesville soil containing a fragipan. Limestone bedrock is in a few local areas.

Available water capacity is moderate in the Wellston soil and low in the Berks soil because of the stoniness and depth to bedrock. Permeability is moderate in the Wellston soil and moderate or moderately rapid in the Berks soil. Runoff is rapid to very rapid, and the hazard of erosion is severe. Steepness of slopes, presence of stones, boulders, and rock ledges, and droughtiness are the main problems in the use.

These soils are wooded. This complex is suited to woodland, wildlife, water yield, and paths and trails, and it has esthetic value. Capability unit VIIe-1; woodland group 3r2.

Figure 7.—**Zanesville soils are underlain by material weathered from sandstone, siltstone, and shale.**

Zanesville Series

The Zanesville series consists of moderately well drained, strongly sloping and moderately steep soils that are 24 to 36 inches deep to a fragipan where the soil is only slightly eroded. These soils are on hillsides, side slopes, and foot slopes of the uplands. They formed in loess and in the underlying material that weathered from sandstone, siltstone, and shale (fig. 7). The native vegetation was deciduous hardwoods.

In a representative profile, the surface layer is dark-brown silt loam 6 inches thick. The subsoil is 36 inches thick. The upper part is yellowish-brown and brown light silty clay loam and silt loam. The lower part, a fragipan, is a firm and brittle heavy loam or light clay loam that has grayish coatings. Coarse fragments are in the lower part of the subsoil and substratum. The substratum is strong-brown channery clay loam that overlies siltstone and sandstone bedrock at a depth of about 61 inches.

Available water capacity is moderate. Permeability is moderate in the upper part of the soil and slow within the fragipan. The fragipan impedes root growth and movement of water.

Most areas of these soils are used for pasture or meadow. Some are wooded. A number of the areas formerly cleared have now grown to brush or have been planted to pines. The soil is suited to pasture or woodland and wildlife.

Representative profile of Zanesville silt loam, 12 to 18 percent slopes, eroded, about 495 feet south and 1,285 feet west of the center of sec. 15, T. 10 S., R. 5 E., in a meadow:

Ap—0 to 6 inches, dark-brown (10YR 4/3) silt loam; weak, fine and medium, granular structure; friable; medium acid; abrupt, smooth boundary.

B21t—6 to 12 inches, yellowish-brown (10YR 5/6) light silty clay loam; moderate, medium, subangular blocky structure; firm; few, thin, pale-brown (10YR 6/3) uncoated silt grains on faces of peds; strongly acid; clear, smooth boundary.

B22t—12 to 22 inches, yellowish-brown (10YR 5/6) light silty clay loam; moderate, medium, subangular blocky structure; firm; patchy, thin, brown (10YR 4/4) clay films on faces of peds; strongly acid; clear, smooth boundary.

B23t—22 to 26 inches, brown (7.5YR 4/4) heavy silt loam; moderate and weak, medium, subangular blocky structure; firm; patchy, thin, dark-brown (7.5YR 4/4) clay films and common, thin, pale-brown (10YR 6/3) uncoated silt grains on faces of peds; very strongly acid; clear, smooth boundary.

Bx1—26 to 32 inches, yellowish-brown (10YR 5/4) and dark yellowish-brown (10YR 4/4) heavy loam; few, fine, distinct, grayish-brown (10YR 5/2) mottles; moderate, medium and coarse, angular and subangular blocky structure; firm and brittle; patchy, thin, dark-brown (7.5YR 4/4) clay films and many thin and medium coatings on faces of peds of light brownish-gray (10YR 6/2) and pale-brown (10YR 6/3) uncoated silt grains; very strongly acid; abrupt, smooth boundary.

IIBx2—32 to 42 inches, brown (7.5YR 5/4 and 4/4) light clay loam; common, medium, distinct, grayish-brown (10YR 5/2) mottles; weak and moderate, medium and coarse, angular and subangular blocky

structure; firm, very firm, brittle; patchy, thin and medium, reddish-brown (5YR 4/4) clay films and common thin coatings on faces of peds of pale-brown (10YR 6/3) uncoated silt grains; common (10 to 15 percent) pebbles and fragments; very strongly acid; gradual, smooth boundary.

IIC—42 to 61 inches, strong-brown (7.5YR 5/6) channery clay loam with streaks of yellowish red (5YR 4/6) and light brownish gray (10YR 6/2); massive; firm; 15 to 25 percent coarse fragments; strongly acid; abrupt, broken boundary.

R—61 to 70 inches, brown and grayish-brown, thin-bedded siltstone and sandstone; slightly acid.

Where the soil is slightly eroded, the A1 and A2 horizons are commonly 8 to 12 inches thick, depth to the fragipan ranges from 24 to 36 inches, depth to material weathered from bedrock ranges from 25 to 50 inches, and depth to bedrock ranges from 4 to 7 feet. Most areas of Zanesville soils are eroded or severely eroded, so these depths are less. The solum formed mainly in loess but extends into the material that weathered from bedrock. This material is mainly loam but includes clay loam and silty clay loam and is channery or flaggy in the lower part of the profile in most places.

Zanesville soils are mainly on side slopes or foot slopes in hilly areas. They are associated with Grantsburg or Hosmer soils commonly on ridgetops and Wellston and Berks soils on the steeper side slopes. Zanesville soils differ from Grantsburg and Hosmer soils in that the solum formed partly in material weathered from sandstone, siltstone, and shale. They differ from Wellston and Berks soils in that they have a fragipan.

340D2—Zanesville silt loam, 7 to 12 percent slopes, eroded. This strongly sloping soil is on side slopes and foot slopes. The slopes are generally 100 to 200 feet long. The soil is mainly wooded or in meadow. This soil has a profile similar to the one described as representative of the series, but the surface layer is generally 4 to 10 inches thick. Depth to the fragipan is commonly about 20 to 30 inches.

Included with this soil in mapping are small areas of Grantsburg silt loam or Hosmer silt loam along the upper slopes and areas of Wellston silt loam along some drainageways and lower slopes. Spots of severely eroded soil are shown by a conventional symbol on the soil map.

Runoff is medium or rapid, and the hazard or erosion is moderate or severe.

Most areas of this soil are in woodland or pasture. The soil is suited to cultivated crops if erosion is controlled. Maintenance of fertility and tilth is needed. Capability unit IIIe-1; woodland group 3d2.

340D3—Zanesville silt loam, 7 to 12 percent slopes, severely eroded. This strongly sloping soil is on side slopes, foot slopes, and along drainageways or bottom lands. The slopes are generally short, about 100 to 150 feet long. This soil is severely eroded and the subsoil is now at or near the surface. The present surface layer is less friable and porous, and the soil is only about 10 to 20 inches deep to the fragipan. Gullies have cut into the soil in some places.

Included with this soil in mapping are small areas of Grantsburg soil or Hosmer soil along the upper slopes and areas of Wellston soil along some drainageways and lower slopes. Also included are some areas that have more than 3 inches of the original silty surface layer.

Runoff is rapid, and the hazard of further erosion is severe. Seepage spots are on some hillside slopes during rainy seasons. Erosion has seriously reduced the storage capacity for water, and this soil is droughty during dry spells.

This soil is mainly used as pasture. Some areas of this soil are in crops but many areas formerly cultivated are now in brush or have been planted to pines. Maintenance of organic matter, tilth, and fertility is needed. Capability unit IVe-2; woodland group 3d2.

340E2—Zanesville silt loam, 12 to 18 percent slopes, eroded. This moderately steep soil is mainly on long, wooded foot slopes below steep soils that are more stony, but it is also on side slopes along drainageways or adjacent to bottom lands. Slopes are mainly 200 to 400 feet in length. This soil has the profile described as representative of the series. The surface layer is generally 3 to 8 inches thick.

Included with this soil in mapping are small areas of Grantsburg silt loam or Hosmer silt loam on upper side slopes and in intervening areas between drainageways, and areas of Wellston silt loam along some drainageways and lower slopes. Also included are a few severely eroded spots. These spots are shown by a conventional symbol on the soil map.

Runoff is rapid, and the hazard of erosion is severe. This soil is mainly wooded or in meadow. It is well suited to woodland and wildlife. Capability unit IVe–2; woodland group 3d2.

340E3—Zanesville silt loam, 12 to 18 percent slopes, severely eroded. This moderately steep soil is on side slopes along drainageways or adjacent to bottom lands, or on the upper slopes above steeper, more stony soils. Slopes are generally 150 to 350 feet long. This soil is severely eroded, and the subsoil is at or near the surface. The fragipan generally is at a depth of less than 16 inches. The present surface layer is less friable and porous. Gullies have cut into the soil in some places.

Included with this soil in mapping are small areas of Grantsburg soil or Hosmer soil along the upper side slopes and Wellston soil along some drainageways and lower side slopes. Bedrock is near the surface in some places. Also included are a few areas with a thicker surface layer.

Runoff is rapid, and the hazard of further erosion is severe. Erosion has reduced the storage capacity of the soil for water, and the soil is droughty during spells of dryness. Seepage spots are on some hillside slopes during rainy seasons.

This soil is mainly used as pasture or is now grown to brush or planted to pines. It is suited to pasture or woodland and wildlife. Capability unit VIe–2; woodland group 3d2.

Zipp Series

The Zipp series consists of poorly drained, nearly level soils on low-lying terraces. These soils formed in clayey lake-deposited sediment. The native vegetation was mainly mixed deciduous forest and grasses.

In a representative profile the surface layer is very dark grayish-brown and dark-gray heavy silty clay 6 inches thick. The subsoil, about 40 inches thick, is mottled dark-gray and gray light silty clay. The substratum to a depth of about 60 inches is gray and dark-gray heavy silty clay loam.

Available water capacity is moderate to high. Permeability is slow or very slow. The clayey soil material

is sticky and plastic and difficult to till or excavate. The seasonal water table is at or near the surface, and some areas are susceptible to occasional flooding or overflow.

Most of these soils are used for cultivated crops. Some are in pasture or remain wooded. Crops respond well to fertilizer.

Representative profile of Zipp silty clay loam, about 835 feet south and 1,033 east of the northwest corner of sec. 1, T. 9 S., R. 6 E., in a cultivated field:

Ap—0 to 6 inches, very dark grayish-brown (10YR 3/2) and dark-gray (10YR 4/1) silty clay; weak, medium, granular structure and fine, subangular blocky structure; firm; common, fine, dark concretions (iron and manganese oxides); slightly acid; abrupt, smooth boundary.

B1g—6 to 16 inches, dark-gray (10YR 4/1) light silty clay; common, fine, distinct, yellowish-brown (10YR 5/6) mottles and few, fine, faint, gray (10YR 5/1) mottles; weak, medium, prismatic structure parting to moderate, medium, subangular blocky and angular blocky; firm; common, fine, dark concretions (iron and manganese oxides); neutral; clear, smooth boundary.

B21g—16 to 26 inches, gray (10YR 5/1) light silty clay; common, fine, distinct, yellowish-brown (10YR 5/6) mottles; moderate, medium, prismatic structure parting to moderate, medium, angular blocky and subangular blocky; firm; thin, dark-gray (10YR 4/1) clay films on faces of many peds; common, fine, dark concretions (iron and manganese oxides); neutral; clear, smooth boundary.

B22g—26 to 36 inches, gray (5Y 5/1) light silty clay; common, fine, distinct, yellowish-brown (10YR 5/6) mottles; moderate, medium, prismatic structure parting to moderate, medium, angular blocky and subangular blocky; firm; common, fine, dark concretions (iron and manganese oxides); neutral; clear, smooth boundary.

B3g—36 to 46 inches, gray (5Y 5/1) light silty clay; common, fine, distinct, yellowish-brown (10YR 5/6) mottles; weak, medium, prismatic structure parting to weak, medium, angular blocky; firm; common, fine, dark concretions (iron and manganese oxides); neutral; clear, smooth boundary.

Cg—46 to 60 inches; gray (10YR 5/1) and dark-gray (10YR 4/1) heavy silty clay loam; common, fine, distinct, yellowish-brown (10YR 5/6) mottles; massive; common, fine, dark concretions (iron and manganese oxides); mildly alkaline.

In uncultivated areas the A1 horizon is 5 to 7 inches thick. The solum is heavy silty clay loam or light silty clay. The C horizon is silty clay or silty clay loam. The solum ranges from slightly acid to neutral, but some profiles have carbonates below a depth of 40 inches.

Zipp soils commonly lie adjacent to Karnak, Darwin, McGary, and Patton soils. Zipp soils contain somewhat less clay in the solum and are slightly higher on the landscape than Karnak and Darwin soils. In addition, they are less acid than Karnak soils and have a thinner A horizon than Darwin soils. Zipp soils are more gray in the B horizon than McGary soils, and they do not have a silty A horizon, as McGary soils have. They are more clayey throughout than Patton soils.

524—Zipp silty clay loam (0 to 2 percent slopes). This nearly level soil is on low-lying terraces. It has the profile described as representative of the series.

Included with this soil in mapping are small areas of Darwin silty clay, Karnak silty clay, and Patton silty clay loam. Also included are a few areas that have a thin silty overwash. Also, small wet areas, generally less than 1 acre, are shown by a conventional symbol on the soil map.

Available water capacity is moderate to high. Permeability is slow to very slow. Runoff is slow to very slow. Wetness and overflow are concerns in most areas.

This soil is suited to the commonly grown row crops where drainage and protection from overflow are adequate. Favorable tilth is difficult to maintain, and timeliness of tillage is important. Capability unit IIIw-2; woodland group 3w6.

524+—Zipp silt loam, overwash (0 to 2 percent slopes). This nearly level soil is in long, narrow areas adjacent to stream channels. The present surface layer is dark grayish-brown or gray silt loam about 10 to 20 inches thick. Except for the silty overwash, the profile is similar to the one described as representative of the series.

This soil is wet in spring, and most areas are susceptible to overflow. Tilth is not a serious problem in the plow layer, but the underlying sticky and plastic clayey material is difficult to excavate with earthmoving machinery. Because of the overwash surface layer, the soil is a better seedbed than is Zipp silty clay loam.

This soil is suited to most of the commonly grown crops. Capability unit IIw–2; woodland group 3w6.

Use and Management of the Soils

This section has five main parts. In the first part, the soils are placed into capability units and the capability classification used by the Soil Conservation Service to show the relative suitability of the soils for crops is explained. Also included in this part is a table giving predicted crop yields under a high level of management. In the second part, the use of soils for woodland is discussed, and in the third part, the kinds of wildlife and the uses of soils for wildlife habitat are described. In the fourth part, the use of soils for recreation is discussed, and the fifth part consists of engineering data and interpretations.

Use of the Soils for Cropland

About 60 percent of Saline County is cultivated. Corn, soybeans and wheat are the major crops. Pasture, hay, and grain sorghum are other important crops.

The main considerations in managing cultivated soils in the county are controlling erosion, overcoming wetness and protecting from flooding, conserving moisture, and maintaining tilth and fertility.

Measures that will help in controlling erosion on sloping soils include terracing, contour farming, minimum tillage, cover crops, grassed waterways, and the use of crop residue. Generally, a combination of several measures is used. Control of erosion (*13*) not only keeps the topsoil in place but also prevents sediments from being carried to low-lying areas.

Measures to help overcome wetness in the more poorly drained or low-lying soils include the use of surface ditches or tile drains, tile inlet drains, and diversions. Levees can be used for protection from flooding.

Conserving moisture generally means reducing evaporation, limiting runoff, increasing infiltration, and controlling weeds. Practices that help to conserve moisture include minimum tillage, use of crop residue

and mulches, contour farming, stripcropping, and establishing field windbreaks.

Among the measures that help to maintain tilth and fertility are the application of chemical and organic fertilizers, green manure and barnyard manure, and the inclusion in the cropping system of cover crops, grasses, and legumes. Application of lime is needed periodically, especially on most soils on uplands and on the more acid soils on terraces and bottom lands. Control of erosion also helps to conserve fertility and maintain tilth.

Capability grouping

Capability grouping shows, in a general way, the suitability of soils for most kinds of field crops. The groups are made according to the limitations of the soils when they are used for field crops, the risk of damage, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops that require special management.

Those familiar with the capability classification can infer from it much about the behavior of soils when they are used for other purposes, but this classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for forest trees or for engineering.

In the capability system, all kinds of soils are grouped at three levels: capability class, subclass, and unit. The levels of the capability system are described in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use, 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 require moderate conservation practices.

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

Class IV soils have very severe limitations that reduce the choice of plants or 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 largely to pasture, range, woodland, or wildlife.

Class VI soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture, range, woodland, or wildlife.

Class VII soils have very severe limitations that make them unsuited to cultivation and limit their use largely to pasture, range, woodland, or wildlife.

Class VIII soils and landforms have limitations that preclude their use for comercial plants and limit their use to recreation, wildlife, or water supply, or to esthetic purposes.

Capability subclasses are soil groups within one class; they are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage) ; *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c,* used in only some parts of the United States, but not in Saline County, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can have, at the most, only the subclasses indicated by *w, s,* and *c,* because the soils in class V are subject to little or no erosion, though they have other limitations that restrict their use largely to pasture, range, woodland, wildlife, or recreation. In this survey only subclass *w* is used with class V.

Capability units are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designated by adding an Arabic numeral to the subclass symbol; for example, IIe–1 and IIe–3. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the preceding paragraphs; and the Arabic numeral specifically identifies the capability unit.

In the following pages the capability units in Saline County are described, and suggestions for use and management for the soils in the units are given. Soils used for cultivated crops generally need lime and fertilizers. Soil tests determine how much to apply on each soil. The name of the soil phase represented is mentioned in the description of each capability unit if there is only one soil in that capability unit. To find the soils in each capability unit, refer to the "Guide to Mapping Units" at the back of this survey.

CAPABILITY UNIT I–1

The only soil in this unit is Sharon silt loam. It is nearly level to gently sloping and uneroded. This soil is on bottom lands. It is well drained or moderately well drained and is silt loam throughout.

This soil is low in organic-matter content and medium in natural fertility. Available water capacity is very high, and permeability is moderate. The surface layer is medium acid or strongly acid in unlimed areas. The management practices needed are those that maintain organic-matter content, fertility, and tilth. Flash flooding is generally a hazard during severe storms. Use of crop residue, winter cover crops, and green-manure crops helps maintain organic-matter content, fertility, and tilth.

This soil is well suited to corn, soybeans, grain sorghum, small grain, and hay or pasture.

CAPABILITY UNIT I–2

The only soil in this unit is Uniontown silt loam, 0 to 2 percent slopes. This soil is on terraces. It is moderately well drained and has a subsoil of silty clay loam.

This soil is low in organic-matter content and medium in natural fertility. Available water capacity is high or very high, and permeability is moderate or moderately slow. The surface layer is medium acid or strongly acid in unlimed areas. The management practices needed are those that maintain organic-matter content, fertility, and tilth. Use of crop residue, winter cover crops, and green-manure crops helps maintain organic-matter content, fertility, and tilth.

This soil is well suited to corn, soybeans, grain sorghum, small grain, and hay or pasture.

CAPABILITY UNIT I–3

The only soil in this unit is Harco silt loam. This soil is on terraces. It is deep, dark colored, nearly level, and uneroded. It is somewhat poorly drained and has a subsoil of silty clay loam.

This soil is medium in organic-matter content and natural fertility. Available water capacity is very high, and permeability is moderate. The surface layer is naturally neutral or slightly acid. Management practices needed are those that maintain organic-matter content, fertility, and tilth. Use of winter cover crops, crop residue, and green-manure crops helps maintain organic-matter content, fertility, and tilth.

This soil is well suited to corn, soybeans, grain sorghum, small grain, and hay or pasture. Tiling or surface ditches are needed in places to remove excess water.

CAPABILITY UNIT IIe–1

This capability unit consists of somewhat poorly drained, gently sloping soils on uplands. These soils have a surface layer of silt loam and a subsoil of silty clay loam or light silty clay.

These soils are low or medium in organic-matter content and natural fertility. Available water capacity is high, and permeability is slow. The surface layer is medium acid or strongly acid in unlimed areas. The management practices needed are control of erosion and runoff and those that maintain organic-matter content, fertility, and tilth. Use of crop residue, green-manure crops, winter crops, and conservation tillage helps maintain organic-matter content, fertility, and tilth. Grassed waterways and terraces help control erosion and runoff.

These soils are well suited to corn, soybeans, grain sorghum, small grain, and hay or pasture. Regulated grazing and pasture mowing are needed for good pasture management. Removal of excess water is needed in places from the more level areas and from the heads of drainageways.

CAPABILITY UNIT IIe–2

This capability unit consists of moderately well drained, gently sloping, slightly eroded soils that are moderately deep to a fragipan. They are on uplands. They have a surface layer of silt loam and a subsoil of heavy silt loam or silty clay loam.

These soils are low in organic-matter content and natural fertility. Available water capacity is moderate or high, and permeability is moderate above the fragipan and slow or very slow within the fragipan. The surface layer is strongly acid in unlimed areas. The management practices needed are control of erosion and runoff and those that maintain organic-matter content, fertility, and tilth. Use of conservation tillage, contouring, stripcropping, winter cover crops, terraces, crop residue, and grassed waterways helps control erosion and runoff.

These soils are well suited to corn, soybeans, grain sorghum, small grain, and hay or pasture. Regulated grazing and pasture mowing are needed in many places for good pasture management.

CAPABILITY UNIT IIe–3

The only soil in this unit is Uniontown silt loam, 2 to 6 percent slopes. This soil is on terraces. It is moderately well drained and has a subsoil of silty clay loam.

This soil is low in organic-matter content and medium in natural fertility. Available water capacity is high to very high, and permeability is moderate to moderately slow. The surface layer is medium acid or strongly acid in unlimed areas. The management practices needed are control of erosion and runoff and those that maintain organic-matter content, fertility, and tilth. Use of conservation tillage, contouring, stripcropping, winter cover crops, crop residue, terraces, and grassed waterways helps control erosion and runoff.

This soil is well suited to corn, soybeans, grain sorghum, small grain, and hay or pasture.

CAPABILITY UNIT IIw–1

This capability unit consists of somewhat poorly drained, light-colored or dark-colored, nearly level soils. These soils are on uplands and terraces. They have a surface layer of silt loam and a subsoil of silt loam, silty clay loam, or light silty clay.

These soils are low in organic-matter content and natural fertility. Available water capacity is moderate to very high, and permeability is slow or moderately slow. The surface layer is medium acid or strongly acid in unlimed areas. The management practices needed are drainage and those that maintain organic-matter content, fertility, and tilth. Use of winter cover crops, crop residue, and green-manure crops helps maintain organic-matter content, fertility, and tilth.

These soils are well suited to corn, soybeans, grain sorghum, small grain, and hay or pasture. Surface ditches are needed in many places to remove excess water, and in some places diversions may be needed to intercept overflow from higher ground. Regulated grazing and clipping are generally needed for pastures.

CAPABILITY UNIT IIw–2

This capability unit consists of poorly drained, nearly level soils. These soils are on low terraces. They have a surface layer of silt loam and silty clay loam and a subsoil of silty clay and silty clay loam.

These soils have medium or high organic-matter content and natural fertility. Available water capacity

is very high, and permeability is moderate to slow. The surface layer is naturally slightly acid or neutral. The management practices needed are drainage and those that maintain organic-matter content, fertility, and tilth. Use of winter cover crops, crop residue, and green-manure crops helps maintain organic-matter content, fertility, and tilth.

These soils are well suited to corn, soybeans, grain sorghum, small grain, and hay or pasture. Tiling or surface ditches are generally needed to remove excess water.

CAPABILITY UNIT IIw–3

The only soil in this unit is Belknap silt loam. This soil is on bottom lands. It is somewhat poorly drained, nearly level, and is silt loam throughout.

This soil is low in organic-matter content and low or medium in natural fertility. Available water capacity is very high, and permeability is moderately slow. The surface layer is strongly acid or medium acid in unlimed areas. The management practices needed are drainage, protection from overflow, and maintenance of organic-matter content, fertility, and tilth. Use of winter cover crops, crop residue, and green-manure crops helps maintain organic-matter content, fertility, and tilth.

This soil is well suited to corn, soybeans, grain sorghum, small grain, and hay or pasture. Surface ditches and tiling can be used to remove excess water. Levees and diversions can be used for protection from overflow. Regulated grazing and clipping are generally needed for pasture.

CAPABILITY UNIT IIs–1

The only soil in this unit is Burnside silt loam. This soil is on bottom lands. It is nearly level and gently sloping, well drained or moderately well drained, and has channery or flaggy lower layers.

This soil is low in organic-matter content and low or medium in natural fertility. Available water capacity and permeability are moderate. The surface layer is strongly acid or medium acid in unlimed areas. The management practices needed are those that maintain organic-matter content, fertility, and tilth. Flash flooding is generally a hazard during severe storms.

This soil is suited to row crops and small grain, but it is in narrow valleys surrounded by steep hillsides and is used mainly for woodland, pine plantation, and hay or pasture. Fertilizer, regulated grazing, and clipping are needed for good management. Woodland needs to be protected from fire and grazing, and logging operations need to be conducted with the least possible disturbance of vegetation.

CAPABILITY UNIT IIIe–1

This capability unit consists of moderately well drained, sloping and strongly sloping, eroded soils. These soils are on uplands. They have a surface layer of silt loam and a subsoil of heavy silt loam or silty clay loam. They have a fragipan in the subsoil.

These soils are low in organic-matter content and natural fertility. Available water capacity is moderate or high, and permeability is moderate above the fragipan and slow or very slow within the fragipan. The surface layer is strongly acid or medium acid in unlimed areas. The main management practices needed are control of erosion and runoff and maintenance of organic-matter content, fertility, and favorable tilth. Conservation tillage, contouring, stripcropping, terraces, and grassed waterways help control erosion and runoff. Use of crop residue, winter cover crops, and green-manure crops helps maintain organic-matter content, fertility, and tilth.

These soils are suited to corn, soybeans, grain sorghum, and small grains if erosion control practices are used. They are well suited to hay or pasture. Fertilizer is needed for vigorous growth of cultivated crops, hay, or pasture. Regulated grazing and clipping are also needed for pastures.

CAPABILITY UNIT IIIe–2

This capability unit consists of moderately well drained, light-colored, gently sloping and sloping, slightly eroded and eroded soils. These soils are on terraces. They have a surface layer of silt loam and a subsoil of silty clay or heavy silty clay loam.

These soils are low in organic-matter content and natural fertility. Available water capacity is moderate or high, and permeability is slow. The surface layer is strongly acid or medium acid in unlimed areas. The major management practices needed are control of erosion and runoff and those that maintain organic-matter content, fertility, and tilth. Conservation tillage, contouring, stripcropping, terraces, and grassed waterways help control erosion and runoff. Use of crop residue, winter cover crops, and green-manure crops helps maintain organic-matter content, fertility, and tilth.

These soils are suited to corn, soybeans, grain sorghum, and small grain if erosion-control practices are used. They are well suited to pasture or hay. Fertilizer is needed for vigorous growth of cultivated crops, hay, or pasture. Regulated grazing and clipping are also needed for pastures.

CAPABILITY UNIT IIIw–1

This capability unit consists of poorly drained and somewhat poorly drained, light-colored, nearly level soils. These soils are on terraces or uplands. They have a surface layer of silt loam and a subsoil of silty clay or silty clay loam.

These soils are low in organic-matter content and natural fertility. Available water capacity is moderate or high, and permeability is slow or very slow. The surface layer is strongly acid or medium acid in unlimed areas. The major management practices needed are drainage and those that maintain organic-matter content, fertility, and tilth. Use of winter cover crops, crop residue, and green-manure crops helps maintain organic-matter content, fertility, and tilth.

These soils are suited to corn, soybeans, grain sorghum, small grain, pasture, and hay if surface ditches can remove excess water. Fertilizer is needed for greater root penetration and vigorous growth of cultivated crops, hay, or pasture. Regulated grazing and clipping are also needed for pastures. Woodland needs to be protected from fire and grazing.

CAPABILITY UNIT IIIw–2

This capability unit consists of poorly drained and

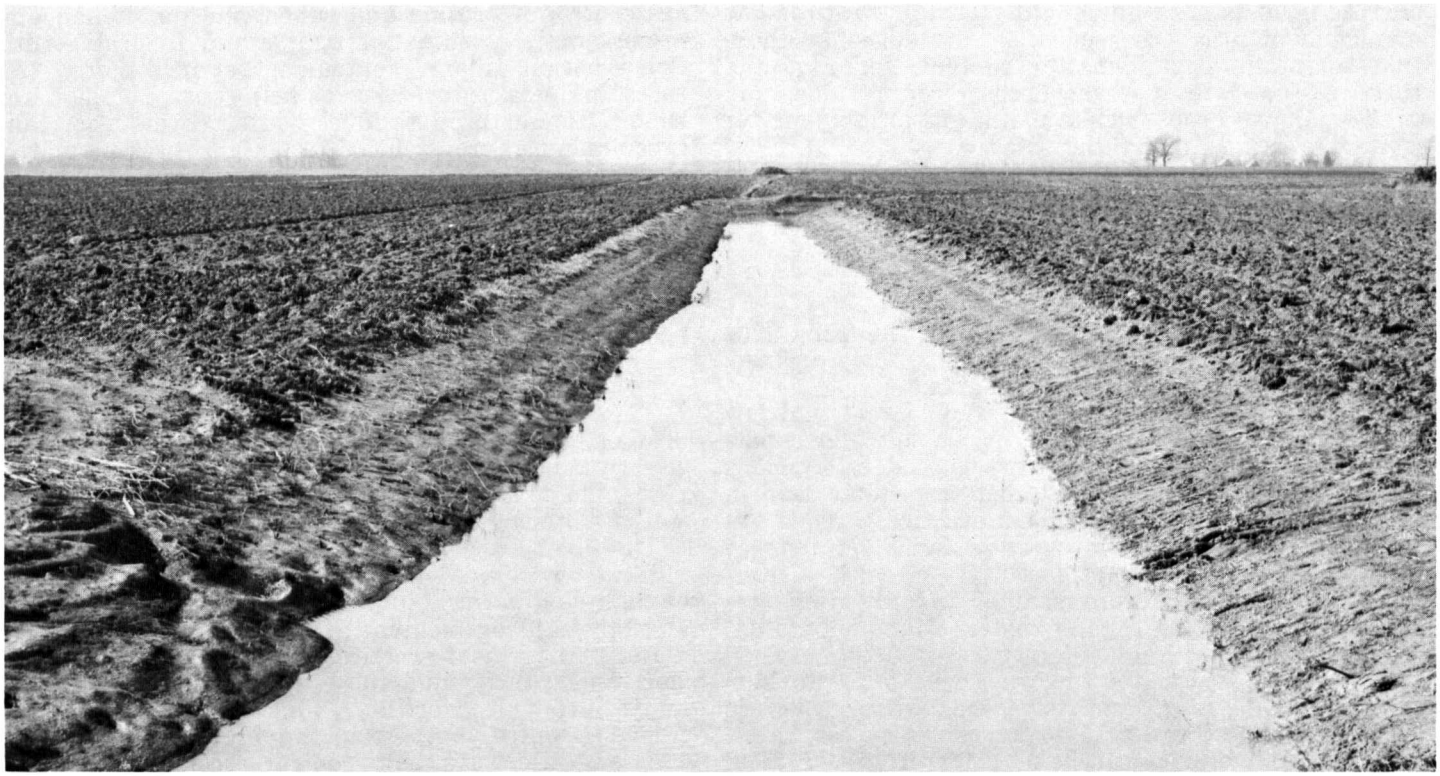

Figure 8.—**Removal of excess water from the soils in capability unit IIIw–2 promotes better soil aeration. This aids root penetration and makes more water available to plants during the growing season, particularly during dry spells.**

very poorly drained, dark-colored and light-colored, nearly level and depressional soils. These soils are on bottom lands or low-lying terraces. They are silt loam, silty clay, or silty clay loam throughout.

These soils are low or medium in organic-matter content and natural fertility. Available water capacity is moderate or high, and permeability is very slow or slow. The surface layer is neutral to strongly acid in unlimed areas. The major management practices needed are drainage, protection from overflow, and those that maintain organic-matter content, fertility, and tilth. Use of crop residue, winter cover crops, and green-manure crops helps maintain organic-matter content, fertility, and tilth.

These soils are suited to corn, soybeans, grain sorghum, small grain, pasture, and hay if removal of excess water and protection from overflow are adequate. Timeliness of tillage is important. Surface ditches can be used for removing excess water, and levees and diversions can be used for protection from overflow (fig. 8).

CAPABILITY UNIT IVe–1

This capability unit contains well drained and moderately well drained, moderately steep soils. These soils have a surface layer of loam or silt loam and a subsoil of silty clay loam, clay loam, or channery loam.

These soils are low in organic-matter content and natural fertility. Available water capacity is moderate or high, and permeability is moderate. The major management practices needed are control of erosion and runoff. Use of conservation tillage, contouring, stripcropping, terraces, grassed waterways, winter cover crops, and crop residue helps control erosion and runoff.

These soils are well suited to pasture, hay, pine plantations, woodland, and limited crops if erosion control practices are used. Regulated grazing and clipping are generally needed for pastures. Woodland needs to be protected from fire and grazing. Logging operations need to be conducted with the least possible disturbance of vegetation and surface soil.

CAPABILITY UNIT IVe–2

This capability unit consists of moderately well drained and well drained, strongly sloping, severely eroded soils and moderately steep, eroded soils. The moderately well drained soils have a subsoil of heavy silt loam or silty clay loam and a fragipan, and the well-drained soils have a subsoil of channery loam and are underlain by bedrock.

These soils are low in organic-matter content and natural fertility. The rooting zone is impeded by the fragipan or bedrock. Erosion has seriously reduced the available water capacity, and these soils are droughty during dry spells. Seepage spots are on some hillsides during rainy seasons. The major management practices needed are control of erosion and runoff and those that maintain or improve organic-matter content, fertility, and tilth (fig. 9). Conservation tillage,

Figure 9.—Tall fescue, Korean lespedeza, and Ladino clover in a severely eroded area of a soil in capability unit IVe–2. These plants not only provide forage for livestock, but the stabilizing fabric of the roots holds the surface soil intact, the impact of raindrops is dissipated, runoff is slowed, and the turf acts as a filtering element.

contouring, stripcropping, terraces, and grassed waterways help control erosion and runoff. Use of residue, winter cover crops, and green-manure crops helps maintain organic-matter content, fertility, and tilth.

These soils are suited to limited cultivation if erosion control practices are used. They are suited to hay, pasture, or woodland. Fertilizer is needed for vigorous growth of cultivated crops, hay, or pasture. Regulated grazing and clipping are also needed for pasture. Woodland needs to be protected from fire and grazing. Logging operations need to be conducted with the least disturbance of vegetation and surface soil.

CAPABILITY UNIT IVw–1

The only soil in this unit is Huey silt loam. This soil is on uplands. It is poorly drained, light-colored, and nearly level to gently sloping. The subsoil is silty clay loam that is alkaline and has a high content of sodium.

This soil is low in organic-matter content and fertility. Available water capacity is low, and permeability is very slow. The major management practices needed are drainage on the more level areas and control of erosion and runoff on the more sloping areas. Use of crop residue, winter cover crops, and green-manure crops helps maintain organic-matter content, fertility, and tilth.

This soil has limited suitability for soybeans, grain sorghum, small grain, and corn. Response to fertilizer is limited.

CAPABILITY UNIT Vw–1

The only soil in this unit is Bonnie silt loam, wet. This soil is on bottom lands. It is very poorly drained, light-colored, and nearly level to depressional. The water table is at or near the surface during most of the winter and spring, and some areas may be submerged. The soil is silt loam throughout.

This soil is low in organic-matter content and fertility. Available water capacity is high, and permeability is slow. The surface layer is strongly acid in unlimed areas.

This soil is generally too wet to be used for cultivated crops. It is suited to pasture, woodland, and wildlife habitat. Plants that grow in wet areas are needed for pasture stands. Grazing needs to be limited

to drier periods. If drained, this soil needs to be managed in the same manner as the soils in capability unit IIIw–2.

CAPABILITY UNIT VIe–1

This capability unit consists of light-colored, strongly sloping to very steep, slightly eroded soils. These soils are on uplands. They have a surface layer of silt loam or loam and a subsoil of loam, silty clay loam, or clay loam.

These soils are low in organic-matter content and natural fertility. Available water capacity is moderate or high, and permeability is moderate. The surface layer is medium acid or strongly acid in unlimed areas. Runoff is rapid or very rapid. The major management practices needed are control of erosion and runoff. Steepness of slopes affects use.

These soils are well suited to woodland and pine plantings. Strongly sloping or moderately steep areas of these soils are also suited to pasture and hay. Regulated grazing, clipping, and fertilizers are needed for pastures. Woodland needs to be protected from fire and grazing. Logging needs to be conducted with the least possible disturbance of vegetation and surface soil.

CAPABILITY UNIT VIe–2

This capability unit consists of moderately steep, severely eroded soils. These soils are on uplands. They are shallow to a fragipan and moderately deep to bedrock, or they have a massive loamy substratum.

These soils are low in organic-matter content and natural fertility. Erosion has seriously reduced the available water capacity, and these soils are droughty during spells of dryness. Seepage spots are on some hillsides during rainy seasons. Permeability is moderate to slow. Runoff is rapid. The main management practices needed are control of further erosion and of runoff. Steepness of slopes affects use.

These soils are suited to hay, pasture, pine plantings, or woodland. Regulated grazing and clipping are generally needed for pastures. Fertilizer improves root penetration and forage growth. Woodland needs to be protected from fire and grazing. Logging needs to be done with the least possible disturbance to vegetation and surface soil.

CAPABILITY UNIT VIe–3

The only soil in this unit is Markland soils, 7 to 15 percent slopes, severely eroded. This strongly sloping and moderately steep soil has mainly short slopes. It is on terraces. The soil is generally severely eroded, but some wooded areas are less eroded. The subsoil is silty clay or heavy silty clay loam.

This soil is low in organic-matter content and low to medium in natural fertility. Available water capacity is moderate, and permeability is slow. The present surface soil is medium acid to alkaline, and carbonates are at the surface in some places. Runoff is rapid. The main management practices needed are control of further erosion and of runoff. Steepness of slopes affects use.

This soil is suited to hay, pasture, pine plantings, or woodland. Regulated grazing and clippings are generally needed for pastures. Woodland needs to be protected from grazing and fire. Logging needs to be done with the least possible disturbance of vegetation and surface soil.

CAPABILITY UNIT VIs–1

The only soil in this unit is Orthents, 5 to 15 percent slopes. These soils are sloping to moderately steep. These loamy-skeletal soils are composed of fine-textured earth material that is predominantly silty or loamy and of shaly fragments, including common flags and stones. Most of the surface stones have been buried, but they are in the surface layer and also on the surface in some places.

These soils are low in organic-matter content and medium in natural fertility. They are medium acid to neutral. Available water capacity is moderate or low, and permeability is moderately rapid. Runoff is medium.

These soils are suited to hay where surface stones have been removed and to grazing, woodland, wildlife, and water yield.

CAPABILITY UNIT VIIe–1

This capability unit consists of steep and very steep soils that are generally moderately deep to bedrock, but it includes soils that are shallow to bedrock. These soils are on uplands. The surface layer is loam or silt loam, and the subsoil is clay loam, silty clay loam, loam, or silt loam. These soils have coarse fragments in part or all of the soil. Surface stones and rock ledges are in some places.

These soils are low in organic-matter content and natural fertility. The subsoil is strongly acid or very strongly acid. Available water capacity is moderate or low, and permeability is moderate or moderately rapid. Runoff is rapid or very rapid. The main management practices needed are control of erosion and runoff. Steepness of slope and stoniness and droughtiness in some places affect use.

These soils are suited to woodland, wildlife, and water yield, and they have esthetic value. Woodland needs to be protected from fire and grazing. Logging needs to be done with the least possible disturbance to vegetation and surface soil.

CAPABILITY UNIT VIIs–2

The only soil in this unit is Orthents, 15 to 60 percent slopes. These soils are moderately steep to very steep. These loamy-skeletal soils are composed of material that is predominantly silty or loamy and of shaly fragments, including common flags and stones. Surface stones are common in most areas.

These soils are low in organic-matter content and medium in natural fertility. They are medium acid to neutral. Available water capacity is low or moderate, and permeability is moderately rapid. Runoff is rapid. The main management practices needed are control of erosion and runoff. Steepness of slopes, stoniness, and droughtiness affect use.

These soils are suited to grazing, woodland, and wildlife. They also are suited to water yield except in spots of extremely acid shale. Woodland needs to be protected from fire and grazing. Logging needs to be done with the least disturbance to the vegetative cover.

Figure 10.—This Patton soil consistently produces high yields of corn and soybeans when farmed under a high level of management.

CAPABILITY UNIT VIIIs-1

The only soil in this unit is Orthents, acid, 15 to 60 percent slopes. These moderately steep to very steep, loamy-skeletal soils are composed of material that is predominantly silty or loamy and of shaly fragments, including common flags and stones. Surface stones are common in most areas.

These soils are very low in organic-matter content and low in natural fertility. They are extremely acid. Available water capacity is low, and permeability is moderately rapid. Runoff is rapid or very rapid. The main management practices needed are control of erosion and runoff. Establishment of vegetation is very difficult.

Natural vegetation is sparse, consisting of the more acid-tolerant trees and shrubs. Wildlife food and cover are limited. Water is commonly acid and contains concentrations of iron, manganese, and sulfur.

Predicted yields

Table 2 shows predicted yields of the major crops grown in Saline County under a high level of management (fig. 10). These predicted yields are based on yields for the period 1954 to 1963 from experimental plots and on the experience and records of farmers, agronomists, conservationists, and farm advisers (*18*). The predictions are adjusted to reflect the trend towards higher yields during the period from 1963 to 1972. Average yields are expected to increase. A few farmers obtain yields as high as 200 bushels of corn on an acre in some years, but yields this high are an exception.

Management was determined for farming techniques, crop varieties, and fertilizer commonly used in 1973. Differences in weather from year to year may cause annual yields to vary 20 percent or more above or below those shown in the table. Hay and pasture yields are predicted for varieties of grasses and legumes suited to the soil.

High-level management is based on adequate drainage, protection from flooding or overflow, and control of erosion; the proper number of plants grown; use of high-quality seed; minimum tillage done under favorable soil moisture conditions; control of weeds, plant diseases, and harmful insects; maintenance of favorable surface soil reaction and near-optimum levels of nitrogen, phosphorus, and potassium; efficient use of available crop residue, livestock manure, and green

TABLE 2.—*Predicted average yields per acre of principal crops*

[Yields are those to be expected under a high level of management. Absence of a yield figure indicates that the crop is not commonly grown on the soil or the soil is not well suited to the crop]

Soil	Corn	Soybeans	Wheat	Mixed hay [1]	Rotation pasture
	Bu	*Bu*	*Bu*	*Tons*	*Animal-unit-months* [2]
Ava silt loam, 2 to 4 percent slopes	85	30	40	3.8	6.0
Ava silt loam, 4 to 7 percent slopes, eroded	80	28	35	3.5	5.8
Ava silt loam, 7 to 12 percent slopes, eroded	75	25	35	3.2	5.3
Ava silt loam, 5 to 12 percent slopes, severely eroded	60	22	28	2.5	4.2
Banlic silt loam [3]	95	32	38	3.8	6.7
Belknap silt loam [3]	105	38	48	4.5	7.5
Berks-Wellston complex, 30 to 60 percent slopes					
Bluford silt loam, 0 to 2 percent slopes	95	32	42	3.8	6.0
Bluford silt loam, 2 to 4 percent slopes	95	32	42	3.8	6.0
Bonnie silt loam [3]	90	32	35	3.8	6.0
Bonnie silt loam, wet					
Burnside silt loam [3]	80	28	38	3.2	5.3
Cape silty clay loam	85	30	38	3.0	5.0
Colp silt loam, 1 to 4 percent slopes	75	28	35	3.0	5.0
Creal silt loam	95	32	44	3.8	6.3
Darwin silty clay [3]	90	32	38	3.0	5.0
Frondorf silt loam, 7 to 12 percent slopes, severely eroded				2.8	4.7
Frondorf silt loam, 12 to 18 percent slopes				2.8	5.0
Frondorf silt loam, 18 to 45 percent slopes					4.8
Grantsburg silt loam, 2 to 4 percent slopes	75	28	35	3.2	5.7
Grantsburg silt loam, 4 to 7 percent slopes, eroded	70	25	32	3.2	5.5
Grantsburg silt loam, 7 to 12 percent slopes, eroded	65	22	30	2.8	5.0
Grantsburg silt loam, 7 to 12 percent slopes, severely eroded	50	18	25	2.5	4.0
Harco silt loam	135	40	50	4.5	7.8
Hickory loam, 12 to 18 percent slopes			35	3.5	5.8
Hickory loam, 12 to 18 percent slopes, severely eroded				3.4	5.6
Hickory loam, 18 to 45 percent slopes					5.6
Hosmer silt loam, 2 to 4 percent slopes	90	32	38	4.0	6.7
Hosmer silt loam, 4 to 7 percent slopes, eroded	85	30	35	3.8	6.3
Hosmer silt loam, 7 to 12 percent slopes, eroded	75	28	35	3.8	6.1
Hosmer silt loam, 7 to 12 percent slopes, severely eroded	60	22	25	3.5	5.7
Hoyleton silt loam, 1 to 4 percent slopes	105	38	48	4.5	7.3
Huey silt loam	55	20	30	2.2	3.9
Hurst silt loam	80	30	35	3.2	5.8
Karnak silty clay [3]	80	28	38	3.0	5.0
Markland silt loam, 3 to 7 percent slopes, eroded	70	25	35	3.0	5.0
Markland soils, 7 to 15 percent slopes, severely eroded				2.2	3.8
McGary silt loam	80	28	35	3.2	5.3
Orthents, 5 to 15 percent slopes				[4] 3.0	4.0
Orthents, 15 to 60 percent slopes					2.0
Orthents, acid, 15 to 60 percent slopes					
Patton silty clay loam	130	45	50	5.0	8.3
Piopolis silty clay loam [3]	90	32	40	3.8	6.0
Racoon silt loam	90	32	40	3.8	6.0
Reesville silt loam	115	40	50	4.8	7.8
Sharon silt loam [3]	115	40	48	4.5	7.3
Stoy silt loam, 0 to 2 percent slopes	100	35	45	4.2	7.0
Stoy silt loam, 2 to 4 percent slopes	100	35	45	4.2	7.0
Uniontown silt loam, 0 to 2 percent slopes	115	38	48	4.8	8.0
Uniontown silt loam, 2 to 6 percent slopes	110	35	45	4.5	7.6
Weir silt loam	85	30	38	3.5	5.8
Wellston silt loam, 12 to 18 percent slopes				3.5	5.8
Wellston silt loam, 18 to 45 percent slopes					5.5
Wellston-Berks complex, 15 to 30 percent slopes					5.2
Zanesville silt loam, 7 to 12 percent slopes, eroded	75	30	35	3.5	5.5
Zanesville silt loam, 7 to 12 percent slopes, severely eroded	70	20	30	3.2	4.5
Zanesville silt loam, 12 to 18 percent slopes, eroded			25	3.2	5.3
Zanesville silt loam, 12 to 18 percent slopes, severely eroded				3.0	4.2
Zipp silty clay loam	100	35	35	4.0	5.8
Zipp silt loam, overwash	105	38	38	4.0	6.0

[1] Hay and pasture yields are predicted for mixed stands of grasses and legumes that are adapted to the soil.

[2] Animal-unit-month is a term used to express the carrying capacity of pasture. It is the number of months 1 acre can carry 1 animal unit during a single grazing season without injury to the sod. One animal unit is defined as 1 cow, 2 yearling calves, 1 horse, 5 sheep, or 4 brood sows. For example, 2 cows can graze about 4 months in a pasture that has a capacity of 8 animal-unit-months.

[3] In the yield predictions for soils on bottom lands, it was assumed protection from flooding or overflow was adequate. However, most bottom land areas in the county are subject to flooding.

[4] Removal of stones from the surface may be necessary.

manure; harvest of crops with the smallest possible loss; efficient combination of practices used; and timely operations.

Use of the Soils for Woodland [3]

Hardwood forests originally covered almost all of Saline County. The Conservation Needs Inventory (*17*) shows that there were 34,900 acres of privately owned woodland (which includes 600 acres owned by the State of Illinois) in Saline County in 1967. Another 10,920 acres is in Shawnee National Forest. The total acreage of woodland makes up about 19 percent of the land area. Most of this woodland is in areas that can produce hardwoods of high quality.

In table 3, the soils of Saline County are placed in woodland suitability groups (*8*) on the basis of soil characteristics that affect the production of timber. A group is composed of kinds of soils that are capable of producing similar kinds of wood crops that need similar management to produce these crops in places where the vegetation is similar. In each group the soils are described briefly, both site index and average annual growth in board feet are given, and the hazards and limitations that affect the use of soils for woodland are rated. Also shown are preference ratings for trees in existing stands and for species suitable for planting.

Each woodland group is identified by a three-part symbol, such as 1o4, 2w3, or 3s2. The first part of the symbol, always a number, indicates relative potential productivity of the soils in the groups: 1 = very high; 2 = high; 3 = moderately high; 4 = moderate; and 5 = low.

The second part of the symbol identifying a woodland group is a small letter. This letter indicates an important soil property that imposes a slight to severe hazard or limitation in managing the soils of the group for wood crops. A letter *o* shows that the soils have few limitations that restrict their use for trees; *r* shows that the main limitation is steep slopes; *t* shows that, within the rooting zone, excessive alkalinity, acidity, sodium salts, or other toxic substances are present that limit or impede development of trees; *w* shows that water in or on the soil, either seasonally or year round, is the chief limitation.

The third part of the symbol indicates the degree of hazard or limitation.

The numeral *1* indicates soils on uplands and terraces on which all management hazards or limitations exclusive of plant competitors are rated slight. The numeral *2* indicates soils on uplands and terraces on which one or more management hazards or limitations exclusive of plant competitors are rated moderate. The numeral *3* indicates soils on uplands and terraces on which one or more management hazards or limitations exclusive of plant competition are rated severe. The numeral *4* indicates soils on bottom lands on which all management hazards or limitations exclusive of plant competition are rated slight. The numeral *5* indicates soils on bottom lands on which one or more management hazards or limitations exclusive of plant competition are rated moderate. The numeral *6* indicates soils on bottom lands on which one or more management hazards or limitations exclusive of plant competition are rated severe.

The potential productivity of a soil for a given species is commonly expressed as site index. It is the height, in feet, that the dominant trees of a given species, growing on a specified soil, will reach at a specified age. The site index for cottonwood is based on height at 30 years of age (*4*), and for other species, on height at 50 years of age.

The estimated average annual growth per acre is given in board feet measured by the Doyle Rule. The estimates are based on data from well-stocked, well-managed stands of upland oaks, pin oak, yellow-poplar, and cottonwood (*9, 10*). Red oak and white oak were used to estimate the rate of growth for all upland oaks.

The hazards or limitations that affect management of soils for woodland in Saline County are seedling mortality, plant competition, erosion hazard, and equipment limitations.

Seedling mortality is the failure of seedlings to grow in a soil after natural seeding or after seedlings have been planted. It is affected by the nature of the soil and by other environmental factors when plant competition is assumed not to be a limiting factor. The ratings for seedling mortality given in this survey are for trees in a natural environment. Mortality is *slight* if not more than 25 percent of the planted seedlings die, or if trees ordinarily regenerate naturally in places where there are enough seeds. It is *moderate* if 25 to 50 percent of the seedlings die, or if trees do not regenerate naturally in numbers needed for adequate restocking. In some places, replanting to fill open spaces is necessary. Mortality is *severe* if more than 50 percent of the planted seedlings die, or if trees do not ordinarily reseed naturally in places where there are enough seeds.

Plant competition ratings are determined by the rate that unwanted trees, shrubs, and weeds vegetate a site in places where openings are made in the canopy. The presence of well-stocked stands of desirable seedlings is assumed. A rating of *slight* indicates that competition from other plants is no special concern. Undesirable plant species will not impede the growth of desirable plant species. Plant competition is *moderate* if unwanted plants develop but generally do not prevent the establishment of an adequate stand of desirable species. Establishment may be delayed and initial growth slowed. A *severe* rating indicates that plant competition prevents desirable trees from restocking naturally. Special management and careful preparation of the site are necessary.

Erosion hazard is rated according to the risk of erosion on well-managed woodland that is not protected by special practices. It is *slight* where only a slight loss of soil is expected. Generally, the hazard of erosion is slight if slopes range from 0 to 12 percent and runoff is slow or very slow. The erosion hazard is *moderate* if the loss of soil is moderate in places where runoff is not controlled and the vegetative cover is not adequate for protection. It is *severe* if there are steep slopes, rapid runoff, slow infiltration, and slow permeability.

Equipment limitations depend on soil characteris-

[3] WILLIAM CLARK, woodland conservationist, Soil Conservation Service, assisted in the preparation of this section.

TABLE 3.—*Suitability of*

[The woodland classification of each individual soil is shown in

Woodland suitability group [1]	Potential productivity			Management concerns	
	Species	Site index	Average annual growth per acre	Seedling mortality	Plant competition
			Board feet		
Group 1o4: Well drained and moderately well drained soils on bottom lands; less than 5 percent slopes; silt loam surface layer; moderate permeability and moderate to very high available water capacity. 72, 427 [2].	Cottonwood Yellow-poplar	>105 >95	550–650 550–650	Slight	Moderate
Group 1r2: Well drained and moderately well drained soils on uplands; 12 to 30 percent slopes; silt loam surface layer and loam and clay loam subsoil; moderate permeability and moderate or high available water capacity. 8E, 8E3, 8F.	Upland oaks Yellow-poplar	>85 >95	350–450 550–650	Slight	Moderate
Group 2o1: Well drained, moderately well drained, and somewhat poorly drained soils on uplands and terraces; 0 to 12 percent slopes; silt loam surface layer and silty clay loam subsoil; moderate or moderately slow permeability and moderate or high available water capacity. 148, 14C2, 14D2, 14D3, 214B [3], 214C2, 214D2, 214D3, 467C2, 467D3, 482A, 482B, 484 [3], 723.	Upland oaks Yellow-poplar	75–85 85–95	250–350 450–550	Slight	Slight to moderate.
Group 2o4: Somewhat poorly drained soils on bottom lands; slopes generally less than 2 percent; silt loam surface layer and underlying layer; moderately slow permeability and very high available water capacity. 382.	Cottonwood Yellow-poplar	95–100 85–95	450–550 450–550	Slight	Slight
Group 2r2: Well-drained soils on uplands; 12 to 30 percent slopes; silt loam surface layer and silty clay loam, loam, or clay loam subsoil; moderate permeability and moderate available water capacity. 339E, 339F.	Upland oaks Yellow-poplar	75–85 85–95	250–350 450–550	Slight to moderate.	Slight
Group 2w5: Poorly drained soils on bottom lands; less than 2 percent slopes; silt loam or silty clay loam surface layer and subsoil; slow permeability and high available water capacity. 108, 142 [4], 420, 422.	Pin oak	85–95	350–450	Moderate	Severe

the soils for trees

the "Guide to Mapping Units." The symbol > means more than]

Management concerns—Continued		Species to favor in existing stands		Species to plant	
Erosion hazard	Equipment limitations	More desirable	Less desirable	Uneroded or eroded soils	Severely eroded soils
Slight	Slight	Cottonwood, sycamore, yellow-poplar, cherrybark oak, sweetgum, white ash, southern red oak, silver maple.	Hickory, boxelder, blackgum.	Cottonwood, black walnut [2], sycamore, cherrybark oak, pin oak, sugar maple, sweetgum, red maple, pecan.	No severely eroded soils in this group.
Moderate	Moderate	White oak, red oak, yellow-poplar, white ash, black oak.	Hickory, black oak, beech, sassafras, blackgum.	*Cool sites:* black walnut, sweetgum, yellow-poplar, white oak, ash, red oak, sugar maple. *Hot sites:* ash, loblolly pine.	*Cool sites:* white pine, loblolly pine, shortleaf pine, Scotch pine. *Hot sites:* shortleaf pine, loblolly pine, Scotch pine.
Slight	Slight	White oak, red oak, yellow-poplar, black walnut, sweetgum, white ash, sycamore, soft maple.	Hickory, soft maple, persimmon.	Cottonwood, sweetgum, yellow-poplar, white oak, red oak, ash, sycamore, white pine, loblolly pine, shortleaf pine, sugar maple.	White pine, loblolly pine, shortleaf pine, Scotch pine.
Slight	Slight	Cottonwood, sycamore, yellow-poplar, sweetgum, pin oak.	Blackgum, hickory, boxelder.	Cottonwood, red maple, sycamore, sweetgum, cypress, pin oak, water tupelo, silver maple.	No severely eroded soils in this group.
Moderate	Moderate	White oak, black walnut, red oak, yellow-poplar.	Hickory, soft maple, persimmon, post oak.	*Cool sites:* black walnut, cottonwood, sweetgum, yellow-poplar, white oak, red oak, ash, sycamore, white pine, loblolly pine, shortleaf pine, sugar maple. *Hot sites:* ash, loblolly pine.	No severely eroded soils in this group.
Slight	Moderate	Pin oak, cottonwood, sweetgum, cherrybark oak, sycamore.	Honeylocust, hickory, willow.	Cottonwood, red maple, sycamore, sweetgum, cypress, pin oak, water tupelo.	No severely eroded soils in this group.

TABLE 3.—*Suitability of*

Woodland suitability group[1]	Potential productivity			Management concerns	
	Species	Site index	Average annual growth per acre	Seedling mortality	Plant competition
			Board feet		
Group 3o1: Somewhat poorly drained and moderately well drained soils on uplands and terraces; 0 to 7 percent slopes; silt loam surface layer and silty clay loam or silty clay subsoil; moderately slow, slow, and very slow permeability and moderate or high available water capacity. 3B[3], 13A, 13B, 122B, 164A, 164B, 173, 337, 338, 787.	Upland oaks	65–75	150–250	Slight	Slight to moderate.
Group 3r2: Well-drained soils on uplands; 7 to 30 percent slopes; silt loam or loam surface layer and loam, silt loam, silty clay loam, or clay loam subsoil; channery, flaggy, or stony in part or all of soil; moderate and moderately rapid permeability and low or moderate available water capacity. 786D3, 786E, 786F, 986F, 986G[3].	Upland oaks	65–75	150–250	Moderate to severe.	Slight
Group 3w6: Poorly drained soils on bottom lands; less than 2 percent slopes; silt loam to silty clay surface layer and silt loam to silty clay subsoil; slow and very slow permeability and moderate or high available water capacity. 71, W108, 109, 426, 524, 524+.	Pin oak	75–85	350–450	Severe	Moderate to severe.
Group 3d2: Moderately well drained soils on uplands; 2 to 18 percent slopes; silt loam surface layer and silt loam or silty clay loam subsoil; moderately permeable in the upper part of the subsoil and slow or very slow permeability in the fragipan; moderate available water capacity. 301B, 301C2, 301D2, 301D3, 340D2, 340D3, 340E2, 340E3.	Upland oaks	65–75	150–250	Moderate	Slight
Group 4w2: Poorly drained soils on uplands; less than 3 percent slopes; silt loam surface layer and silty clay loam or silty clay subsoil; very slow permeability and moderate available water capacity. 165.	Pin oak	65–75	150–200	Moderate	Severe
Group 4t3: Poorly drained soils on uplands; less than 3 percent slopes; silt loam surface layer and silty clay loam subsoil; very slow permeability and low available water capacity. Rooting is restricted by high sodium content and poor physical properties of the soils. 120[3].					

[1] Orthents (803C and 803F) and Orthents, acid (804F) are not placed in any woodland suitability group.
[2] Burnside silt loam (427) requires onsite investigation to determine suitability for planting walnut.
[3] Ava and Hosmer soils contain a fragipan that somewhat restricts rooting depth, permeability, and available water capacity.

the soils for trees—Continued

Management concerns—Continued		Species to favor in existing stands		Species to plant	
Erosion hazard	Equipment limitations	More desirable	Less desirable	Uneroded or eroded soils	Severely eroded soils
Slight	Slight to moderate.	White oak, red oak, ash, bur oak.	Post oak, hickory, blackgum, blackjack oak, persimmon.	Shortleaf pine, loblolly pine, white pine, white oak, white ash, sycamore.	No severely eroded soils in this group.
Moderate	Moderate	Red oak, white oak, black oak, redcedar, bur oak.	Hickory, blackjack oak, post oak.	Shortleaf pine, loblolly pine, white pine, redcedar.	Shortleaf pine, loblolly pine, redcedar.
Slight	Severe	Cypress, tupelo gum, swamp white oak, swamp chestnut oak.	Willow, birch, hickory.	Cypress	No severely eroded soils in this group.
Moderate	Slight where slope is 0 to 12 percent. Moderate where slope is 12 to 30 percent.	White oak, red oak, black oak, white ash.	Hickory, sassafras.	*Cool sites:* white pine, loblolly pine, white ash, white oak, Scotch pine, shortleaf pine. *Hot sites:* loblolly pine, Scotch pine, shortleaf pine.	*Cool sites:* white pine, loblolly pine, Scotch pine, shortleaf pine. *Hot sites:* shortleaf pine, loblolly pine, Scotch pine.
Slight	Moderate	Pin oak, white oak, black oak, green ash.	Hickory, blackjack oak, post oak.	Cypress, pin oak, green ash, water tupelo, red maple, sweetgum.	No severely eroded soils in this group.
				Cool sites: green ash, eastern redcedar.	

[4] Trees seldom grown on this soil, but it is included in this group because it is adapted to those species listed in the planting guide.

[5] This soil has similar ratings to others in this group except that it has severe erosion hazard and equipment limitations because of slope.

TABLE 4.—*Suitability of*

Wildlife group	Elements of wildlife habitat			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood plants
Group 1: Well drained and moderately well drained, nearly level to strongly sloping soils on uplands and terraces. 14B, 14C2, 14D2, 14D3, 122B, 214B, 214C2, 214D2, 214D3, 301B, 301C2, 301D2, 301D3, 340D2, 340D3, 467C2, 467D3, 482A, 482B, 786D3.	Good where slope is 0 to 7 percent. Fair where slope is 7 to 12 percent. Poor where slope is 7 to 12 percent and the soils are severely eroded.	Good. Fair where the soils are severely eroded.	Good	Good
Group 2: Well drained and moderately well drained, moderately steep soils on uplands and terraces. 8E, 8E3, 339E, 340E2, 340E3, 786E, 803C.	Poor: slope severely limits use. Very poor where the soils are severely eroded.	Fair: slope somewhat limits use. Poor where the soils are severely eroded.	Good	Good
Group 3: Well drained and moderately well drained, steep and very steep soils on uplands. 8F, 339F, 786F, 803F, 804F, 986F, 986G.	Very poor: slope very severely limits use; 986F and 986G are stony.	Fair where slope is 18 to 30 percent. Very poor where slope exceeds 30 percent; 986F and 986G are stony.	Good	Good
Group 4: Somewhat poorly drained, nearly level to gently sloping soils on uplands and terraces. 3B, 13A, 13B, 164A, 164B, 173, 337, 338, 484, 723.	Good in drained areas. Fair in undrained areas; wetness.	Good in drained areas. Fair in undrained areas; wetness.	Good	Good
Group 5: Somewhat poorly drained, nearly level soils on bottom lands. 382, 787.	Good in drained areas. Fair in most areas; wetness and flooding.	Good in drained areas. Fair in most areas; wetness and flooding.	Good	Good
Group 6: Very poorly drained and poorly drained, nearly level soils on uplands, terraces and bottom lands. 71, 108, W108, 109, 120, 142, 165, 420, 422, 426, 524, 524+.	Good in drained areas. Poor in undrained areas; wetness; flooding or ponding limits growth. Very poor on W108: wetness.	Good in drained areas. Poor in undrained areas; wetness; flooding or ponding limits growth.	Good in drained areas. Fair in undrained areas; wetness; flooding or ponding limits growth. Poor on W108: wetness.	Good in drained areas. Fair in undrained areas. Poor on bottom-land soils: subject to flooding; wetness on W108.
Group 7: Well drained and moderately well drained, nearly level soils on bottom lands. 72, 427.	Good in most areas; flooding.	Good in most areas; flooding.	Good	Good: subject to flooding.

tics and topographic features that restrict the use of equipment in planting, tending, or harvesting trees. Limitations are *slight* if there are no restrictions on the type of equipment or on the time of year that equipment can be used. They are *moderate* if slopes are moderately steep, if heavy equipment is restricted by wetness in winter and early in spring, or if the use of equipment damages the tree roots to some extent. Equipment limitations are *severe* if many types of equipment cannot be used, if the time the equipment cannot be used is more than 3 months per year, or if the use of equipment severely damages the roots of trees and the structure and stability of the soil.

Species to favor in existing stands. Trees listed as *more desirable* are those that have high market value and that grow well on the specified group of soils. They should be protected and favored in existing stands. Trees listed as *less desirable* have low market value or undesirable growth habits. They should be discouraged or removed to allow for the growth of more desirable trees.

Species to plant. Trees are listed in order of their suitability for planting, both in areas that are not severely eroded and in areas that are severely eroded, and on hot sites and cool sites.

Cool sites include the lower two-thirds of all slopes facing north, northwest, northeast, and east; slopes of less than 12 percent on ridgetops more than 600 feet wide, or that are on gently rolling terrain; and coves, foot slopes, stream terraces, and bottom lands.

Hot sites include all slopes of more than 12 percent facing southeast, south, southwest, and west; narrow

the soils for wildlife

Elements of wildlife habitat—Continued		Kinds of wildlife		
Wetland plants	Shallow-water developments	Openland wildlife	Woodland wildlife	Wetland wildlife
Very poor: no suitable plant species for food and cover.	Very poor: water table too deep.	Good. Fair where the soils are severely eroded.	Good. Fair where the soils are severely eroded.	Very poor: no suitable wetland food and cover plants; water supply limited.
Very poor: no suitable plant species for food and cover.	Very poor: slope very severely limits use; water table too deep.	Fair: production of grain and seed crops severely limited. Poor where the soils are severely eroded.	Good: production of grasses and legumes limited.	Very poor: no suitable wetland food and cover plants; water supply limited.
Very poor: no suitable plant species for food and cover.	Very poor: slope very severely limits use; water table too deep; 986F and 986G are stony.	Poor: unsuited to production of grain and seed crops.	Fair: production of grasses and legumes limited.	Very poor: no suitable wetland food and cover plants; water supply limited.
Fair: limited number of suitable plant species for food and cover.	Fair: water table too deep.	Good	Good	Fair: water supply and suitable wetland food and cover plants limited.
Fair: limited number of suitable plant species for food and cover.	Fair: water table too deep.	Good: production of grain and seed crops moderately limited in undrained areas.	Good in drained areas. Fair in undrained areas; growth of grasses and legumes limited.	Fair: limited number of suitable wetland food and cover plants; water supply limited.
Good in undrained areas. Poor in drained areas; limited number of suitable plant species for food and cover.	Good in undrained areas; bottom-land soils subject to flooding. Fair in drained areas; water supply limited.	Good in drained areas. Fair in undrained areas; grain and seed crops severely limited.	Good in drained areas. Fair in undrained areas; growth of food and cover plants limited.	Good in undrained areas. Fair in drained areas; limited number of suitable wetland food and cover plants.
Poor: limited number of suitable plant species for food and cover in some areas.	Very poor: water table too deep.	Good in most areas; subject to flooding.	Good	Poor: water supply severely limited in most areas; severely limited number of suitable wetland food and cover plants in most areas.

ridgetops less than 600 feet wide; and the upper third of the northerly and easterly slopes of the ridges. Moisture evaporates more rapidly, leaf litter decays more readily, and productivity is lower than on the cooler north-facing slopes.

Use of the Soils for Wildlife[4]

Wildlife in Saline County can be classified into three major groups: openland, woodland, and wetland. Soils in the county have potential for habitat development for all three kinds of wildlife (*1*).

In table 4, the soils are placed in seven groups and rated according to their suitability for elements of wildlife habitat and for kinds of wildlife. The ratings are *good, fair, poor,* and *very poor.* A rating of good means that habitats are easily established, improved, or maintained. A rating of fair indicates that the soils have moderate limitations for establishing and maintaining habitats. A poor rating means that the soils have severe limitations for establishing and maintaining habitats. Habitat management may be difficult and expensive. A very poor rating means it is generally impractical to establish and maintain wildlife habitats on these soils.

The six elements of wildlife habitat and the three kinds of wildlife shown in table 4 are defined in the following paragraphs.

Grain and seed crops.—These are domestic grains or seed-producing annual plants that include such

[4] REX HAMILTON, wildlife biologist, Soil Conservation Service, assisted in the preparation of this section.

Figure 11.—Grasses, forbs, and shrubs on Hosmer and Zanesville soils provide food and cover for wildlife. In the background is part of Glenn O. Jones Lake, a popular fishing spot.

crops as corn, sorghum, wheat, oats, soybeans, buckwheat, and sunflower.

Grasses and legumes.—These are domestic perennial grasses and legumes that include such crops as brome, fescue, timothy, redtop, orchardgrass, reed canarygrass, clovers, trefoil, alfalfa, sericea, and lespedeza.

Wild herbaceous plants.—These are native or introduced perennial grasses and forbs that provide food and cover mainly for upland wildlife. These plants include bluestem, indian grass, wheatgrasses, wild rye, oatgrasses, pokeweed, strawberries, lespedeza, tick clovers, wild beans, jewelweed, and ragweed.

Hardwood plants.—These are deciduous trees, shrubs, and woody vines that produce fruits, nuts, buds, catkins, twigs (browse), or foliage used extensively as food by wildlife. These plants, commonly established by natural processes but also planted, include oak, cherry, hawthorns, dogwoods, viburnums, hazel, maple, birch, ash, grapes, sumac, briers, greenbriers, and roses.

Wetland plants.—These are annual and perennial wild herbaceous plants, excluding submerged or floating aquatic plants, that grow on moist or wet sites. These plants, used mainly by wetland wildlife for food or cover, include smartweeds, wild millets, rushes, sedges, reeds, rice, cutgrass, mannagrass, bluejoint, cord grasses, cattails, pondweeds, wild celery, and spatterdocks.

Shallow-water developments.—These are impoundments or excavations generally not more than 5 feet deep. Examples are low dikes and levees, shallow dugouts, level ditches, and devices for controlling the water level on marshy streams or channels.

Soils are not rated for ponds in table 4. However, this type of pond attracts migratory waterfowl and can be used for freshwater fish. Features affecting the use of soils for impounded farm ponds are given in table 7, "Interpretations of engineering properties of the soils."

Openland wildlife.—Included are quail, mourning dove, meadowlark, cottontail rabbit, red fox, and other birds and mammals that normally live on cropland, pastures, hayland, and other areas overgrown with grasses, forbs, and shrubs. Wildlife habitat elements used to rate the soils for this kind of wildlife are grain and seed crops, grasses and legumes, wild herbaceous plants, and hardwood plants (fig. 11).

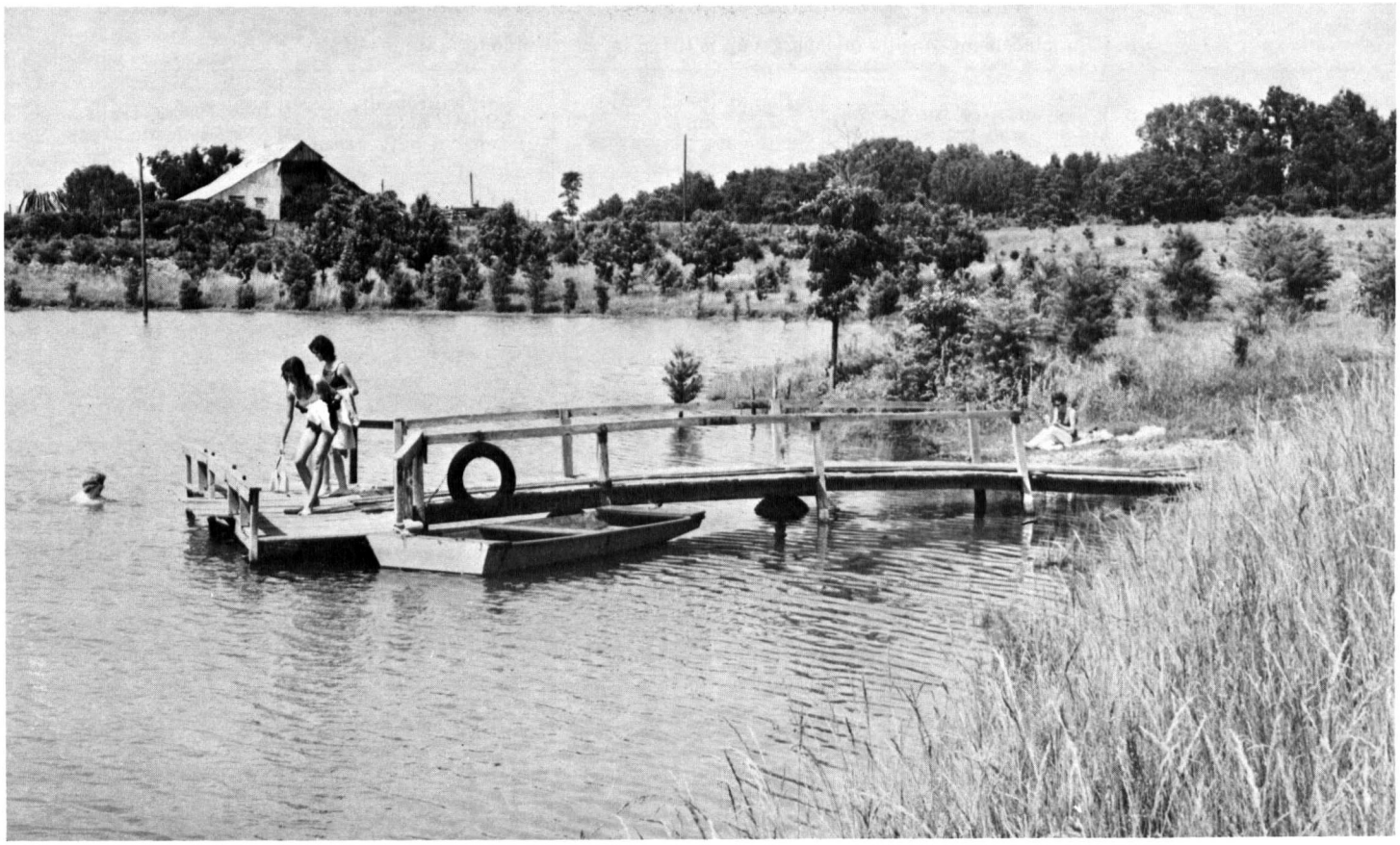

Figure 12.—**This pond cradled by the fragipan of strongly sloping Ava soil provides a setting and a source of water for family recreation.**

Woodland wildlife.—Included are squirrel, white-tailed deer, raccoon, chipmunks, woodpeckers, nuthatches, and other birds and mammals that frequent wooded areas consisting of hardwood trees and shrubs. Wildlife habitat elements used to rate the soils for this kind of wildlife are grasses and legumes, wild herbaceous plants, and hardwood plants.

Wetland wildlife.—Included are various kinds of waterfowl, muskrat, mink, kingfisher, red-winged blackbird, and other birds and mammals that normally live in wet areas such as ponds, marshes, and swamps. Wildlife habitat elements used to rate the soils for this kind of wildlife are wetland plants and shallow-water developments.

Recreational Uses of the Soils [5]

Saline County has a high potential for outdoor recreation activities. Hilly terrain, wooded slopes, panoramic views, rocky formations, lakes and ponds, streams, and plains provide amenities for study or contemplation, scenic settings for camping or similar activities, and a varied background for recreational development (fig. 12).

Knowledge of soils is necessary in planning, developing, and maintaining areas used for recreation. In table 5, the soils of Saline County are rated according to limitations that affect their suitability for camp areas, playgrounds, picnic areas, and paths and trails.

The soils are rated as having *slight, moderate,* or *severe* limitations for the specified uses. A limitation of *slight* means that soil properties are generally favorable and limitations are so minor that they can be easily overcome. A *moderate* limitation can be overcome or modified by planning, by design, or by special maintenance. A *severe* limitation means that costly soil reclamation, special design, or intense maintenance, or a combination of these, is required.

Campsites for tents and trailers are used for tents and small camp trailers and the accompanying activities of outdoor living. Little preparation of the site is required, other than shaping and leveling for tent and parking areas. Camp areas are subject to foot traffic and limited vehicular traffic. The best soils have mild slopes, good drainage, a surface free of rocks and coarse fragments, freedom from flooding during periods of heavy use, and a surface that is firm after rains but not dusty when dry.

Picnic areas, parks, and extensive play areas are attractive natural or landscaped tracts used mainly for preparing meals and eating outdoors. These areas are subject to foot traffic. Most of the vehicular traffic, however, is confined to access roads. The best soils are firm when wet but not dusty when dry; are free of

[5] BRUCE CURRIE, soil scientist, Soil Conservation Service, assisted in the preparation of this section.

TABLE 5.—*Limitations of the soils for recreational uses*

[The placement of soils in each group is listed in the "Guide to Mapping Units"]

Recreation groups	Campsites for tents and trailers	Picnic areas, parks, and extensive play areas	Playgrounds, athletic fields, and intensive play areas	Paths, trails, and scenic areas [1]
Group 1. Moderately well drained soils on uplands and terraces; 0 to 7 percent slopes; silt loam surface layer; moderate permeability in upper part of soil and moderate to very slow permeability in lower part of subsoil. 14B, 14C2, 122B, 214B, 214C2, 301B, 301C2, 467C2, 482A, 482B.	Moderate: slow to dry out.	Slight	Slight where slope is 0 to 2 percent. Moderate where slope is 2 to 7 percent.	Slight: gently rolling terrain or ridgetops; some soils are on high linear ridges.
Group 2. Moderately well drained and well drained soils on uplands and terraces; 7 to 15 percent slopes; eroded and severely eroded; moderate to very slow permeability in lower part of subsoil. 14D2, 14D3, 214D2, 214D3, 301D2, 301D3, 340D2, 340D3, 467D3, 786D3.	Moderate: strongly sloping; slow to dry out; surface layer sticky where wet; erosion and dust hazard; difficult to grow and maintain vegetation.	Moderate: strongly sloping; slow to dry out; surface layer sticky where wet; erosion and dust hazard; difficult to grow and maintain vegetation.	Severe: strongly sloping; slow to dry out; surface layer sticky where wet; erosion and dust hazard; difficult to grow and maintain vegetation.	Slight: strongly sloping hillsides; some soils are adjoining ridgetops and bottom lands.
Group 3. Moderately well drained and well drained soils on uplands; 12 to 60 percent slopes; mainly silt loam or loam surface layer, some areas stony; moderate or moderately rapid permeability but slow in fragipan. 8E, 8E3, 8F, 339E, 339F, 340E2, 340E3, 786E, 786F, 986F, 986G.	Severe: moderately steep to very steep; 986F and 986G are stony; erosion hazard; difficult to maintain vegetation.	Severe: moderately steep to very steep; 986F and 986G are stony; erosion hazard; difficult to maintain vegetation.	Severe: moderately steep to very steep; 986F and 986G are stony; erosion hazard; difficult to maintain vegetation.	Moderate where slope is 12 to 25 percent. Severe where slope is more than 25 percent; 986F and 986G are stony; difficult to maintain vegetation. Generally on long slopes where elevation change is significant; mainly wooded; rock formations and escarpments in some places.
Group 4. Somewhat poorly drained soils on uplands and terraces; 0 to 4 percent slopes; moderate to slow permeability; silt loam or silty clay loam surface layer. 3B, 13A, 13B, 142 [2], 164A, 164B, 173, 337, 338, 484, 723.	Moderate: slow to dry out; possible overflow after storms on 337.	Moderate: slow to dry out; possible overflow after storms on 337.	Moderate: slow to dry out; possible overflow after storms on 337.	Moderate: slow to dry out. Nearly level to gently sloping terrain.
Group 5. Poorly drained soils on uplands and terraces; 0 to 2 percent slopes; silt loam surface layers. 109, 120, 165.	Severe: slowly permeable; slow to dry out; possible standing water or overflow after storms; turf easily damaged when wet.	Severe: slowly permeable; slow to dry out; possible standing water or overflow after storms; turf easily damaged when wet.	Severe: slowly permeable; slow to dry out; possible standing water or overflow after storms; turf easily damaged when wet.	Severe: slowly permeable; slow to dry out. Nearly level terrain or plains.

TABLE 5.—*Limitations of the soils for recreational uses*—Continued

Recreation groups	Campsites for tents and trailers	Picnic areas, parks, and extensive play areas	Playgrounds, athletic fields, and intensive play areas	Paths, trails, and scenic areas [1]
Group 6. Well drained to somewhat poorly drained soils on bottom lands; 0 to 3 percent slopes; moderate or moderately slow permeability except slow in dense subsoil and moderately rapid in coarse textured layers; silt loam surface layers. 72, 382, 427, 787.	Severe: subject to flooding; 382 and 787 slow to dry out.	Severe: subject to flooding; 382 and 787 slow to dry out.	Severe or moderate: subject to flooding; 382 and 787 slow to dry out.	Slight or moderate: subject to flooding; 382 and 787 slow to dry out. Contains streams; generally enclosed by strongly sloping or steep wooded hillsides.
Group 7. Poorly drained soils on bottom lands; 0 to 2 percent slopes; slow permeability; silt loam or silty clay loam surface layers. 108, W108, 420.	Severe: subject to flooding; slowly permeable; slow to dry out; standing water after storms; turf easily damaged when wet.	Severe: subject to flooding; slowly permeable; slow to dry out; standing water after storms; turf easily damaged when wet.	Severe: subject to flooding; slowly permeable; slow to dry out; standing water after storms; turf easily damaged when wet.	Severe: subject to flooding; slowly permeable; slow to dry out; standing water after storms. Nearly level flood plains; streams generally nearby.
Group 8. Poorly drained and very poorly drained soils on bottom lands and low-lying terraces; 0 to 2 percent slopes; very slow or slow permeability; silty clay or silty clay loam surface layers except for silty overwash. 71, 422, 426, 524, 524+.	Severe: subject to flooding; slowly permeable; slow to dry out; standing water after storms; bare surface soil sticky and slippery when wet.	Severe: subject to flooding; slowly permeable; slow to dry out; standing water after storms; bare surface soil sticky and slippery when wet.	Severe: subject to flooding; slowly permeable; slow to dry out; standing water after storms; bare surface soil slippery and sticky when wet.	Severe: subject to flooding; slowly permeable; slow to dry out; standing water after storms; bare surface soil sticky and slippery when wet. Nearly level flood plains or low-lying terraces.

[1] Land features such as configuration of the soil unit, presence of streams, and the natural vegetation are noted but are not included in the rating.

[2] This soil is naturally poorly drained but excess water is removed by tile drainage from most areas.

flooding during the season of use; and do not have slopes or stoniness that greatly increases cost of leveling sites or of building access roads.

Playgrounds, athletic fields, and intensive play areas are areas used intensively for baseball, football, badminton, and similar organized games. Soils suitable for this use need to withstand intensive foot traffic. The best soils have a nearly level surface free of coarse fragments and rock outcrops, good drainage, freedom from flooding during periods of heavy use, and a surface that is firm after rains but not dusty when dry. If grading and leveling are required, depth to rock is important.

Paths, trails, and scenic areas are used for local and cross-country travel by foot or horseback. Design and layout should require little or no cutting and filling. The best soils are at least moderately well drained, are firm when wet but not dusty when dry, are flooded not more than once during the season of use, have slopes of less than 15 percent, and have few or no rocks or stones on the surface.

Attractiveness of the general surroundings is important to those who engage in these activites. Areas of distinctive natural environment have esthetic and cultural interest and attract people to enjoy these areas or to study them. Therefore, associated land features such as configuration of the soil unit, presence of streams, and natural vegetation are noted, although these are not included in the rating.

Cottages, services, or utility buildings and streets or roads are necessary to most recreational development. Soil information on sites for small buildings is in table 7 in the columns "Septic tank absorption fields," "Sewage lagoons," "Shallow excavations," and "Dwellings without basements." Information concerning streets or roads is found in the columns "Local roads and streets" and "Road fill."

Engineering Uses of the Soils [6]

This section is useful to those who need information about soils used as structural material or as foundation upon which structures are built. Among those who can benefit from this section are planning commissioners, town and city managers, land developers, engineers, contractors, and farmers.

Among properties of soils important in engineering are permeability, shear strength, compaction characteristics, soil drainage condition, shrink-swell potential, grain size, plasticity, and pH, or reaction. Also

[6] EDWIN SHERADEN, civil engineer, Soil Conservation Service, assisted in the preparation of this section.

important are depth to the seasonal water table, depth to bedrock, and steepness of slope. These properties, in various degrees and combinations, affect construction and maintenance of roads, airports, pipelines, foundations for small buildings, irrigation systems, ponds and small dams, and systems for disposal of sewage and refuse.

Information in this section of the soil survey can be helpful to those who:

1. Select potential residential, industrial, commercial, and recreational areas;
2. Evaluate alternate routes for roads, highways, pipelines, and underground cables;
3. Seek sources of gravel, sand, or clay;
4. Plan farm drainage systems, irrigation systems, ponds, terraces, or other structures for controlling water and conserving soils;
5. Correlate performance of structures built with the properties of soil on which they were built for predicting the performance of structures on the same or similar kinds of soil in other locations;
6. Predict the trafficability of soils for cross-country movement of vehicles and construction equipment; or
7. Develop preliminary estimates pertinent to construction in a particular area.

This information, along with the soil map and other sections of this survey, can be used to make additional interpretations and other useful maps.

This information, however, does not eliminate the need for further investigation at sites selected for engineering works, especially works that involve heavy loads or that require excavations to depths greater (more than 5 feet) than those generally shown in the tables. Also, inspection of sites is needed because many areas of a given soil mapping unit may contain small areas of other kinds of soil that have contrasting properties and different suitabilities or limitations for soil engineering.

Some of the terms used in this soil survey have special meaning to soil scientists but are not commonly known to engineers. The Glossary defines most of these terms. The information in this section is in tables 6, 7, and 8, which show, respectively, estimated soil properties significant in engineering, interpretations of engineering properties of the soils, and engineering test data.

Engineering classification systems

The two systems commonly used in classifying samples of soils for engineering are the Unified system (*3*) used by SCS engineers, the Department of Defense, and others, and the AASHTO system (*2*) adopted by the American Association of State Highway and Transportation Officials.

In the Unified system soils are classified according to particle-size distribution, plasticity, liquid limit, and organic matter. Soils are grouped in 15 classes. There are eight classes of coarse-grained soils, identified as GW, GP, GM, GC, SW, SP, SM, and SC; six classes of fine-grained soils, identified as ML, CL, OL, MH, CH, and OH; and one class of highly organic soils, identified as Pt. Soils on the borderline between two classes are designated by symbols for both classes; for example, CL–ML.

The AASHTO system is used in classifying soils according to those properties that affect use in highway construction and maintenance. In this system, a soil is placed in one of seven basic groups ranging from A–1 through A–7 on the basis of grain-size distribution, liquid limit, and plasticity index. In group A–1 are gravelly soils of high bearing strength, the best soils for subgrade (foundation). At the other extreme, in group A–7, are clay soils that have low strength when wet and that are the poorest mineral soils for subgrade. If laboratory data are available to justify a further breakdown, the A–1, A–2, and A–7 groups are divided as follows: A–1a, A–1b, A–2–4, A–2–5, A–2–6, A–2–7, A–7–5, and A–7–6. As an additional refinement, the engineering value of soil material can be indicated by a group index number. Group indexes range from 0, for the best material, to 20 or more for the poorest. The AASHTO classification for tested soils, with group index numbers in parentheses, is shown in table 8; the estimated classification, without group index numbers, is given in table 6 for all soils mapped in the survey area.

Estimated soil properties significant in engineering

Estimated soil properties significant in engineering are given in table 6. Evaluations are made for the typical profile of each soil series by layers sufficiently different from each other to have significance for soil engineering. The estimates are based on field observations made in the course of mapping, on test data for the specified soils and similar soils, and on experience with the same kinds of soil in other counties. Following are explanations of the columns in table 6.

Soil series are listed alphabetically and the map symbols identifying the units of each series are given.

Depth to seasonal high water table is the distance from the surface of the soil downward to the highest level water stands in the soil in most years. Those soils subject to flooding are indicated by a footnote.

Depth from the surface downward is given for each of the main horizons or layers of a soil. Estimated properties in each of the following columns are given for each layer.

The USDA texture classification is described in standard terms used by the Department of Agriculture. These terms take into account relative percentages of sand, silt, and clay in soil material that is less than 2 millimeters in diameter. "Loam," for example, is soil material that contains 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the soil contains gravel or particles coarser than sand, an appropriate modifier is added, for example, "gravelly loam." Terms used in the USDA textural classification are defined in the Glossary.

The Unified and AASHTO classification systems hae been briefly defined in the preceding section.

The percent of particles or fragments larger than 3 inches of the total soil mass is given.

Information on grain-size distribution as estimated percentage of material passing through no. 4 sieve (4.7 millimeters), no. 10 sieve (2.0 millimeters), no. 40 sieve (0.42 millimeters), and no. 200 sieve (0.074 millimeters) is given.

Liquid limit and plasticity index pertain to the effect of water on the strength and consistence of soil material. As the moisture content of a clayey soil is increased from a dry state, the material changes from a semisolid to a plastic state. If the moisture content is further increased, the material changes from a plastic to a liquid state. The plastic limit is the moisture content at which the soil material changes from the semisolid to the plastic state; the liquid limit is the moisture content at which the soil material changes from the plastic to the liquid state. The plasticity index is the numerical difference between the liquid limit and the plastic limit. It indicates the range of moisture content within which a soil material is plastic.

Permeability is that quality of a soil that enables it to transmit water or air. It is estimated on the basis of those soil characteristics observed in the field, particularly structure and texture. The estimates in table 6 do not take into account lateral seepage or such transient soil features as plowpans, surface crusts, or crayfish holes that are not consistent and inherent characteristics of the soil.

Available water capacity is the ability of soils to hold water for use by most plants. It is defined as the difference between the amount of water in the soil at field capacity and the amount in the soil at the wilting point of most crop plants.

Reaction is the degree of acidity or alkalinity of a soil, expressed in pH values. The pH value and terms used to describe soil reaction are explained in the Glossary.

Shrink-swell potential is that quality of the soil that determines its volume change with change in moisture content. Building foundations, roads, and other structures may be damaged by the shrinking and swelling of soil. The volume change of soil is influenced by the amount of moisture change and the amount and kind of clay. COLE, the coefficient of linear extensibility, is an estimate of the vertical component of swelling of a natural soil clod expressed as a decimal: *low* (0.03 COLE); *moderate* (0.03–0.06 COLE); and *high* and *very high* (0.06 COLE).

Various metals and other materials corrode when on or in the soil, and some metals and materials corrode more rapidly when in contact with specific soils than with other soils. The estimated corrosivity for *uncoated steel* (low, moderate, or high) is based on resistance to flow of electrical current, total acidity, soil drainage, soil texture, and conductivity of saturation extract. The estimated corrosivity for *concrete* (low, moderate, or high) is related to the amount of sulfates and soil texture and acidity.

Engineering interpretations

The estimated interpretations in table 7 are based on the engineering properties of soils shown in table 6, on test data for soils in this survey area and others nearby or adjoining, and on the experience of engineers and soil scientists with the soils of Saline County. In table 7, ratings are used to summarize limitations or suitability of the soils for all listed purposes other than for drainage for crops and pasture, irrigation, pond reservoirs, embankments, and terraces and diversions. For these uses, soil features to be considered in planning, installation, and maintenance are listed.

Soil limitations are indicated by the ratings *slight, moderate,* and *severe. Slight* means soil properties are generally favorable for the rated use or, in other words, limitations are minor and easily overcome. *Moderate* means that some soil properties are unfavorable but can be overcome or modified by special planning and design. *Severe* means soil properties are so unfavorable and so difficult to correct or overcome or modify by special planning and design that major soil reclamation is required.

Soil suitability is rated by the terms *good, fair,* and *poor,* which respectively have meanings approximately parallel to the terms *slight, moderate,* and *severe.*

Following are explanations of columns in table 7.

Soil series are listed alphabetically, and the map symbols identifying the units of each series are given.

Septic tank absorption fields are subsurface systems of tile or perforated pipe that distribute effluent from a septic tank into natural soil. The soil material between depths of 1½ and 5 feet is evaluated. The soil properties considered are those that affect both absorption of effluent and construction and operation of the system. Properties that affect absorption are permeability, depth to seasonal water table or bedrock, and susceptibility to flooding. Slope affects difficulty of layout and construction, risk of soil erosion, and lateral seepage or downslope flow of effluent. Large rocks or boulders increase construction costs.

Sewage lagoons are shallow ponds constructed to hold the effluent long enough at depths of 3 to 5 feet for bacterial decomposition to take place. A lagoon has a nearly level floor and sides or embankments of compacted soil material. Soil properties affecting the embankment are shear strength, compressibility, permeability of compacted material, susceptibility to piping, and compaction characteristics. A high shrink-swell potential or a high content of stones or salts also needs to be considered.

Shallow excavations are those that require digging or trenching to a depth of less than 6 feet; for example, excavations for pipelines, sewer lines, phone lines and power transmission lines, basements, open ditches, and cemeteries. Desirable soil properties are good workability, moderate resistance to sloughing, gentle slopes, absence of rock outcrops or large stones, and freedom from flooding or a high water table.

Soils are given limitation ratings for dwellings not more than three stories high that are supported by foundation footings placed in undisturbed soil. Capacity to support a load, ability to resist settlement under load, and ease of excavation are important features relating to the rating. Soil properties affecting capacity to support load are wetness, susceptibility to flooding, density, plasticity, texture, and shrink-swell potential. Those that affect excavation are wetness, slope, depth to bedrock and content of stones and rocks.

Sanitary landfill is a method of disposing of refuse in dug trenches. The waste is spread in thin layers, throughout the disposal period. Landfill areas are subject to heavy vehicular traffic. Ease of excavation, hazard of polluting ground water, and trafficability are considered. The best soils have moderately slow permeability, withstand heavy traffic, and are easy to

TABLE 6.—*Estimated soil properties*

[An asterisk in the first column indicates that at least one mapping unit is made up of two or more kinds of soil. The soil in such tions for referring to another series in the first column of the table. Data given are characteristics of the soil series and do not symbol > means greater than; the symbol < means less than]

Soil series and map symbols	Depth to seasonal high water table	Depth from surface	USDA texture	Classification		Coarse fraction greater than 3 inches	Percentage less than 3 inches passing sieve—	
				Unified	AASHTO		No. 4 (4.7 mm)	No. 10 (2.0 mm)
	Feet	*Inches*				*Percent*		
Ava: 14B, 14C2, 14D2, 14D3[3].	[3] 1½–2½	0–10	Silt loam	ML or CL	A–4 or A–6	0	100	95–100
		10–22	Heavy silt loam and light silty clay loam.	CL	A–6, A–7	0	100	100
		22–61	Silty clay loam and silt loam.	CL or ML	A–6	0	100	95–100
Banlic: 787	[5] 1–3	0–25	Silt loam	ML or CL	A–4	0	100	95–100
		25–62	Silt loam	ML or CL	A–4	0	100	95–100
		62–67	Silt loam	ML or CL	A–6	0	100	95–100
Belknap: 382	[6] 1–3	0–13	Silt loam	ML or CL	A–4	0	100	95–100
		13–47	Silt loam	ML or CL	A–4	0	100	95–100
		47–74	Silt loam	ML or CL	A–4	0–5	95–100	95–100
*Berks: 986G For Wellston part, see Wellston series.	>5	0–4	Channery loam	GM, ML, GC, SC	A–2 or A–4	10–40	45–80	35–55
		4–28	Very flaggy loam	GM, GC SM, SC	A–1, A–2, or A–4	15–40	30–65	25–60
		[8] 28	Bedrock					
Bluford: 13A, 13B	1–3	0–18	Silt loam	CL	A–4 or A–6	0	100	100
		18–38	Heavy silty clay loam, silty clay loam.	CL	A–7 or A–6	0	100	100
		38–63	Light silty clay loam and heavy silt loam.	CL	A–6 or A–4	0	100	95–100
Bonnie: 108, W108	[6] 0–5	0–8	Silt loam	ML or CL	A–4 or A–6	0	100	100
		8–62	Silt loam	ML or CL	A–4 or A–6	0	100	100
Burnside: 427	[6] >5	0–15	Silt loam	ML	A–4	0–5	90–100	85–100
		15–60	Very flaggy loam	GM or SM	A–2 or A–4	10–60	30–80	25–65
		[10] 60	Bedrock.					
Cape: 422	[6] 0–1	0–22	Silty clay loam	CH	A–7	0	100	100
		22–45	Silty clay	CH	A–7	0	100	100
		45–60	Silty clay loam, silty clay.	CH or CL	A–7 or A–6	0	100	100
Colp: 122B	[11] 3–5	0–9	Silt loam	ML or CL	A–4 or A–6	0	100	100
		9–55	Silty clay	CH or CL	A–7	0	100	100
		55–61	Heavy silty clay loam.	CL	A–6 or A–7	0	100	100
Creal: 337	[12] 1–3	0–24	Silt loam	ML or CL	A–4 or A–6	0	100	95–100
		24–58	Silty clay loam	CL	A–6 or A–7	0	100	95–100
		58–68	Silt loam	ML or CL	A–4 or A–6	0	100	95–100
Darwin: 71	[6] 0–1	0–36	Silty clay	CH	A–7	0	100	100
		36–74	Silty clay, silty clay loam.	CH or CL	A–7 or A–6	0	100	100
Frondorf: 786D3, 786E, 786F	>5	0–6	Silt loam	ML	A–4	0–2	95–100	95–100
		6–21	Loam, silty clay loam.	ML or CL	A–6 or A–4	0–2	95–100	95–100
		21–38	Channery loam or clay loam.	ML, CL, or GM	A–4, A–6, or A–2	5–15	75–90	60–85
		[8,9] 38	Bedrock					

significant in engineering

mapping units may have different properties and limitations, and for his reason it is necessary to follow carefully the instruc- cover extreme variations or minor inclusions within a mapping unit. Absence of an entry indicates information does not apply. The

Percentage less than 3 inches passing sieve—Continued		Liquid limit	Plasticity index	Permeability [1]	Available water capacity	Reaction	Shrink-swell potential	Corrosivity	
No. 40 (0.42 mm)	No. 200 (0.074 mm)							Uncoated steel	Concrete
		Percent		*Inches per hour*	*Inches per inch of soil*	*pH*			
95–100	95–100	21–33	10–15	0.6–2.0	0.22–0.24	5.1–6.5	Moderate	Moderate	High.
95–100	95–100	31–44	15–24	0.6–2.0	0.18–0.20	4.5–5.0	Moderate	Moderate	High.
90–100	80–95	20–38	5–26	<0.06	[4] 0.09–0.10	4.5–5.5	Moderate	Moderate	High.
90–100	85–95	20–35	5–15	0.6–2.0	0.22–0.24	4.5–6.0	Low	High	High.
90–100	85–95	20–35	5–15	<0.06	[4] 0.10–0.12	4.5–5.5	Low	High	High.
90–100	80–95	35–40	10–25	0.2–0.6	0.16–0.20	5.6–6.1	Low	High	Moderate.
95–100	85–95	21–39	2–8	0.6–2.0	0.22–0.24	5.6–6.5	Low	High	High.
90–100	80–95	22–32	[7] NP–10	0.2–0.6	0.20–0.22	5.1–5.5	Low	High	High.
85–100	75–95	22–32	NP–10	0.2–0.6	0.20–0.22	5.6–6.0	Low	High	High.
25–55	20–45	25–35	5–10	0.6–6.0	0.08–0.12	4.5–5.0	Low	Low	High.
25–40	15–35	24–35	2–10	0.6–6.0	0.06–0.10	4.5–5.0	Low	Low	High.
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95–100	90–100	20–35	10–15	0.2–0.6	0.20–0.22	4.5–5.0	Moderate	High	High.
95–100	90–100	30–45	10–25	0.06–0.2	0.15–0.18	4.5–5.0	Moderate	High	High.
90–100	85–95	25–40	5–25	0.06–0.2	[4] 0.10–0.15	4.5–5.0	Moderate	High	High.
100	95–100	27–34	8–12	0.6–2.0	0.22–0.24	6.1–6.5	Low	High	Low.
100	90–95	27–34	8–12	0.06–0.2	0.18–0.22	4.5–5.0	Low	High	High to moderate.
80–100	75–95	24–31	2–10	0.6–2.0	0.22–0.24	4.5–5.5	Low	Low	High.
30–55	25–55	<20	NP–10	2.0–6.0	0.10–0.15	4.5–5.5	Low	Low	High.
100	95–100	41–60	20–39	0.06–0.2	0.12–0.14	5.1–7.3	Very high	High	Moderate.
100	95–100	51–70	33–45	<0.06	0.11–0.13	5.1–5.5	Very high	High	Moderate.
100	95–100	45–63	22–40	0.06–0.2	0.08–0.18	5.1–5.5	High	High	Moderate.
95–100	90–100	25–35	5–15	0.2–0.6	0.22–0.24	6.1–6.5	Moderate	Moderate	Low.
95–100	90–100	40–65	20–45	0.06–0.2	0.12–0.15	4.5–7.8	High	High	High.
95–100	95–100	35–45	20–25	0.06–0.2	0.12–0.18	7.9–8.4	High	High	Low.
95–100	85–100	25–35	6–17	0.2–0.6	0.22–0.24	4.5–6.5	Low	High	High.
95–100	90–100	38–48	15–26	0.2–0.6	0.18–0.20	4.5–5.5	Moderate	High	High.
90–100	80–95	20–33	5–15	0.2–0.6	0.18–0.22	6.1–6.5	Low	High	Low.
100	95–100	50–85	30–55	<0.06	0.11–0.14	7.4–7.8	High	High	Low.
95–100	90–100	33–70	25–45	0.06–0.2	0.10–0.20	7.4–8.4	High	High	Low.
85–100	65–90	<40	NP–20	0.6–2.0	0.20–0.24	4.5–6.5	Low	Moderate	High.
85–95	60–80	<45	NP–25	0.6–2.0	0.17–0.20	4.5–5.0	Low	Moderate	High.
50–80	30–75	<45	NP–25	0.6–2.0	0.09–0.14	4.5–5.0	Low	Moderate	High.
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TABLE 6.—*Estimated soil properties*

Soil series and map symbols	Depth to seasonal high water table	Depth from surface	USDA texture	Classification		Coarse fraction greater than 3 inches	Percentage less than 3 inches passing sieve—	
				Unified	AASHTO		No. 4 (4.7 mm)	No. 10 (2.0 mm)
	Feet	*Inches*				*Percent*		
Grantsburg: 301B, 301C2, 301D2, 301D3.	[8] 1½–2½	0–9	Silt loam	ML or CL	A–4 or A–6	0	100	100
		9–23	Heavy silt loam, light silty clay loam.	CL	A–6	0	100	100
		23–37	Silty clay loam, light silty clay loam.	CL	A–6	0	100	100
		37–72	Heavy silt loam, silt loam.	CL or ML	A–4	0	100	100
Harco: 484	[11] 1–3	0–12	Silt loam	ML or CL	A–4 or A–6	0	100	95–100
		12–39	Silty clay loam	CL	A–6 or A–7	0	100	95–100
		39–72	Silt loam	ML or CL	A–4 or A–6	0	100	95–100
Hickory: 8E, 8E3, 8F	>5	0–12	Loam, silt loam	ML or CL	A–4 or A–6	0–2	95–100	90–100
		12–42	Clay loam, loam	CL	A–6 or A–7	2–4	95–100	85–95
		42–60	Loam, clay loam	ML or CL	A–4 or A–6	2–4	95–100	80–95
Hosmer: 214B, 214C2, 214D2, 214D3.	[8] 2–3	0–5	Silt loam	ML or CL	A–4 or A–6	0	100	100
		5–26	Light silty clay loam, silt loam.	CL	A–6 or A–4	0	100	100
		26–49	Heavy silt loam	CL or ML	A–6 or A–4	0	100	100
		49–62	Silt loam	ML or CL	A–4	0	100	100
Hoyleton: 3B	1–3	0–13	Silt loam	ML or CL	A–4 or A–6	0	100	100
		13–30	Silty clay loam, silty clay.	CL or CH	A–7	0	100	100
		30–60	Silt loam, loam	CL	A–7 or A–6	0	100	95–100
Huey: 120	0–1	0–12	Silt loam	ML or CL	A–4 or A–6	0	98–100	95–100
		12–32	Silty clay loam	CL	A–6 or A–7	0	100	95–100
		32–58	Silt loam, silty clay loam, loam.	CL	A–6	0	95–100	95–100
Hurst: 338	[11] 1–3	0–13	Silt loam, heavy silt loam.	CL or ML	A–4 or A–6	0	100	95–100
		13–46	Silty clay, heavy silty clay loam.	CH or CL	A–7	0	100	100
		46–62	Silty clay loam, silty clay, silt loam.	CL, CH or ML	A–7	0	100	95–100
Karnak: 426	[6] 0–1	0–14	Silty clay	CH or CL	A–7	0	100	100
		14–53	Silty clay	CH	A–7	0	100	100
		53–67	Silty clay, silty clay loam.	CH	A–7	0	100	100
Markland: 467C2, 467D3	[11] 3–5	0–7	Heavy silt loam	CL	A–6 or A–4	0	100	95–100
		7–55	Silty clay, silty clay loam.	CH or CL	A–7	0	100	100
		55–65	Silty clay loam, silty clay.	CH or CL	A–6 or A–7	0	100	95–100
McGary: 173	[11] 1–3	0–16	Silt loam, heavy silt loam.	CL or ML	A–6	0	100	100
		16–52	Silty clay, silty clay loam.	CH	A–7	0	100	100
		52–65	Silty clay loam, silt loam, silty clay.	CH or CL	A–6 or A–7	0	100	95–100
Orthents: 803C, 803F	>5	0–60	Channery loam	GM, SM, ML, CL–ML	A–2 or A–4	5–35	50–85	40–55

significant in engineering—Continued

Percentage less than 3 inches passing sieve—Continued		Liquid limit	Plasticity index	Permeability [1]	Available water capacity	Reaction	Shrink-swell potential	Corrosivity	
No. 40 (0.42 mm)	No. 200 (0.074 mm)							Uncoated steel	Concrete
		Percent		*Inches per hour*	*Inches per inch of soil*	*pH*			
100	95–100	30–38	8–16	0.6–2.0	0.22–0.24	5.1–6.0	Low	Low	Moderate.
100	95–100	30–38	8–16	0.6–2.0	0.20–0.22	4.5–5.0	Low	Moderate	High.
100	95–100	34–40	11–18	0.06–0.2	[4] 0.10–0.14	4.5–5.0	Moderate	High	High.
95–100	80–100	20–25	5–10	0.2–0.6	0.14–0.18	5.1–6.0	Low	Moderate	Moderate.
90–95	90–100	18–26	2–13	0.6–2.0	0.23–0.25	6.6–7.3	Low	High	Low.
90–95	90–100	35–45	14–27	0.6–2.0	0.20–0.22	6.1–7.3	Moderate	High	Low.
90–95	90–100	10–30	2–13	0.6–2.0	0.18–0.22	7.4–8.4	Low	High	Low.
90–100	85–95	20–35	5–15	0.6–2.0	0.20–0.24	5.1–5.5	Low	Low	Moderate.
75–95	70–85	30–50	15–30	0.6–2.0	0.15–0.19	5.1–6.0	Moderate	Low	Moderate.
70–95	60–80	20–40	5–20	0.6–2.0	0.14–0.19	6.1–7.3	Low	Low	Low.
100	80–90	27–36	9–15	0.6–2.0	0.22–0.24	6.1–6.5	Low	Low	Low.
100	80–90	27–36	9–15	0.6–2.0	0.20–0.22	4.5–5.5	Low	Moderate	High.
100	80–90	27–36	9–15	0.06–0.2	[4] 0.06–0.08	4.5–5.0	Low	Moderate	High.
95–100	80–100	27–36	9–15	0.2–0.6	0.14–0.18	4.5–5.5	Low	Moderate	High.
95–100	90–100	25–32	6–13	0.6–2.0	0.22–0.24	6.6–7.3	Moderate	Moderate	Low.
95–100	90–100	41–52	20–31	0.06–0.2	0.15–0.20	4.5–5.5	High	High	High.
90–100	80–95	30–45	20–27	0.06–0.2	0.17–0.22	6.1–7.3	Moderate	High	Low.
95–100	80–90	22–30	1–14	0.06–0.2	0.22–0.24	6.6–7.3	Low	High	Moderate.
95–100	85–95	30–48	15–24	<0.06	0.08–0.10	7.4–8.4	Moderate	Very high	High.
90–100	65–90	25–32	10–15	0.06–0.2	0.12–0.14	7.9–8.4	Moderate	Very high	High.
90–100	85–100	24–35	6–14	0.2–0.6	0.20–0.24	5.6–6.0	Moderate	High	Moderate.
95–100	90–100	43–63	22–43	<0.06	0.11–0.13	4.5–5.5	High	Very high	High.
90–100	85–100	43–63	22–43	<0.06	0.12–0.20	6.1–7.8	High	High	Low.
100	95–100	45–80	25–34	0.06–0.2	0.12–0.14	6.1–6.5	Very high	Very high	Low.
100	95–100	55–80	28–38	<0.06	0.11–0.13	6.1–6.5	Very high	Very high	Low.
100	95–100	50–75	25–34	0.06–0.2	0.10–0.18	7.4–7.8	High	High	Low.
95–100	80–90	25–35	5–15	0.2–0.6	0.21–0.24	6.6–7.3	Moderate	Moderate	Low.
95–100	85–95	45–60	25–35	0.06–0.2	0.11–0.13	5.6–8.4	High	High	Moderate.
90–100	85–95	32–60	14–35	0.06–0.6	0.09–0.11	7.4–8.4	High	High	Low.
90–100	80–90	34–38	12–15	0.6–2.0	0.21–0.24	5.6–7.3	Low	High	Moderate to low.
95–100	90–95	46–55	25–31	<0.06	0.11–0.13	5.6–7.8	High	Very high	Moderate.
95–100	85–95	38–48	12–24	<0.06	0.14–0.16	7.9–8.4	High	High	Low.
30–65	25–65	20–40	NP–10	2.0–6.0	0.02–0.16	2.0–5.0	Low	Low	Moderate to low.

TABLE 6.—*Estimated soil properties*

Soil series and map symbols	Depth to seasonal high water table	Depth from surface	USDA texture	Classification		Coarse fraction greater than 3 inches	Percentage less than 3 inches passing sieve—	
				Unified	AASHTO		No. 4 (4.7 mm)	No. 10 (2.0 mm)
	Feet	*Inches*				*Percent*		
Orthents, acid: 804F	>5	0–60	Channery loam	GM, SM, ML, CL–ML	A–2 or A–4	5–35	50–85	40–55
Patton: 142	[11] 0–1	0–13	Silty clay loam	CL	A–6	0	100	100
		13–52	Silty clay loam, silt loam.	CL, CH	A–7	0	100	100
		52–76	Silt loam, silty clay loam.	CL	A–6	0	100	100
Piopolis: 420	[6] 0–1	0–6	Silty clay loam	CL	A–6	0	100	100
		6–43	Silty clay loam	CL	A–6	0	100	100
		43–69	Silty clay loam, silt loam, silty clay.	CL	A–6	0	100	100
Racoon: 109	[5] 0–1	0–14	Silt loam	ML or CL	A–6 or A–4	0	100	95–100
		14–30	Silt loam	ML or CL	A–4 or A–6	0	100	95–100
		30–59	Silty clay loam	CL	A–6 or A–7	0	100	95–100
		59–73	Silt loam, silty clay loam, silty clay.	CL, ML	A–6, A–4	0	100	95–100
Reesville: 723	[11] 1–3	0–13	Silt loam	ML or CL	A–4	0	100	100
		13–49	Silty clay loam	CL	A–6 or A–4, A–7	0	100	100
		49–75	Silt loam, loam	ML or CL	A–4 or A–6	0	100	100
Sharon: 72	[6] 3–5	0–36	Silt loam	ML	A–4	0	100	100
		36–60	Silt loam, loam, channery loam.	ML	A–4	0–10	100	100
Stoy: 164A, 164B	1–3	0–17	Silt loam	ML or CL	A–4	0	100	100
		17–41	Silty clay loam	CL or CH	A–7	0	100	100
		41–75	Silt loam	ML or CL	A–6	0	100	100
Uniontown: 482A, 482B	[11] 3–5	0–7	Silt loam	ML	A–4	0	100	100
		7–42	Silty clay loam	CL	A–6 or A–4	0	100	100
		42–71	Silt loam, loam	ML	A–4 or A–6	0	100	100
Weir: 165	0–1	0–20	Silt loam	ML or CL	A–4 or A–6	0	100	100
		20–43	Silty clay, silty clay loam, silt loam.	CL	A–6 or A–7	0	100	100
		43–71	Silty clay loam, silt loam.	ML or CL	A–4 or A–6	0	100	95–100
*Wellston: 339E, 339F, 986F For Berks part of 986F, see Berks series.	>5	0–7	Silt loam	ML	A–4	0–15	90–100	85–100
		7–33	Silty clay loam, clay loam, silt loam.	CL	A–6 or A–4	0–20	85–100	80–95
		33–60	Channery or flaggy loam, clay loam, or silt loam.	ML, CL, or GM	A–4 or A–6	10–25	70–90	65–85
		[10] 60	Bedrock					
Zanesville: 340D2, 340D3, 340E2, 340E3.	[6] 1½–2½	0–6	Silt loam	ML or CL	A–4 or A–6	0	100	95–100
		6–26	Silty clay loam	CL	A–6 or A–4	0	100	95–100
		26–42	Silty clay loam, silt loam, loam.	CL or ML	A–4 or A–6	0–5	85–100	80–95
		[10] 42–61	Channery clay loam, channery loam.	CL, SM, SC	A–6, A–4, A–2	0–10	65–100	50–95

significant in engineering—Continued

Percentage less than 3 inches passing sieve—Continued		Liquid limit	Plasticity index	Permeability [1]	Available water capacity	Reaction	Shrink-swell potential	Corrosivity	
No. 40 (0.42 mm)	No. 200 (0.074 mm)							Uncoated steel	Concrete
		Percent		*Inches per hour*	*Inches per inch of soil*	*pH*			
30–65	25–65	20–40	NP–10	2.0–6.0	0.05–0.12	5.6–7.3	Low	Low	High.
90–100	85–95	30–40	11–20	0.6–2.0	0.22–0.24	6.6–7.3	Moderate	High	Low.
90–100	85–100	40–55	15–25	0.6–2.0	0.18–0.20	7.4–7.8	Moderate	High	Low.
90–100	85–95	25–40	11–20	0.6–2.0	0.18–0.22	7.4–8.4	Moderate	High	Low.
95–100	85–95	30–40	15–20	0.2–0.6	0.21–0.23	5.6–6.0	Moderate	High	Moderate.
95–100	85–95	30–40	15–20	0.06–0.2	0.18–0.20	5.1–6.0	Moderate	High	Moderate.
95–100	85–95	30–40	15–20	0.06–0.2	0.12–0.22	6.1–6.5	Moderate	High	Low.
95–100	85–100	25–35	5–15	0.2–0.6	0.22–0.24	5.1–7.3	Moderate	High	Moderate.
95–100	85–100	25–35	5–15	0.06–0.2	0.20–0.22	4.5–5.0	Moderate	High	Moderate to high.
95–100	90–100	35–50	15–30	0.06–0.2	0.18–0.20	4.5–5.5	High	High	Moderate to high.
95–100	80–90	<40	NP–25	0.2–0.6	0.12–0.22	6.1–6.5	Moderate	High	Low.
95–100	90–100	22–40	4–10	0.6–2.0	0.22–0.24	6.1–7.3	Low	High	Low.
95–100	90–100	22–50	4–28	0.2–0.6	0.18–0.20	5.1-7.8	Moderate	High	Low.
85–95	70–90	20–40	4–18	0.2–0.6	0.17–0.22	7.4–7.8	Low	High	Low.
90–100	85–95	24–31	2–10	0.6–2.0	0.22–0.24	4.5–5.0	Low	Low	High.
75–90	65–90	20–31	NP–10	0.6–2.0	0.17–0.22	4.5–5.0	Low	Low	High.
95–100	95–100	23–33	3–14	0.2–0.6	0.22–0.24	4.5–6.5	Low	High	High to moderate.
95–100	95–100	44–55	21–32	0.06–0.2	0.09–0.18	4.5–5.5	Moderate	High	High.
90–100	90–100	31–43	13–24	0.2–0.6	0.20–0.22	4.5–7.3	Low	High	High.
95–100	90–100	25–35	2–10	0.6–2.0	0.22–0.24	6.1–6.5	Low	Low	Low.
95–100	90–100	25–40	7–20	0.2–2.0	0.18–0.20	5.1–7.8	Low	Low	Moderate.
85–95	75–90	25–40	5–20	0.2–2.0	0.17–0.22	7.4–7.8	Low	Low	Low.
100	90–100	23–35	6–17	0.2–0.6	0.22–0.24	4.5–6.0	Low	High	High.
100	90–100	35–46	15–29	<0.06	0.18–0.20	4.5–5.5	High	High	High.
90–100	75–95	22–39	9–19	0.6–2.0	0.18–0.20	5.1–6.5	Moderate	High	Moderate.
85–100	80–95	26–34	4–10	0.2–2.0	0.22–0.24	5.6–6.5	Low	Low	Moderate.
80–95	75–90	25–40	5–18	0.2–2.0	0.17–0.20	4.5–5.5	Low	Moderate	High.
55–85	40–70	20–40	5–19	0.2–6.0	0.12–0.15	5.1–5.5	Low	Low	High.
				(°)					
85–100	80–100	25–40	5–20	0.6–2.0	0.22–0.24	5.1–6.0	Low	Moderate	Moderate.
85–100	80–100	25–40	5–20	0.6–2.0	0.18–0.20	4.5–5.5	Moderate	Moderate	High.
80–95	75–95	20–40	2–20	0.06–0.2	0.08–0.12	4.5–5.5	Moderate	Moderate	High.
40–90	20–85	20–40	2–20	0.2–2.0	0.08–0.12	4.5–5.5	Low	Moderate	High.

TABLE 6.—*Estimated soil properties*

Soil series and map symbols	Depth to seasonal high water table	Depth from surface	USDA texture	Classification		Coarse fraction greater than 3 inches	Percentage less than 3 inches passing sieve—	
				Unified	AASHTO		No. 4 (4.7 mm)	No. 10 (2.0 mm)
	Feet	*Inches*				*Percent*		
Zipp: 524, 524+	[6] 0–1	0–6	Silty clay, silty clay loam.	CL or CH	A–7	0	100	100
		6–46	Silty clay, heavy silty clay loam.	CH or CL	A–7	0	100	100
		46–60	Silty clay loam, silty clay.	CL or CH	A–7 or A–6	0	100	100

[1] Permeability classes are as follows: less than 0.06, very slow; 0.06 to 0.2, slow; 0.2 to 0.6, moderately slow; 0.6 to 2.0, moderate; 2.0 to 6.0, moderately rapid; 6.0 to 20.0, rapid.

[2] On severely eroded soils, most or all of the first depth shown has been eroded, and the second depth is exposed; therefore, the engineering properties of the present surface layer are more like those shown for the second depth.

[3] Perched water table at this depth during rainy seasons.

[4] Root growth is impeded at this depth, and less water is available for plants.

[5] Most areas of this soil are subject to occasional or rare flooding or overflow.

excavate. Unless otherwise stated, the ratings in table 7 apply only to a depth of about 5 feet, and therefore, limitation ratings of *slight* or *moderate* may not be valid if trenches are to be much deeper. Every site should be investigated before it is selected.

The ratings given apply to use of soils for construction and maintenance to improve local roads and streets that have all-weather surfacing. These roads or streets consist of a subgrade of local soil material, whether cut or fill; a base material of gravel, crushed rock, or soil material stabilized with lime or cement; and a flexible or rigid surface that is commonly asphalt or concrete. However, gravel with binder is commonly used in rural areas. Ordinary provisions for drainage and grading to shed water are made. Cuts and fills are generally less than 6 feet. Soil properties that most affect design and construction of roads and streets are load-supporting capacity, stability of the subgrade, and the workability and quantity of cut and fill material available. The AASHTO and Unified classifications of the soil material, and also the shrink-swell potential, indicate traffic-supporting capacity. Wetness and flooding affect stability of the material. Slope, depth to hard rock, content of stones and rocks, and wetness affect ease of excavation and amount of cut and fill needed to reach an even grade.

Road fill is soil material used in embankments for roads. The suitability ratings reflect the predicted performance of soil after it has been placed in an embankment, properly compacted, and provided with adequate drainage; and the relative ease of excavating the material at borrow areas. Possible sources of sand and gravel in the county are generally deeper than soil depth and not related to kind of soil.

Topsoil is used for topdressing an area where vegetation is to be established and maintained. A favorable source of topsoil has physical, chemical, and biological characteristics favorable for starting and growing of suited plants. It is also friable and easy to handle and spread. Although a high content of nutrients in good balance is desirable, of more importance is responsiveness of fertilizing, and also of liming if the soil is acid. Also to be considered is whether the remaining soil is reclaimable after the surface soil has been stripped away (fig. 13).

Pond reservoir areas hold water behind a dam or embankment. Soils suitable for pond reservoir areas have low seepage, which is related to their permeability and depth to fractured or permeable bedrock or other permeable material.

Dikes, levees, and other embankments for retention of water require soil material resistant to seepage and piping and of favorable stability, shrink-swell potential, shear strength, and compactibility. Presence of stones or organic material in a soil are among unfavorable factors.

Drainage for crops and pasture is affected by such soil properties as permeability, texture, structure, depth to claypan, rock, or other layers that influence rate of water movement; depth to seasonal high water table; steepness of slope; stability in ditchbanks; susceptibility to stream overflow; salinity or alkalinity; and availability of outlets for drainage.

Irrigation of a soil is affected by such features as steepness of slope; susceptibility to stream overflow, water erosion, or soil blowing; soil texture; content of stones; accumulations of salts; depth of rooting zone; rate of water intake at the surface; permeability of soil

significant in engineering—Continued

Percentage less than 3 inches passing sieve—Continued		Liquid limit	Plasticity index	Permeability [1]	Available water capacity	Reaction	Shrink-swell potential	Corrosivity	
No. 40 (0.42 mm)	No. 200 (0.074 mm)							Uncoated steel	Concrete
		Percent		*Inches per hour*	*Inches per inch of soil*	*pH*			
100	95–100	46–58	24–32	<0.06	0.11–0.13	6.1–6.5	High	High	Low.
100	95–100	46–58	24–32	<0.2	0.11–0.13	6.7–7.3	High	High	Low.
95–100	90–100	45–55	25–35	<0.2	0.08–0.10	7.4–7.8	High	High	Low.

[6] Most areas of this soil are subject to flooding or overflow.

[7] Nonplastic.

[8] Depth to bedrock is mainly 20 to 40 inches.

[9] Pollution of ground water is a hazard in places because of percolation in substratum.

[10] Depth to bedrock is mainly 3 to 7 feet.

[11] Most areas of this soil are subject to rare flooding or overflow.

[12] Most areas of this soil are subject to overflow from higher ground.

layers below the surface layer and in fragipans or other layers that restrict movement of water or amount of water held available to plants; need for drainage; and depth to water table or bedrock.

Terraces and diversions are low ridges constructed across the slope to a prepared outlet (fig. 14, page 85). Features affecting soil suitability for terraces are uniformity and steepness of slope; depth to bedrock or other unfavorable material; presence of stones; permeability; resistance to water erosion, soil slipping, or soil blowing; and difficulty in growing plants. Suitable outlets are also needed.

Engineering test data

Table 8 contains engineering test data for some of the major soil series in Saline County. These tests were made to help evaluate the soils for engineering purposes. The engineering classifications given are based on data obtained by mechanical analyses and by tests to determine liquid limits and plastic limits. The mechanical analyses were made by combined sieve and hydrometer methods.

Compaction (or moisture-density) data are important in earthwork. If a soil material is compacted at successively higher moisture contents, assuming that the compactive effort remains constant, the density of the compacted material increases until the optimum moisture content is reached. After that, density decreases with increase in moisture content. The highest dry density obtained in the compactive test is termed maximum dry density. As a rule, maximum strength of earthwork is obtained if the soil is compacted to the maximum dry density.

Tests to determine liquid limit and plastic limit measure the effect of water on the consistence of soil material, as has been explained in the text for table 6.

Formation and Classification of the Soils [7]

In this section, the factors that affect the formation of the soils in Saline County are discussed and the system of classification is explained. The soil series are classified by higher categories, and laboratory data from tests on selected soil profiles are given.

Factors of Soil Formation

Soil is a dynamic natural body. It has width, depth, and extent. It lies as a mantle upon the earth's surface, supports plants, and has properties resulting from the integrated effect of climate and living forms acting on earthy parent material as conditioned by relief over periods of time.

Climate and plant and animal life, chiefly plants, are active factors of soil formation. These factors act on the parent material that has accumulated through the weathering of bedrock and slowly change it to a natural body that has genetically related horizons. The effects of climate and plant and animal life are conditioned by relief. The parent material also affects the kind of soil profile that is formed and, in extreme cases, determines it almost entirely. Finally, time is

[7] LEWIS DUNCAN, soil scientist, Soil Conservation Service, assisted in the preparation of this section.

TABLE 7.—*Interpretations of*

[An asterisk in the first column indicates that at least one mapping unit is made up of two or more kinds of soil. The soils in such tions for referring to another series in the first column of the table. Information given is characteristic for the soil series and does planning, design, and construction]

Soil series and map symbols	Degree and kind of limitation for—					
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings without basements [1]	Sanitary landfill	Local roads and streets
Ava: 14B, 14C2, 14D2, 14D3.	Severe: very slow permeability in fragipan; seasonal perched water table and seep spots.	Moderate where slope is 2 to 7 percent. Severe where slope is 7 to 12 percent.	Moderate: water seeps out above fragipan.	Moderate: moderate shrink-swell potential.	Slight where slope is 2 to 7 percent. Moderate where slope is 7 to 12 percent; possible lateral seepage.	Severe: susceptible to frost action; moderate plasticity; erodible.
Banlic: 787	Severe: subject to flooding; moderately slow permeability; seasonal water table at a depth of 1 to 3 feet.	Severe: subject to flooding.	Severe: seasonal water table at a depth of 1 to 3 feet; subject to flooding.	Severe: subject to flooding; seasonal water table at a depth of 1 to 3 feet.	Severe: subject to flooding; seasonal water table at a depth of 1 to 3 feet.	Severe: subject to flooding; seasonal water table at a depth of 1 to 3 feet; susceptible to frost action; silty material.
Belknap: 382	Severe: subject to flooding; moderately slow permeability; seasonal water table at a depth of 1 to 3 feet.	Severe: subject to flooding.	Severe: seasonal water table at a depth of 1 to 3 feet; subject to flooding.	Severe: subject to flooding; seasonal water table at a depth of 1 to 3 feet.	Severe: subject to flooding; seasonal water table at a depth of 1 to 3 feet.	Severe: subject to flooding; seasonal water table at a depth of 1 to 3 feet; susceptible to frost action; silty material.
*Berks: 986G For Wellston part, see Wellston series.	Severe: strongly sloping to steep; channery or flaggy; bedrock at a depth of 20 to 40 inches; possible pollution.	Severe: slope is 30 to 60 percent; channery or flaggy; bedrock at a depth of 20 to 40 inches.	Severe: slope is 30 to 60 percent; channery or flaggy; bedrock at a depth of 20 to 40 inches.	Severe: slope is 30 to 60 percent; channery or flaggy.	Severe: slopes are 30 to 60 percent; channery or flaggy; possible pollution.	Severe: slope is 30 to 60 percent; channery or flaggy; bedrock at a depth of 20 to 40 inches.
Bluford: 13A, 13B	Severe: slow permeability; seasonal water table at a depth of 1 to 3 feet.	Slight where slope is 0 to 2 percent. Moderate where slope is 2 to 4 percent.	Severe: seasonal water table at a depth of 1 to 3 feet; clayey and plastic subsoil.	Moderate: seasonal water table at a depth of 1 to 3 feet; moderate shrink-swell potential in subsoil.	Severe: seasonal water table at a depth of 1 to 3 feet.	Severe: moderate shrink-swell potential in subsoil; susceptible to frost action.

engineering properties of the soils

mapping units may have different properties and limitations, and for this reason it is necessary to follow carefully the instruc- not apply to extreme variations or minor inclusions within a mapping unit. Onsite investigations of a particular site are needed for

Suitability as a source of—		Soil features affecting—				
Road fill	Topsoil	Pond reservoir areas	Dikes, levees, and other embankments	Drainage for crops and pasture	Irrigation	Terraces and diversions
Poor: moderate plasticity; moderate shrink-swell potential; susceptible to frost action.	Fair: thin, erodible subsoil.	Favorable; sloping soil is erodible and susceptible to wave action.	Low to medium shear strength; medium compressibility; low permeability; low to medium piping hazard; fair to good compaction characteristics.	Generally not needed; slow permeability; fragipan restricts percolation, causing seeps and ditch side slope instability.	Moderate available water capacity; fragipan restricts rooting zone; slow water intake; [2] erodible.	Exposed fragipan erodes easily and is low in fertility; difficult to establish vegetation; no major construction difficulty.
Poor: susceptible to frost action; silty material; seasonal water table at a depth of 1 to 3 feet.	Good: moisture, texture, and thickness of upper horizon favorable.	Favorable; moderately slow permeability; subject to siltation of flood plain scour.	Medium to low shear strength; medium compressibility; low to medium permeability; low to medium piping hazard; fair to good compaction characteristics.	Seasonal high water table and subject to flooding; moderately slow permeability; drainage can be improved by surface or subsurface drains.	Seasonal high water table and subject to flooding; favorable available water capacity but moderately slow infiltration; needs drainage.	Bottom land, diversions needed in places to intercept and divert runoff from higher ground.
Poor: susceptible to frost action; silty material; seasonal water table at a depth of 1 to 3 feet.	Good: moisture, texture, and thickness of upper horizon favorable.	Favorable; moderately slow permeability; subject to siltation of flood plain scour.	Medium to low shear strength; medium compressibility; low to medium permeability; low to medium piping hazard; fair to good compaction characteristics.	Seasonal high water table and subject to flooding; moderately slow permeability; [3] drainage can be improved by surface or subsurface drains.	Seasonal high water table and subject to flooding; favorable available water capacity [4] but moderately slow infiltration; needs drainage.	Bottom land, diversions needed in places to intercept and divert runoff from higher ground.
Poor: slope is 30 to 60 percent; channery or flaggy; bedrock at a depth of 20 to 40 inches.	Poor: slope is 30 to 60 percent; channery or flaggy.	Steep rocky sites and shoreline; low plastic fine grained soils; highly susceptible to wave action; seepage likely.	Medium to high shear strength; low to medium compressibility; medium to low permeability; medium to high piping hazard; poor to fair compaction characteristics.	Natural drainage is adequate.	Very steep; shallow to bedrock.	Very steep and stony; wooded.
Poor: subsoil of high plasticity; difficult to compact; susceptible to frost action.	Fair in surface layer.	Favorable; slow permeability; seasonal water table at a depth of 1 to 3 feet.	Low shear strength where saturated or wet; medium compressibility; medium to low permeability; low to medium piping hazard; fair to good compaction characteristics.	Drainage needed in some places; slow permeability; suited to open ditches.	Medium to slow intake rate and slow permeability; seasonal high water table.	No significant construction difficulty on favorable topography; wetness affects channel bottoms in places.

TABLE 7.—*Interpretations of engineering*

Soil series and map symbols	Degree and kind of limitation for—					
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings without basements [1]	Sanitary landfill	Local roads and streets
Bonnie: 108, W108	Severe: slow permeability; seasonal water table at a depth of 0 to 1 foot; subject to flooding.	Severe: subject to flooding; unstable fill material.	Severe: seasonal water table at a depth of 0 to 1 foot; subject to flooding.	Severe: subject to flooding; seasonal water table at a depth of 0 to 1 foot; fair to poor stability.	Severe: seasonal water table at a depth of 0 to 1 foot; subject to flooding.	Severe: subject to flooding; seasonal water table at a depth of 0 to 1 foot; silty material; susceptible to frost action.
Burnside: 427	Severe: subject to flooding; channery or flaggy subsoil; bedrock at a depth of 4 to 7 feet.	Severe: subject to flooding; channery or flaggy subsoil; bedrock at a depth of 4 to 7 feet.	Severe: subject to flooding; channery or flaggy subsoil; bedrock at a depth of 4 to 7 feet.	Severe: subject to flooding.	Severe: subject to flooding.	Severe: subject to flooding; silty surface layer; potential frost action.
Cape: 422	Severe: very slow permeability; seasonal water table at a depth of 0 to 1 foot; subject to flooding.	Severe: subject to flooding.	Severe: seasonal water table at a depth of 0 to 1 foot; subject to flooding; clayey and plastic soil.	Severe: subject to flooding; seasonal water table at a depth of 0 to 1 foot; clayey and plastic soil.	Severe: subject to flooding; seasonal water table at a depth of 0 to 1 foot; clayey and plastic subsoil.	Severe: subject to flooding; seasonal water table at a depth of 0 to 1 foot; high shrink-swell potential.
Colp: 122B	Severe: slow permeability; high water retention; seasonal water table at a depth of 3 to 5 feet.	Slight	Severe: seasonal water table at a depth of 3 to 5 feet; clayey and plastic subsoil.	Severe: subject to rare flooding; high shrink-swell potential in subsoil.	Severe: clayey and plastic subsoil.	Severe: high shrink-swell potential in subsoil; susceptible to frost action.
Creal: 337	Severe: moderately slow permeability; seasonal water table at a depth of 1 to 3 feet; subject to overflow.	Slight	Severe: seasonal water table at a depth of 1 to 3 feet; subject to overflow.	Severe: seasonal water table at a depth of 1 to 3 feet; subject to overflow.	Severe: seasonal water table at a depth of 1 to 3 feet; subject to overflow.	Severe: seasonal water table at a depth of 1 to 3 feet; susceptible to frost action; thick silty surface layer.
Darwin: 71	Severe: very slow permeability; subject to flooding and standing water; seasonal water table at a depth of 0 to 1 foot; clayey and plastic soil.	Severe: subject to flooding; clayey and plastic soil.	Severe: seasonal water table at a depth of 0 to 1 foot; subject to flooding; clayey and plastic soil.	Severe: subject to overflow and standing water; seasonal water table at a depth of 0 to 1 foot; very high shrink-swell potential.	Severe: seasonal water table at a depth of 0 to 1 foot; subject to flooding and standing water.	Severe: subject to flooding; seasonal water table at a depth of 0 to 1 foot; poor compaction characteristics; very high shrink-swell potential.

properties of the soils—Continued

Suitability as a source of—		Soil features affecting—				
Road fill	Topsoil	Pond reservoir areas	Dikes, levees, and other embankments	Drainage for crops and pasture	Irrigation	Bottom land,
Poor: susceptible to frost action; silty material; seasonal water table at a depth of 0 to 1 foot.	Poor: wet and thin.	Subject to flooding; seasonal high water table; moderate to low seepage.	Medium to low shear strength; medium to low permeability; medium to low piping hazard; poor to fair compaction characteristics; poor stability.	Poor natural drainage; slow permeability; tile does not function well; better suited to open ditches; flood plain scour may cause ditch siltation.	Slow intake rate; slow permeability; high available water capacity; subject to flooding.	Terraces and diversions diversions needed in places to intercept and divert runoff from higher ground.
Fair to poor: poor compaction characteristics and stability; subject to flooding; channery and flaggy subsoil; potential frost action.	Good if surface layer is free of stones; subject to flooding.	Subject to flooding; channery or flaggy subsoil; seepage likely.	Low shear strength; poor slope stability; medium compressibility; medium to low permeability; high piping hazard and poor compaction characteristics.	Drainage is generally not needed; subject to flooding, flood plain scour, and deposition.	Moderate intake rate; moderate permeability and moderate available water capacity.	Bottom land, diversions needed in places to intercept and divert runoff from higher ground.
Poor: subject to flooding; seasonal water table at a depth of 0 to 1 foot; high shrink-swell potential.	Poor: wet and clayey; cloddy and hard when dry.	Very slow permeability; high plasticity resists wave action.	Low shear strength; high compressibility; low piping hazard; fair to poor compaction characteristics.	Wet because of seasonal high water table; subject to flooding and standing water; very slow permeability; surface drainage system only.	Naturally wet; very slow intake rate; subject to flooding and standing water; very slow permeability.	Bottom land, diversions needed in places to intercept and divert runoff from higher ground.
Poor: high shrink-swell potential in subsoil; susceptible to frost action.	Fair: thin -----	Favorable depth of topsoil and subsoil to establish shoreline vegetation; plasticity resists wave action.	Low permeability; medium to low shear strength; low piping hazard and fair compaction characteristics.	Natural drainage is adequate.	Moderate surface intake rate; slow permeability in subsoil; moderate to high available water capacity.	No significant construction difficulty on favorable topography.
Poor: seasonal water table at a depth of 1 to 3 feet; susceptible to frost action; thick silty surface layer.	Good ----------	Favorable water retention; slow permeability; good soil depth to establish vegetation; susceptible to wave action.	Medium to low shear strength; medium compressibility; medium to low permeability and susceptibility to piping.	Favorable for surface drainage system on gentler slopes; moderately slow permeability.	Seasonal high water table; moderately slow intake rate; high available water capacity.	Soil depth and texture favorable; high water table may result in wet channel bottoms.
Poor: high plasticity; very high shrink-swell potential; susceptible to frost action.	Poor: wet and clayey; cloddy and hard when dry.	Very slow permeability; ample soil depth to establish shoreline vegetation; high plasticity resists wave action.	Low shear strength; high resistance to piping; highly compressible; low permeability; fair to poor compaction characteristics.	Wet because of high water table; subject to flooding and standing water; surface drainage systems only; very slow permeability.	Naturally wet; very slow intake rate; needs drainage established; subject to flooding and standing water.	Bottom land, diversions needed in places to intercept and divert runoff from higher ground.

TABLE 7.—*Interpretations of engineering*

Soil series and map symbols	Degree and kind of limitation for—					
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings without basements [1]	Sanitary landfill	Local roads and streets
Frondorf: 786D3, 786E, 786F.	Severe: pollution hazard; slope; bedrock at a depth of 20 to 40 inches.	Severe: moderate and moderately rapid permeability; bedrock at a depth of 20 to 40 inches; slope is 7 to 45 percent.	Severe: bedrock at a depth of 20 to 40 inches; slope is 7 to 45 percent.	Moderate where slope is 7 to 12 percent. Severe where slope is 12 to 45 percent; bedrock at a depth of 20 to 40 inches.	Severe: bedrock at a depth of 20 to 40 inches; pollution hazard.	Moderate where slope is 7 to 12 percent. Severe where slope is 12 to 45 percent; bedrock at a depth of 20 to 40 inches; erodible.
Grantsburg: 301B, 301C2, 301D2, 301D3.	Severe: slow to very slow permeability in fragipan; seasonally perched water table; seep spots.	Moderate where slope is 2 to 7 percent. Severe where slope is 7 to 12 percent.	Moderate: water seeps out above fragipan.	Slight where slope is 2 to 8 percent. Moderate where slope is 8 to 12 percent.	Slight where slope is 2 to 8 percent. Moderate where slope is 8 to 12 percent; lateral seepage likely.	Severe: high potential frost action; moderate plasticity; erodible.
Harco: 484	Severe: seasonal water table at a depth of 1 to 3 feet; subject to rare flooding.	Moderate: moderate permeability; seasonal water table at a depth of 1 to 3 feet; subject to rare flooding.	Severe or moderate: seasonal water table at a depth of 1 to 3 feet.	Severe: subject to rare flooding; seasonal water table at a depth of 1 to 3 feet.	Moderate: seasonal water table at a depth of 1 to 3 feet; subject to rare flooding.	Severe: susceptible to frost action; moderate plasticity; seasonal water table at a depth of 1 to 3 feet.
Hickory: 8E, 8E3, 8F.	Severe: slope is 12 to 45 percent.	Severe: slope is 12 to 45 percent; moderate permeability.	Severe: slope is 12 to 45 percent.	Severe: slope is 12 to 45 percent.	Moderate where slope is 12 to 25 percent. Severe where slope is greater than 25 percent.	Severe: slope is 12 to 45 percent; erodible.
Hosmer: 214B, 214C2, 214D2, 214D3.	Severe: slow permeability in fragipan; seasonal perched water table and seep spots.	Moderate where slope is 2 to 7 percent. Severe where slope is 7 to 12 percent.	Moderate: water seeps out above fragipan.	Slight where slope is 2 to 7 percent. Moderate where slope is 7 to 12 percent.	Slight where slope is 2 to 7 percent. Moderate where slope is 7 to 12 percent; lateral seepage likely.	Severe: high potential frost action; moderate plasticity; erodible.
Hoyleton: 3B	Severe: slow permeability; seasonal water table at a depth of 1 to 3 feet.	Slight or moderate: slope is 1 to 4 percent.	Severe: seasonal water table at a depth of 1 to 3 feet.	Severe: seasonal water table at a depth of 1 to 3 feet; high shrink-swell potential.	Severe: seasonal water table at a depth of 1 to 3 feet.	Severe: high shrink-swell potential in subsoil; susceptible to frost action; seasonal water table at a depth of 1 to 3 feet.

properties of the soils—Continued

Suitability as a source of—		Soil features affecting—				
Road fill	Topsoil	Pond reservoir areas	Dikes, levees, and other embankments	Drainage for crops and pasture	Irrigation	Terraces and diversions
Poor: thin layer.	Fair where slope is 7 to 12 percent; thin; erodible. Severe where slope is 12 to 45 percent.	Bedrock at a depth of 20 to 40 inches; slope is 7 to 45 percent; seepage likely.	Medium shear strength; low to medium compressibility; low to medium permeability; medium piping hazard; fair to good compaction characteristics.	Natural drainage adequate.	Strongly sloping to very steep; rapid surface runoff.	Strongly sloping to very steep; generally in pasture or woodland.
Poor: moderate plasticity; moderate shrink-swell potential; susceptible to frost action.	Fair: thin, erodible subsoil.	Favorable, steep sides erodible and susceptible to wave action.	Medium to low shear strength; medium to low compressibility; low permeability; low to medium piping hazard; fair to good compaction characteristics.	Drainage generally not needed; low permeability; fragipan restricts percolation and causes seeps and ditch sideslope instability.	Moderate available water capacity; fragipan restricts rooting zone; medium intake rate [2]; erodible.	Exposed fragipan is easily erodible and low in fertility; difficult to revegetate; no major construction difficulty.
Poor: susceptible to frost action; moderate plasticity; seasonal water table at a depth of 1 to 3 feet.	Good	Moderate permeability; seepage.	Medium to low shear strength; medium to low compressibility; low permeability; low to medium piping hazard; fair to good compaction characteristics.	Drainage needed in some places; moderate permeability; suitable for subsurface drains or open ditches.	Very high available water capacity; medium intake rate; moderate permeability; seasonal high water table.	Generally nearly level topography; no significant construction difficulty.
Fair where slope is 12 to 18 percent; moderate shrink-swell potential. Severe where slope is 18 to 45 percent.	Poor: slope is 12 to 45 percent; erodible.	Slope is 12 to 45 percent; few sandy pockets; generally slight to moderate seepage.	Medium shear strength; low to medium compressibility; low to medium permeability; medium piping hazard; fair to good compaction characteristics.	Natural drainage adequate.	Moderately steep to very steep; rapid surface runoff.	Moderately steep to very steep; generally in pasture or woodland.
Poor: moderate plasticity; moderate shrink-swell potential; susceptible to frost action.	Good	Favorable; steep sides erodible and susceptible to wave action.	Medium to low shear strength; medium to low compressibility; low permeability; low to medium piping hazard; fair to good compaction characteristics.	Drainage generally not needed; low permeability; fragipan restricts percolation and causes seeps and ditch side slope instability.	Moderate or high available water capacity; medium intake rate [2]; erodible.	Exposed fragipan easily erodible; difficult to revegetate; no major construction difficulty.
Poor: high shrink-swell potential in subsoil; susceptible to frost action; seasonal water table at a depth of 1 to 3 feet.	Fair: favorable surface layer; clayey subsoil.	Favorable	Medium to low shear strength; medium to high compressibility; low piping hazard; fair to poor compaction characteristics.	Drainage needed in some places; seasonal high water table; slow permeability; suitable for open ditches.	Moderate or high available water capacity; low intake rate.	No significant construction difficulty on favorable topography; wetness affects channel bottom in places.

TABLE 7.—*Interpretations of engineering*

Soil series and map symbols	Degree and kind of limitation for—					
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings without basements [1]	Sanitary landfill	Local roads and streets
Huey: 120	Severe: very slow permeability; seasonal high water table at a depth of 0 to 1 foot.	Slight	Severe: seasonal water table at a depth of 0 to 1 foot; possible sloughing.	Severe: seasonal water table at a depth of 0 to 1 foot; alkaline.	Severe: seasonal water table at a depth of 0 to 1 foot; alkaline.	Severe: susceptible to frost action; seasonal water table at a depth of 0 to 1 foot; erodible; alkaline.
Hurst: 338	Severe: very slow permeability; seasonal water table at a depth of 1 to 3 feet.	Slight	Severe: seasonal water table at a depth of 1 to 3 feet; clayey and plastic subsoil.	Severe: seasonal water table at a depth of 1 to 3 feet; clayey and plastic subsoil; subject to rare flooding.	Severe: seasonal water table at a depth of 1 to 3 feet; clayey and plastic subsoil.	Severe: high shrink-swell potential in subsoil; susceptible to frost action; seasonal water table at a depth of 1 to 3 feet.
Karnak: 426	Severe: seasonal water table at a depth of 0 to 1 foot; very slow permeability; subject to flooding and standing water.	Severe: seasonal water table at a depth of 0 to 1 foot; subject to flooding and standing water; clayey and plastic soil.	Severe: seasonal water table at a depth of 0 to 1 foot; subject to flooding and standing water.	Severe: seasonal water table at a depth of 0 to 1 foot; subject to flooding and standing water; very high shrink-swell potential.	Severe: seasonal water table at a depth of 0 to 1 foot; subject to flooding and standing water.	Severe: subject to flooding and standing water; very high shrink-swell potential.
Markland: 467C2, 467D3.	Severe: slow permeability; seasonal high water table at a depth of 3 to 5 feet.	Moderate where slope is 3 to 7 percent. Severe where slope is 7 to 15 percent; clayey and plastic subsoil.	Severe: seasonal water table at a depth of 3 to 5 feet; clayey and plastic subsoil.	Severe: subject to rare flooding; high shrink-swell potential in subsoil.	Severe: seasonal water table at a depth of 3 to 5 feet; clayey and plastic subsoil.	Severe: high plasticity; poor workability; high shrink-swell potential.
McGary: 173	Severe: seasonal water table at a depth of 1 to 3 feet; slow or very slow permeability.	Slight	Severe: seasonal high water table at a depth of 1 to 3 feet; clayey and plastic subsoil.	Severe: subject to rare flooding; high shrink-swell potential in subsoil; seasonal water table at a depth of 1 to 3 feet.	Severe: seasonal water table at a depth of 1 to 3 feet; clayey and plastic subsoil.	Severe: high shrink-swell potential; high plasticity; poor workability; fair to poor compaction characteristics.
Orthents: 803C, 803F.	Moderate or severe where slope is 5 to 15 percent; common stones; pollution hazard. Severe where slope is 15 to 60 percent.	Severe: slope is 5 to 60 percent; channery soil with common stones; seepage likely.	Moderate or severe where slope is 5 to 15 percent; channery soil with common stones. Severe where slope is 15 to 60 percent.	Moderate or severe: slope is 5 to 15 percent; channery soil with common stones.	Severe: slope is 5 to 60 percent; channery soil with common stones; seepage likely.	Moderate where slope is 5 to 15 percent. Severe where slope is 15 to 60 percent.

properties of the soils—Continued

Suitability as a source of—		Soil features affecting—				
Road fill	Topsoil	Pond reservoir areas	Dikes, levees, and other embankments	Drainage for crops and pasture	Irrigation	Terraces and diversions
Poor: susceptible to frost action; seasonal water table at a depth of 0 to 1 foot; alkaline; erodible.	Poor: thin, alkaline subsoil; seasonal wetness.	Very slow permeability; erodible and susceptible to wave action; water likely to be muddy; difficult to establish shoreline vegetation.	Medium to low shear strength; medium compressibility; low permeability; high piping hazard; fair to poor compaction characteristics.	Drainage generally needed for level areas; very slow permeability; suitable for open ditches; side slope instability.	Low available water capacity; slow intake rate; alkaline subsoil restricts rooting zone.	Exposed subsoil easily erodible and low in fertility; difficult to revegetate; no major construction difficulty.
Poor: high shrink-swell potential in subsoil; susceptible to frost action; seasonal water table at a depth of 1 to 3 feet.	Fair: favorable surface layer; clayey subsoil.	Favorable ------	Medium to low shear strength; medium to high compressibility; low permeability; low piping hazard; fair to good compaction characteristics.	Drainage needed in most places; seasonal high water table; very slow permeability; suitable for open ditches.	Slow intake rate; very slow permeability; seasonal high water table.	Most areas nearly level; no significant construction difficulty on favorable topography.
Poor: high plasticity and shrink-swell potential; poor compaction characteristics and workability.	Poor: naturally wet; poor workability and tilth.	Favorable water retention characteristics; seasonal high water table; subject to siltation from flooding and flood plain scour.	Low shear strength; high compressibility; low susceptibility to piping; fair to poor compaction characteristics.	Low permeability; clayey soil; subject to flooding and standing water; seasonal high water table.	Very slow intake rate; seasonal high water table; needs surface drainage; subject to flooding.	Bottom land, diversions needed in places to intercept and divert runoff from higher ground.
Poor: high plasticity; poor compaction characteristics and workability; high shrink-swell potential.	Poor: thin and friable; revegetation and control of erosion difficult in borrow areas.	Favorable water retention characteristics; slow permeability.	Low to medium shear strength; medium to high compressibility; low permeability; low piping hazard; fair to poor compaction characteristics.	Natural drainage adequate.	Slow permeability; moderate to high available water capacity; erodible.	No significant construction difficulty on favorable topography; erodible slopes in most places; needs well established outlets.
Poor: high plasticity; high shrink-swell potential.	Fair: medium thickness and friability; borrow areas clayey and difficult to revegetate.	Favorable water retention characteristics; slow to very slow permeability.	Medium to low shear strength; high compressibility; low permeability; susceptible to piping; fair to poor compaction characteristics.	Slow to very slow permeability; seasonal water table at a depth of 1 to 3 feet; only surface drainage systems are feasible.	Slow to very slow permeability; seasonal water table; moderate to high available water capacity.	Generally nearly level topography; no significant construction difficulty.
Fair or good where slope is 5 to 25 percent; common stones. Poor where slope is 25 to 60 percent.	Poor: slope is 5 to 60 percent channery soil with common stones.	Sloping to very steep; channery soil with common stones; seepage likely; natural ponds in depressions below ground water level.	Medium to high shear strength; low to medium compressibility; medium to high piping hazard; fair compaction characteristics.	Natural drainage adequate except in depressions.	Channery soil with common stones; low to moderate available water capacity; sloping to very steep; steeper slopes easily erodible.	Channery soil with common stones; sloping to very steep; steeper slopes easily erodible.

TABLE 7.—*Interpretations of engineering*

Soil series and map symbols	Degree and kind of limitation for—					
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings without basements [1]	Sanitary landfill	Local roads and streets
Orthents, acid: 804F	Severe: steep, channery soil with common stones; pollution hazard.	Severe: slope is 15 to 60 percent; channery soil with common stones; seepage.	Severe: slope is 15 to 60 percent; channery soil with common stones.	Severe: slope is 15 to 60 percent; channery soil with common stones.	Severe: slope is 15 to 60 percent; channery soil with common stones; seepage.	Severe: slope is 15 to 60 percent; channery soil with common stones.
Patton: 142	Severe: seasonal high water table at a depth of 0 to 1 foot; moderate permeability.	Severe: subject to rare flooding; natural seasonal water table at a depth of 0 to 1 foot; moderate permeability.	Severe: seasonal water table at a depth of 0 to 1 foot.	Severe: seasonal water table at a depth of 0 to 1 foot; subject to rare flooding.	Severe: seasonal water table at a depth of 0 to 1 foot; moderate permeability.	Severe: seasonal water table at a depth of 0 to 1 foot; fair to good compaction characteristics.
Piopolis: 420	Severe: slow permeability; seasonal water table at a depth of 0 to 1 foot; subject to flooding and standing water.	Severe: seasonal water table at a depth of 0 to 1 foot; subject to flooding and standing water.	Severe: seasonal water table at a depth of 0 to 1 foot; subject to flooding and standing water.	Severe: seasonal water table at a depth of 0 to 1 foot; subject to flooding and standing water.	Severe: seasonal water table at a depth of 0 to 1 foot; subject to flooding and standing water.	Severe: subject to flooding and standing water; seasonal water table at a depth of 0 to 1 foot; fair to good compaction characteristics.
Racoon: 109	Severe: slow permeability; seasonal water table at a depth of 0 to 1 foot; subject to occasional or rare flooding.	Slight	Severe: seasonal water table at a depth of 0 to 1 foot.	Severe: seasonal water table at a depth of 0 to 1 foot; subject to occasional or rare flooding.	Severe: seasonal water table at a depth of 0 to 1 foot; subject to occasional or rare flooding.	Severe: seasonal water table at a depth of 0 to 1 foot; subject to occasional or rare flooding; susceptible to frost action.
Reesville: 723	Severe: seasonal high water table at a depth of 1 to 3 feet; moderate or moderately slow permeability.	Severe: seasonal water table at a depth of 1 to 3 feet; subject to rare flooding.	Severe: seasonal water table at a depth of 1 to 3 feet.	Severe: seasonal water table at a depth of 1 to 3 feet.	Severe: seasonal water table at a depth of 1 to 3 feet.	Severe: seasonal water table at a depth of 1 to 3 feet; susceptible to frost action; fair to poor compaction characteristics.

properties of the soils—Continued

Suitability as a source of—		Soil features affecting—				
Road fill	Topsoil	Pond reservoir areas	Dikes, levees, and other embankments	Drainage for crops and pasture	Irrigation	Terraces and diversions
Poor: slope is 15 to 60 percent; channery and common stones; possible toxic material.	Poor: slope is 15 to 60 percent; channery soil with common stones; acid.	Steep, channery soil with common stones; seepage likely; natural ponds in depressions below ground water level.	Medium to high shear strength; low to medium compressibility; medium permeability; medium to high piping hazard; fair compaction characteristics.	Natural drainage adequate except in depressions.	Steep slopes; channery soil with common stones; low available water capacity; acid; low fertility; easily erodible.	Steep slopes; channery soil with common stones; easily erodible; low fertility.
Poor: seasonal water table at a depth of 0 to 1 foot; moderate susceptibility to frost action; moderate shrink-swell potential.	Fair where artificially drained; thick and high in organic-matter content. Poor where undrained.	Moderate permeability; seasonal water table at a depth of 0 to 1 foot.	Medium to low shear strength; medium compressibility; low permeability and susceptibility to piping; fair to good compaction characteristics.	Moderate permeability; poor natural drainage; favorable for subsurface drainage.	Moderate intake rate; deep root penetration; seasonal high water table; needs drainage system.	Generally nearly level; moderate permeability; slow surface runoff.
Poor: seasonal water table at a depth of 0 to 1 foot; moderate plasticity and shrink-swell potential.	Poor: thin; fair workability and tilth.	Slow permeability; seasonal water table at a depth of 0 to 1 foot; subject to siltation from flooding and flood plain scour.	Medium to low shear strength; medium compressibility; low permeability; low to medium susceptibility to piping; fair to good compaction characteristics.	Slow permeability; subject to flooding; seasonal high water table; drainage generally needed; fair to good stability of channels and side slopes.	High available water capacity; seasonal high water table; slow water intake rate; needs drainage system.	Bottom land, diversions needed in places to intercept and divert runoff from higher ground.
Poor: susceptible to frost action; moderate shrink-swell potential; seasonal water table at a depth of 0 to 1 foot.	Poor: naturally wet; medium thickness; friable.	Slow permeability; seasonal water table at a depth of 0 to 1 foot; subject to shoreline erosion.	Low to medium shear strength; high to medium compressibility; poor compaction characteristics; low to medium permeability and piping hazard.	Slow permeability; seasonal high water table; surface runoff slow to ponded; steep channel side slopes unstable.	Slow permeability; high available water capacity; needs drainage.	Generally not needed except to intercept and divert runoff from higher ground.
Poor: high potential frost action; low plasticity and shear strength; seasonal water table at a depth of 1 to 3 feet.	Good ----------	Moderately slow permeability; seasonal water table at a depth of 1 to 3 feet; highly subject to shoreline erosion.	Medium to low shear strength; medium compressibility; highly susceptible to frost action; low permeability; fair to poor compaction characteristics.	Moderate to moderately slow permeability; seasonal water table at a depth of 1 to 3 feet; steep channel side slopes unstable; drainage needed in places.	High to very high available water capacity; deep root penetration; moderate intake rate; seasonal water table at a depth of 1 to 3 feet; needs drainage system.	Where slopes are gentle, surface runoff is slow and erosion hazard slight; practice is suited to steeper areas; seasonal water table causes wet channel bottoms.

TABLE 7.—*Interpretations of engineering*

Soil series and map symbols	Degree and kind of limitation for—					
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings without basements [1]	Sanitary landfill	Local roads and streets
Sharon: 72	Severe: subject to flash flooding; moderate permeability.	Severe: subject to flash flooding; moderate permeability.	Severe: subject to flash flooding.	Severe: subject to flash flooding.	Severe: subject to flash flooding.	Severe: subject to flash flooding; susceptible to frost action; fair compaction characteristics.
Stoy: 164A, 164B	Severe: slow permeability; seasonal water table at a depth of 1 to 3 feet.	Slight where slope is 0 to 2 percent. Moderate where slope is 2 to 4 percent.	Severe: seasonal water table at a depth of 1 to 3 feet.	Moderate: seasonal water table at a depth of 1 to 3 feet; moderate shrink-swell potential.	Severe: seasonal water table at a depth of 1 to 3 feet.	Severe: seasonal water table at a depth of 1 to 3 feet; susceptible to frost action; moderate shrink-swell potential.
Uniontown: 482A 482B.	Moderate: moderate or moderately slow permeability; seasonal water table at a depth of 3 to 5 feet.	Moderate: moderate to moderately slow permeability; seasonal water table at a depth of 3 to 5 feet.	Slight: seasonal water table at a depth of 3 to 5 feet.	Severe: subject to rare flooding; susceptible to frost action.	Slight	Severe: susceptible to frost action.
Weir: 165	Severe: very slow permeability; seasonal water table at a depth of 0 to 1 foot.	Slight	Severe: seasonal water table at a depth of 0 to 1 foot; standing water in places; clayey subsoil.	Severe: seasonal water table at a depth of 0 to 1 foot; standing water in places; high shrink-swell potential in subsoil.	Severe: seasonal water table at a depth of 0 to 1 foot; standing water in places.	Severe: seasonal water table at a depth of 0 to 1 foot; high shrink-swell potential in subsoil; susceptible to frost action.
*Wellston: 339E, 339F, 986F. For Berks part of 986F, see Berks series.	Moderate to severe: slope is 12 to 45 percent; bedrock is commonly at a depth of 4 to 7 feet; pollution hazard.	Severe: slope is 12 to 45 percent; bedrock is commonly at a depth of 4 to 7 feet; pollution hazard.	Moderate to severe: slope is 12 to 45 percent; bedrock is commonly at a depth of 4 to 7 feet.	Severe: slope is 12 to 45 percent; erodible.	Severe: slope is 12 to 45 percent; pollution hazard.	Severe: slope is 12 to 45 percent.

properties of the soils—Continued

Suitability as a source of—		Soil features affecting—				
Road fill	Topsoil	Pond reservoir areas	Dikes, levees, and other embankments	Drainage for crops and pasture	Irrigation	Terraces and diversions
Poor: poor slope stability and compaction characteristics; susceptible to frost action.	Good: thick and friable; good tilth.	Subject to flooding; seepage; erodible.	Fair to poor shear strength and slope stability; low to medium piping hazard; fair compaction characteristics.	Natural drainage adequate, but subject to flash flooding.	Moderate intake rate; moderate permeability; very high available water capacity; deep root penetration.	Bottom land, diversions needed in places to intercept and divert runoff from higher ground; siltation from flash flooding.
Poor: poor to fair stability and compaction characteristics; moderate shrink-swell potential; susceptible to frost action.	Fair: medium thickness; friable.	Slow permeability; seasonal water table at a depth of 1 to 3 feet.	Medium to low shear strength and stability; medium compressibility; medium to low permeability; medium to high piping hazard; fair to poor compaction characteristics.	Somewhat poorly drained; slow permeability; seasonal water table at a depth of 1 to 3 feet; drainage needed in places.	Slow intake rate; slow permeability; high available water capacity; seasonal water table at a depth of 1 to 3 feet; needs drainage system.	Soil wetness affects channel bottoms in places; no major construction difficulty on favorable topography.
Poor: susceptible to frost action; poor to fair stability and compaction characteristics.	Fair: medium thickness; friable.	Moderate to moderately slow permeability; low plasticity; susceptible to wave erosion.	Medium to low shear strength; medium compressibility; medium to low permeability; high piping hazard; fair to poor compaction characteristics.	Natural drainage adequate.	Moderate intake rate; high to very high available water capacity; favorable soil depth; surface layer erodible in steeper areas.	Favorable soil depth and texture; easily erodible in steeper areas; no significant construction difficulty on favorable topography.
Poor: high shrink-swell potential in subsoil; susceptible to frost action; seasonal water table at a depth of 0 to 1 foot.	Poor: thin; naturally wet soil; difficult to revegetate borrow areas.	Very slow permeability; seasonal water table near surface.	Medium to low shear strength; medium compressibility; low susceptibility to piping; low permeability; fair to good compaction characteristics.	Naturally poorly drained; very slow permeability; seasonal water table at or near surface; surface drains needed; fair channel stability.	Moderate to high available water capacity; seasonal water table near surface; slow intake rate and very slow permeability.	Nearly level; slow surface runoff; soil wetness affects channel bottoms in places.
Fair where slope is 12 to 18 percent. Poor where slope is 18 to 45 percent; low to moderate shear strength.	Poor: thin; slope is 12 to 45 percent; borrow areas severely erodible.	Moderate permeability; bedrock is commonly at a depth of 4 to 7 feet; slope is 12 to 45 percent and limits reservoir storage; susceptible to wave erosion; sandy or stony pockets in places.	Medium to low shear strength; medium compressibility; high piping hazard; medium to slow permeability; fair to poor compaction characteristics.	Natural drainage adequate.	Slope is 12 to 45 percent; high potential for channel erosion and side slope instability.	Slope is 12 to 45 percent; high potential for channel erosion and side slope instability.

TABLE 7.—*Interpretations of engineering*

Soil series and map symbols	Degree and kind of limitation for—					
	Septic tank absorption fields	Sewage lagoons	Shallow excavations	Dwellings without basements [1]	Sanitary landfill	Local roads and streets
Zanesville: 340D2, 340D3, 340E2, 340E3.	Severe: slow permeability in fragipan; seasonal perched water table; bedrock is at a depth of 2½ to 5 feet.	Severe: seasonal perched water table above fragipan; slope is 7 to 18 percent; bedrock is at a depth of 2½ to 5 feet.	Severe: seasonal perched water table above fragipan; slope is 7 to 18 percent; bedrock is at a depth of 2½ to 5 feet.	Severe: slope is 7 to 18 percent; seasonal water table perched above fragipan; severely erodible; susceptible to frost action.	Severe: seasonal perched water table above fragipan; lateral seepage; slope is 7 to 18 percent.	Severe: highly susceptible to frost action; seepage likely; slope is 7 to 18 percent.
Zipp: 524, 524+	Severe: slow or very slow permeability; water table at a depth of 0 to 1 foot; subject to occasional or rare flooding and standing water.	Severe: subject to occasional or rare flooding.	Severe: seasonal water table at a depth of 0 to 1 foot; subject to occasional or rare flooding and standing water.	Severe: subject to occasional or rare flooding and standing water; seasonal water table at a depth of 0 to 1 foot; high shrink-swell potential.	Severe: seasonal water table at a depth of 0 to 1 foot; subject to occasional or rare flooding and standing water.	Severe: subject to occasional or rare flooding and standing water; seasonal water table at a depth of 0 to 1 foot; high shrink-swell potential.

[1] It is assumed footings are placed below depth of frost action.
[2] These intake rates apply to soil depth above fragipan; after the upper part of the soil is saturated, infiltration rates are reduced by slow or very slow permeability in the fragipan.

needed for changing the parent material into a soil profile. It may be much or little, but some time is always required for differentiation of soil horizons. Generally, a long time is required for the development of distinct horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other four. Many of the processes of soil development are unknown.

Parent material

The parent materials of the soils in Saline County are loess, alluvium, residuum weathered from bedrock, glacial drift, outwash, and lakebed or lacustrine sediments.

Loess.—About 35 percent of the soils formed mainly in windblown silt, called loess, and another 5 percent formed in loess 20 to 40 inches thick over residuum or bedrock. The Grantsburg and Stoy soils, for example, formed entirely in loess, and Zanesville soils formed in loess and residuum.

The sources of loess in Saline County are the Ohio River, the Mississippi River, and to a lesser extent, the Saline River Valley. Loess is thickest in the eastern part of the county where Hosmer soil is common. The loess is about 8 to 10 feet thick on the ridgetops in the southeast corner of the county and 3 or 4 feet thick in the northeast corner.

Over much of the upland area of the county, a loamy material underlies the Peoria Loess, or recent loess. The age and mode of deposition of this material have not been completely established, but it is commonly referred to as Roxanna silt. It is similar to the loess but is about 10 to 20 percent sand and scattered small pebbles. The Peoria Loess generally is about 5 percent sand. The loamy material is 1 to 4 feet thick and averages about 2 feet thick. It commonly grades into the underlying glacial drift or residuum weathered from bedrock without a distinct boundary and probably includes areas of pedisediment. The lower part of the subsoil of such soils as Ava and Bluford soils formed in this material.

Alluvium.—About 20 percent of the soils formed in water-deposited silts along streams. The Sharon and Belknap soils, for example, formed in recent alluvium that has been derived mainly from geological and recent accelerated erosion of upland soils.

Residuum.—About 6 percent of the soils in the county formed mainly in residuum weathered from sandstone and thinly bedded siltstone and shale. Another 5 percent, as mentioned in the discussion of loess, formed in loess 20 to 40 inches thick over residuum. Wellston and Zanesville soils, for example, formed in loess and residuum.

Berks and Frondorf soils are examples of soils that formed mainly in sandstone and siltstone residuum. The bedrock is of Pennsylvanian age and is the oldest geological formation in Saline County (*6*).

properties of the soils—Continued

Suitability as a source of—		Soil features affecting—				
Road fill	Topsoil	Pond reservoir areas	Dikes, levees, and other embankments	Drainage for crops and pasture	Irrigation	Terraces and diversions
Poor: susceptible to frost action; low shear strength in embankment slopes.	Fair: thin; slope is 7 to 18 percent; difficult to revegetate borrow areas; severely erodible.	Slow permeability in fragipan; seasonal perched water table above fragipan; thin-bedded bedrock at a depth of 2½ to 5 feet.	Low to moderate shear strength; medium to high compressibility; low to medium susceptibility to piping; slow permeability; fair to poor compaction characteristics.	Lateral movement of water above fragipan; seepage spots likely.	Slow permeability in fragipan; limited rooting zone above fragipan; slope is 7 to 18 percent; severe erosion hazard.	Slope is 7 to 12 percent; high potential for channel erosion and side slope instability; seepage likely in channel bottom.
Poor: high plasticity; poor workability; high shrink-swell potential; poor compaction characteristics.	Poor: poor workability; thin, naturally wet soil.	Very slow permeability; ample soil depth to establish shoreline vegetation; high plasticity resistant to wave erosion; seasonal water table at or near surface.	Medium to low shear strength and slope stability; high resistance to piping; high compressibility; slow permeability; fair to poor compaction characteristics.	Wet; high water table at or near surface; subject to occasional or rare flooding and standing water; surface drainage systems only.	Naturally wet; high water table at or near surface; subject to overflow and standing water; very slow intake rate.	Bottom land, diversions needed in places to intercept and divert runoff from higher ground.

[3] Belknap soil has slow permeability.
[4] Belknap soil has moderate or high available water capacity.

Glacial drift.—The glaciers which covered most of North America reached the northern third of Saline County. The glacial deposits are thin and discontinuous on the mature pre-Illinoian bedrock topography. Glacial deposits have since been covered by lake sediments and alluvium on the terraces and flood plains and by loess on the uplands (*7*). Glacial deposits are exposed in some dissected areas in the northeastern part of the county. The Hickory soils formed on some of the short, steep side slopes in this area.

Outwash and lacustrine sediments.—About 20 percent of the soils formed in silty and clayey deposits. Patton and Zipp soils, for example, formed in this type of material. These soils are mainly in the eastern part of Saline County on terraces.

These sediments were deposited by water, either flowing or quiet, which flooded the Saline River basin during the latest stages of glaciation. Huge quantities of outwash sediments coming from the melting glacier choked the Ohio River channel and diverted flood waters and sediments into the Saline River basin, and Lake Saline formed (*7*). This lake was filled several times, and more sediment was added each time. The silty outwash sediments were deposited from flowing waters, and the clayey lacustrine sediments were deposited on the lake bed from still waters.

Climate

Climate affects soil formation through its effect on weathering, on vegetation, and on erosion. Freezing and thawing help to break down minerals and rock fragments. Water received as rainfall percolates downward in soils that have favorable slope and permeability and carries with it bases and clay that accumulate in the lower soil horizons.

Saline County has a humid temperate climate which has been favorable for soil development. Rainfall and temperature encouraged the growth of hardwood forests in most places. Enough water has percolated through the soil to cause downward movement of fine particles, colloids, and soluble minerals. Consequently, upland soils and many soils on terraces commonly have a greater proportion of silica in the surface layer and an accumulation of clay in the subsoil, and they are strongly acid.

The soil temperature at a depth of 20 inches averages about 59° F and ranges from about 74° F in July to 42° F in January. Soils that do not have vegetative cover are more variable. Also, the more sloping soils having south-facing slopes have a slightly higher temperature; those having north-facing slopes have a slightly lower temperature.

Plants and animals

Living forms affect the formation of soils. Plants have the main effect, but animals and organisms that live on and in the soils are also important. The changes living forms bring about depend mainly on the kinds of life processes peculiar to each. The kinds of plants and animals that live on and in the soils are affected

TABLE 8.—*Engineering*

[Test performed by Illinois Department of Transportation, Bureau of Materials,

Soil name and location	Parent material	Report No. S–73–I1–83	Depth	Moisture density[1]	
				Maximum dry density	Optimum moisture
			Inches	*Pounds per cubic foot*	*Percent*
Ava silt loam: 990 feet east and 1,270 feet north of center of sec. 32, T. 7 S., R. 6 E. (Modal)	Loess and loamy material	3–1 3–2 3–3	0–7 10–19 22–32	107 106 105	17 18 19
Banlic silt loam: 2,526 feet west and 525 feet south of the NE corner of sec. 21, T. 7 S., R. 6 E. (Modal)	Silty alluvium	8–1	25–38	110	16
Colp silt loam: 1,160 feet north and 1,320 feet west of center of sec. 35, T. 9 S., R. 7 E. (Modal)	Loess or silty wash and lacustrine sediment.	1–1 1–2 1–3	0–7 21–32 61–89	107 103 106	15 20 19
Hickory loam: 405 feet north and 265 feet east of center of sec. 7, T. 8 S., R. 6 E. (Modal)	Glacial drift	2–1 2–2 2–3	1–6 12–20 42–50	115 115 115	13 14 14
Hurst silt loam: 50 feet north and 265 feet east of center of sec. 27, T. 9 S., R. 7 E. (Modal)	Loess or silty wash and lacustrine sediment.	6–1 6–2 6–3	6–13 21–31 53–62	109 103 107	16 20 19
Markland soils: 655 feet south and 985 feet west of center of sec. 25, T. 9 S., R. 6 E. (Modal)	Lacustrine sediment	5–1 5–2	14–26 45–55	103 110	21 18
Racoon silt loam: 1,580 feet south and 705 feet west of center of sec. 22, T. 8 S., R. 6 E. (Modal)	Silty outwash and local overwash	7–1 7–2 7–3	9–17 36–51 61–84	110 103 114	15 19 14
Wellston silt loam: 460 feet south and 1,880 feet east of northeast corner of sec. 1, T. 10 S., R. 7 E. (Modal)	Loess and material weathered from sandstone, siltstone, and shale.	4–1 4–2 4–3	3–7 16–20 36–48	102 112 111	18 16 15
Zipp silty clay loam: 20 feet north and 1,360 feet west of center of sec. 34, T. 9 S., R. 6 E. (Modal)	Lacustrine sediment	[7] 74–0–62 403.1	35–41	----------	----------

[1] Based on AASHTO Designation T 99–57, Method A (*2*).

[2] Mechanical analysis according to AASHTO Designation T 88–57(*2*). Results by this procedure may differ somewhat from the results obtained by the soil survey procedure of the Soil Conservation Service. The mechanical analysis data used in this table are not suitable for use in naming textural classes of soils.

[3] Based on AASHTO Designation T 89–60 (*2*).

in turn by the climate, parent material, relief, and age of the soil.

Most of the soils in Saline County formed under forest vegetation and have a light-colored surface layer. Patton, Harco, and Darwin soils are dark-colored soils on terraces and bottom lands. These soils were influenced by grasses. In general, soils formed under grasses are darker colored and contain more organic matter than those formed under trees.

Small burrowing rodents, insects, grubs, earthworms, crawfish, fungi, microbes, and other organisms influence the formation of soil by mixing organic matter into the soil and by helping break down plant remains. Mixing of soils to varying degrees and depths

test data

Springfield, Illinois. Absence of an entry indicates that no determination was made]

Mechanical analysis [2]										Liquid limit [3]	Plasticity index [4]	Classification	
Percentage less than 3 inches passing sieve—							Percentage smaller than—						
1 inch	¾ inch	⅜ inch	No. 4 (4.7 mm)	No. 10 (2.0 mm)	No. 40 (0.42 mm)	No. 200 (0.074 mm)	0.05 mm	0.005 mm	0.002 mm			AASHTO [5]	Unified [6]
										Percent			
100	100	100	100	100	99	96	91	19	13	28	5	A–4(5)	ML
100	100	100	100	100	100	98	94	39	30	39	17	A–6(18)	CL
100	100	100	100	99	98	94	89	34	27	40	19	A–7–6(19)	CL
100	100	100	100	100	97	94	85	22	17	27	6	A–4(5)	CL–ML
100	100	100	100	100	97	86	78	12	9	29	5	A–4(4)	ML
100	100	100	100	100	99	93	88	45	43	50	30	A–7–6(30)	CL
100	100	100	100	98	97	95	89	50	34	44	24	A–7–6(24)	CL
100	100	99	99	97	89	64	54	18	14	25	6	A–4(2)	CL–ML
100	99	99	98	97	91	62	51	28	21	32	15	A–6(7)	CL
100	100	99	99	98	94	75	64	31	23	30	13	A–6(8)	CL
100	100	100	100	99	94	90	84	40	26	33	13	A–6(12)	CL
100	100	100	100	100	99	97	94	59	47	52	32	A–7–6(34)	CH
100	100	100	100	98	97	95	93	54	37	43	23	A–7–6(24)	CL
100	100	100	100	100	98	96	95	62	42	45	24	A–7–6(25)	CL
100	100	100	100	99	99	96	92	58	40	32	14	A–6(13)	CL
100	100	100	100	97	94	86	77	23	20	28	7	A–4(5)	ML–CL
100	100	100	99	98	96	91	87	41	36	41	23	A–7–6(21)	CL
100	100	100	100	99	96	88	83	30	23	32	15	A–6(12)	CL
100	100	100	100	100	99	95	87	23	17	30	4	A–4(4)	ML
100	100	99	98	96	92	83	79	35	27	31	12	A–6(9)	CL
99	99	97	94	84	78	70	67	43	32	40	19	A–6(12)	CL
100	100	100	100	100	100	100	97	63	49	56	31	----------	CH

[4] Based on AASHTO Designation T 90–56 and AASHTO Designation T 91–54 (*2*).

[5] Based on AASHTO Designation M 145–49 (*2*).

[6] Based on the Unified Soil Classification System (*3*).

[7] Test performed by Soil Conservation Service, Soil Mechanics Laboratory, Lincoln, Nebraska.

by earthworms, for example, generally is quite evident in some soils. Bacteria and fungi aid in the decomposition of plant and animal remains and thus add organic matter, or humus, to the soil.

Relief

Relief controls the amount of moisture in the soil through its influence on the amount of runoff, the degree of erosion, and the amount of water infiltrating into the soils.

In uniform materials such as loess, the differences in natural soil drainage generally are closely associated with slope or relief. Soil drainage in turn greatly affects the color and natural drainage of a soil. Soils

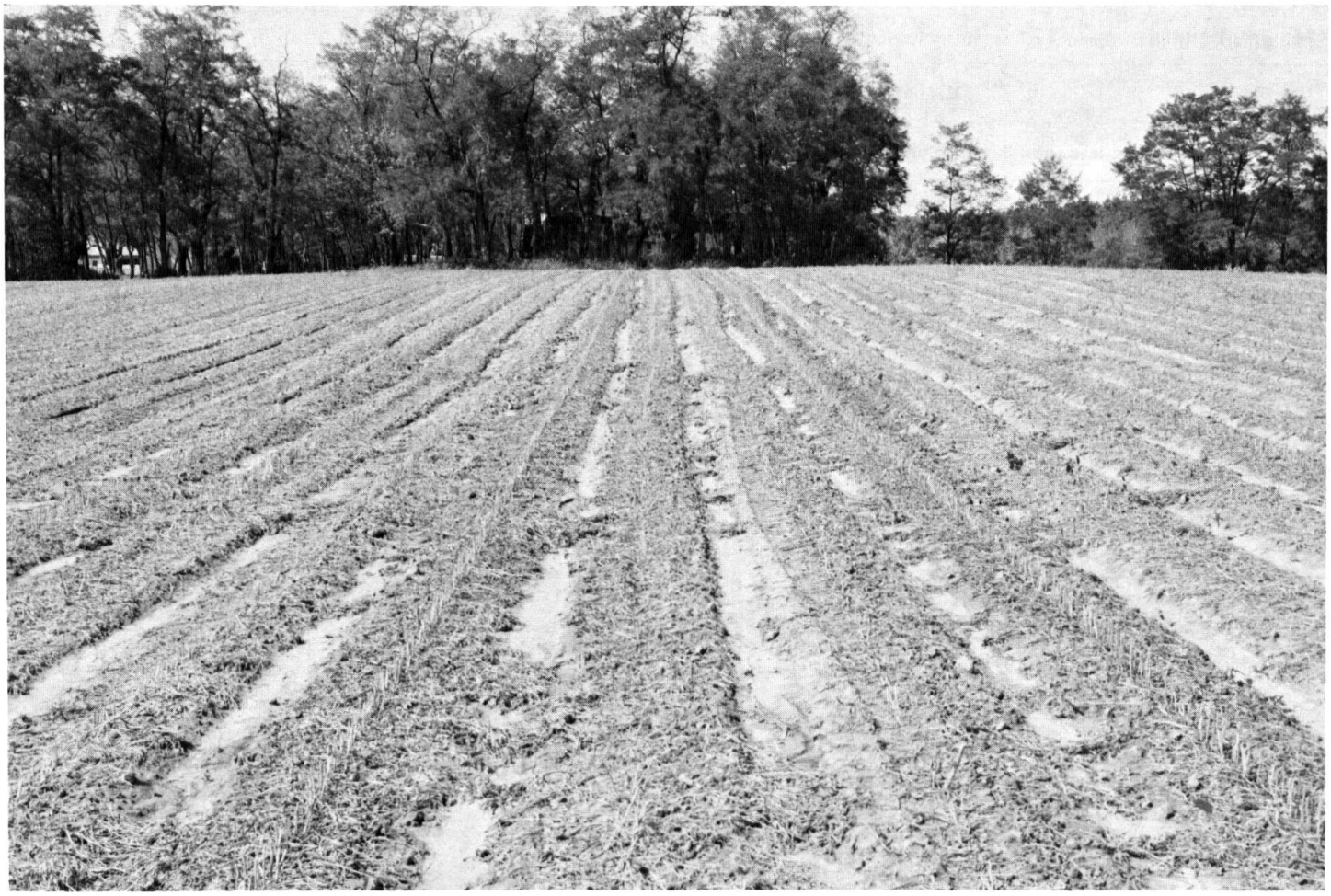

Figure 13.—**Only a few inches of topsoil remain on this sloping, eroded Ava soil. Management of a soil for one use often affects its suitability for another.**

that formed under good drainage have a subsoil that is uniformly brown in color. Soils that formed under poor drainage conditions, such as Weir soils, have grayish color. Soils that formed where drainage is intermediate, have a subsoil that is mottled with gray and brown. Stoy and Reesville soils are examples. The grayish colors persist even though the drainage is provided by ditches or tile drains.

In steep areas, geologic erosion removes surface soil. In low-lying or depressional areas, soil materials often accumulate and add to the thickness of surface soil. In other areas, the formation of soil materials and rates of removal are in equilibrium with soil development.

Relief, or the lack of it, is also related to the eluviation of clay from the A horizon to the B horizon. For instance, in the sloping Hosmer soil, the rate at which clay moves downward in the profile is only moderate. In nearly level soils, such as Weir soils, more clay has accumulated. Weir soils are now commonly referred to as a claypan soil.

Time

Time is necessary for the formation of soil in parent material. Normally, a long period of time is required for the formation of soils that have distinct, well-expressed horizons, but the length of time is largely dependent upon the combined action of the other soil-forming factors.

Soils normally become more strongly developed with increased time of exposure to weathering processes. In areas where geologic erosion is rapid, however, soils such as the steep Berks soil may be in the early stages of development even though the slopes and parent materials have been exposed to weathering for thousands of years.

Bottom land soils such as Belknap soils are still accumulating surface deposits from flooding. These soils are relatively young and have weakly developed horizons. Reesville soils also formed in similar sediments from outwash, but the time lapse since deposition has been long enough for a distinct profile to develop. Although loess is geologically recent, enough time has elapsed to allow soils such as Grantsburg soils to develop well-defined horizons.

The soils of Saline County are young to mature in age. Old soils have not developed because either the parent material is too young for old soil profiles to form, or where old geologic parent material exists, it is

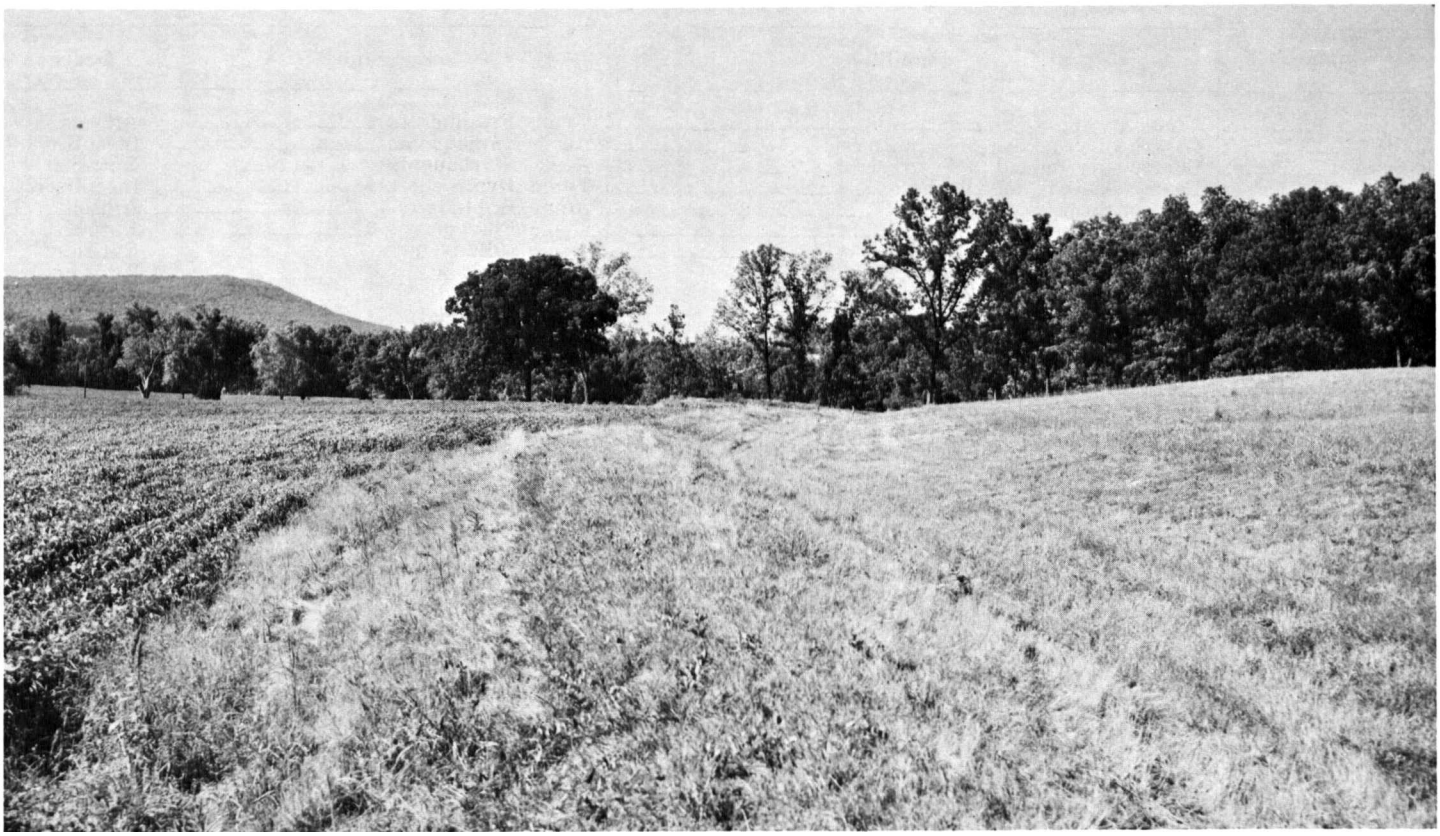

Figure 14.—This diversion terrace at the foot slope of a Zanesville soil walks runoff across the slope and protects the cultivated surface layer of a Hosmer soil.

on steep slopes and geologic erosion removes soil material at a rate which prevents old soil profiles from forming.

Classification of the Soils

The soil is a continuous mantle, except for bodies of water or outcrops of bedrock, over the Earth. A soil body is an entity with three dimensions. Each one has a distinct upper boundary touching the vegetative cover, a less distinct lower boundary grading into the substratum or bedrock, and an indefinite perimeter. Because a soil body is not a distinct individual but a segment of the mantle, its outer boundary is at the point of the maximum rate of lateral change between two soil bodies. Classification of soils is a science. The mapping of soils—locating similar soil bodies and delineating them—is an applied art. The classification system is explained in the following text. The soil maps are at the back of this survey.

Each kind of soil is classified and known by its particular properties and features. Soils are classified so that we can more easily remember their significant characteristics. Classification enables us to assemble knowledge about the soils, to see their relationship to one another and to the whole environment, and to develop principles that help us to understand their behavior and their response to manipulation. First through classification, and then through use of soil maps, we can apply our knowledge of soils to specific tracts of land.

The narrow categories of classification, such as those used in detailed soil surveys, allow us to organize and apply knowledge about soils in managing farms, fields, and woodlands; in developing rural areas; in engineering work; and in many other ways. Soils are placed in broad classes to facilitate study and comparison in large areas, such as countries and continents.

The system of soil classification currently used was adopted by the National Cooperative Soil Survey in 1965 (*12*) and subsequently revised in 1973. Because this system is under continual study, readers interested in developments of the current system should search the latest literature available.

The current system of classification (*15*) has six categories. Beginning with the broadest, these categories are order, suborder, great group, subgroup, family, and series. In this system, the criteria used as a basis for classification are soil properties that are observable and measurable. The properties are chosen, however, so that the soils of similar genesis, or mode of origin, are grouped. The same property or subdivisions of this property may be used in several different categories. In table 9 the soil series of Saline County are placed in four categories of the current system. Classes of the current system are briefly defined in the following paragraphs.

ORDER.—Ten soil orders are recognized. The

TABLE 9.— *Classification of soil series*

Soil	Family	Subgroup	Order
Ava	Fine-silty, mixed, mesic	Typic Fragiudalfs	Alfisols.
Banlic	Coarse-silty, mixed, nonacid, mesic	Aeric Haplaquepts	Inceptisols.
Belknap	Coarse-silty, mixed, acid, mesic	Aeric Fluvaquents	Entisols.
Berks	Loamy-skeletal, mixed, mesic	Typic Dystrochrepts	Inceptisols.
Bluford	Fine, montmorillonitic, mesic	Aquic Hapludalfs	Alfisols.
Bonnie	Fine-silty, mixed, acid, mesic	Typic Fluvaquents	Entisols.
Burnside	Loamy-skeletal, mixed, acid, mesic	Typic Udifluvents	Entisols.
Cape	Fine, montmorillonitic, acid, mesic	Typic Fluvaquents	Entisols.
Colp	Fine, montmorillonitic, mesic	Aquic Hapludalfs	Alfisols.
Creal	Fine-silty, mixed, mesic	Aquic Hapludalfs	Alfisols.
Darwin	Fine, montmorillonitic, mesic	Vertic Haplaquolls	Mollisols.
Frondorf	Fine-loamy, mixed, mesic	Ultic Hapludalfs	Alfisols.
Grantsburg	Fine-silty, mixed, mesic	Typic Fragiudalfs	Alfisols.
Harco	Fine-silty, mixed, mesic	Aquic Argiudolls	Mollisols.
Hickory	Fine-loamy, mixed, mesic	Typic Hapludalfs	Alfisols.
Hosmer	Fine-silty, mixed, mesic	Typic Fragiudalfs	Alfisols.
Hoyleton [1]	Fine, montmorillonitic, mesic	Aquollic Hapludalfs	Alfisols.
Huey	Fine-silty, mixed, mesic	Typic Natraqualfs	Alfisols.
Hurst	Fine, montmorillonitic, mesic	Aeric Ochraqualfs	Alfisols.
Karnak	Fine, montmorillonitic, nonacid, mesic	Vertic Haplaquepts	Inceptisols.
Markland	Fine, mixed, mesic	Typic Hapludalfs	Alfisols.
McGary	Fine, mixed, mesic	Aeric Ochraqualfs	Alfisols.
Orthents	Loamy-skeletal, mixed, nonacid, mesic	Orthents	Entisols.
Orthents, acid	Loamy-skeletal, mixed, acid, mesic	Orthents	Entisols.
Patton	Fine-silty, mixed, mesic	Typic Haplaquolls	Mollisols.
Piopolis [2]	Fine-silty, mixed, acid, mesic	Typic Fluvaquents	Entisols.
Racoon	Fine-silty, mixed, mesic	Typic Ochraqualfs	Alfisols.
Reesville	Fine-silty, mixed, mesic	Aeric Ochraqualfs	Alfisols.
Sharon	Coarse-silty, mixed, acid, mesic	Typic Udifluvents	Entisols.
Stoy	Fine-silty, mixed, mesic	Aeric Fragiudalfs	Alfisols.
Uniontown	Fine-silty, mixed, mesic	Typic Hapludalfs	Alfisols.
Weir	Fine, montmorillonitic, mesic	Typic Ochraqualfs	Alfisols.
Wellston	Fine-silty, mixed, mesic	Ultic Hapludalfs	Alfisols.
Zanesville	Fine-silty, mixed, mesic	Typic Fragiudalfs	Alfisols.
Zipp	Fine, mixed, nonacid, mesic	Typic Haplaquepts	Inceptisols.

[1] Some Hoyleton soils in Saline County are taxadjuncts to the Hoyleton series because the B horizon is grayer than defined in the range for the series.

[2] Some Piopolis soils in Saline County are taxadjuncts to the Piopolis series because the lower part of the control section is not so acid as defined in the range for the series.

properties used to differentiate among soil orders are those that tend to give broad climatic groupings of soils. Three exceptions to this are the Entisols, Histosols, and Vertisols, which occur in many different climates. The four orders represented in Saline County are Alfisols, Entisols, Inceptisols, and Mollisols.

SUBORDER.—Each order is subdivided into suborders, based on the soil characteristics that seem to produce classes having the greatest genetic similarity. The suborders are more narrowly defined than are the orders. The soil properties used to separate suborders are mainly those that reflect either the presence or absence of a water table at a shallow depth; soil climate; the accumulation of clay, iron, or organic carbon in the upper parts of the solum; cracking of soils caused by a decrease in soil moisture; and fine stratification.

GREAT GROUP.—Soil suborders are separated into great groups on the basis of uniformity in the kinds and sequence of soil horizons and features. The horizons used to make separations are those in which clay, carbonates, and other constituents have accumulated or have been removed; and those that have pans that interfere with growth of roots, movement of water, or both. Some features used are soil acidity, soil climate, soil composition, and soil color.

SUBGROUP.—Great groups are subdivided into subgroups, one representing the central (typic) segment of the group, and others, called intergrades, that have properties of the group and also one or more properties of another great group, suborder, or order. Other subgroups may have soil properties unlike those of any other great group, suborder, or order.

FAMILY.—Soil families are separated within a subgroup primarily on the basis of properties important to the growth of plants or to the behavior of soils when used for engineering purposes. Among the properties considered are texture, mineralogy, reaction, soil temperature, permeability, soil depth, and consistence.

SERIES.—The series is a group of soils having major soil horizons that are similar in important characteristics. These characteristics include the kind, thickness, and arrangement of horizons. Within these horizons, color, structure, reaction, consistence, mineral and chemical composition, and texture below the surface layer are similar.

Laboratory Data

Physical and chemical laboratory data for some of the soils in Saline County are given in table 10. These data are useful in classifying soils, in developing con-

TABLE 10.—*Laboratory data of selected soil profiles*

[All samples were taken from the sites of the representative profiles. Absence of an entry indicates tests were not made. The symbol < means less than. The location of each soil and a description of its profile are given in the section "Description of the Soils"]

Soil type	Horizon	Depth	Laboratory number	Particle-size distribution			Base saturation	Bulk density	Coefficient of linear extensibility
				Sand (2.0–0.05 mm)	Silt (0.05–0.002 mm)	Clay (<0.002 mm)			
		Inches		*Percent*	*Percent*	*Percent*	*Percent*	*Grams per cubic centimeter*	
Banlic silt loam.	A2&B2	20–29	[1] 73L1014					1.70	0.007
Belknap silt loam.	Ap1	0–7	[2] S–9	2.7	82.3	15.0			
	Ap2	7–10	S–10	2.5	81.7	15.8			
	A1	10–13	S–11	3.9	82.9	13.2			
	C1	13–25	S–12	4.5	80.5	15.0			
	C2	25–33	S–13	4.3	79.5	16.2			
	C3	33–47	S–14	2.3	82.4	15.3			
Cape silty clay loam.	B21g	20–28	[1] 73L1018					1.61	0.052
Darwin silty clay.	B22g	18–25	[1] 73L1017					1.80	0.073
Frondorf silt loam.	B22t	21–29	[2] S–339	37.9	36.0	26.1			
			[1] 72L386				35		
	IIB23t	29–34	72L387				33		
Hoyleton silt loam.	Ap	0–9	[2] SCS–Sa1	1.1	82.8	16.1			
	A2	9–13	SCS–Sa2	2.9	69.8	26.3			
	B1	13–15	SCS–Sa3	1.8	62.2	36.0			
	B21t	15–20	SCS–Sa4	1.1	54.3	44.6			
	B22t	20–25	SCS–Sa5	1.4	59.4	39.2			
	B23t	25–30	SCS–Sa6	1.4	68.6	31.0			
	B3	30–40	SCS–Sa7	2.0	72.9	25.1			
			[1] 7CL1016					1.64	0.017
	C1	40–48	SCS–Sa8	1.6	81.2	17.2			
Karnak silty clay.	B2g	14–36	[1] 73L1019					1.94	0.126
Patton silty clay loam.	Ap	0–6	[2] SCS–Sa25	3.4	66.4	30.2			
	A1	6–13	SCS–Sa26	2.9	67.0	30.1			
	B1	13–17	SCS–Sa27	2.3	63.7	34.0			
	B21	17–27	SCS–Sa28	3.0	60.0	37.0			
	B22	27–34	SCS–Sa29	2.7	64.1	33.2			
	B23	34–40	SCS–Sa30	2.4	66.6	32.0			
	B3	40–52	SCS–Sa31	2.1	73.5	24.4			
Reesville silt loam.	Ap	0–9	[2] SCS–Sa52	7.4	80.4	12.2			
	A2	9–13	SCS–Sa53	5.5	79.1	15.4			
	B21t	13–24	SCS–Sa54	2.6	61.0	36.4			
	B22t	24–33	SCS–Sa55	3.4	69.1	27.5			
	B23t	33–38	SCS–Sa56	2.5	70.5	27.0			
	B3	38–49	SCS–Sa57	3.2	68.9	27.9			
	C1	49–75	SCS–Sa58	7.9	69.7	22.4			
Stoy silt loam.	Ap	0–8	[2] SCS–Sa40	4.8	81.6	13.6			
	A21	8–17	SCS–Sa41	4.6	79.7	16.7			
	B1	17–22	SCS–Sa42	3.0	74.2	22.8			
	B21t	22–32	SCS–Sa43	0.9	71.0	28.1			
	B22t	32–41	SCS–Sa44	3.1	63.9	33.0			
	Bx1	41–56	SCS–Sa45	2.9	74.9	22.2			
Uniontown silt loam.	Ap	0–7	[2] SCS–Sa25	3.4	66.4	30.2			
	B21t	7–14	SCS–Sa26	2.9	66.4	30.7			
	B22t	14–23	SCS–Sa27	2.3	63.7	34.0			
	B23t	23–34	SCS–Sa28	3.0	60.0	37.0			
	B3	34–42	SCS–Sa29	2.7	64.1	33.2			
	C1	42–55	SCS–Sa30	2.1	74.5	24.4			

TABLE 10.—*Laboratory data of selected soil profiles*—Continued

Soil type	Horizon	Depth	Laboratory number	Particle-size distribution			Base saturation	Bulk density	Coefficient of linear extensibility
				Sand (2.0–0.05 mm)	Silt (0.05–0.002 mm)	Clay (<0.002 mm)			
		Inches		*Percent*	*Percent*	*Percent*	*Percent*	*Grams per cubic centimeter*	
Zanesville silt loam.	Bx2	20–29	[1] 72L389	----------	----------	----------	55	----------	----------
	IIBx3	29–35	72L390	----------	----------	----------	45	----------	----------

[1] Data are on file in Soil Survey Laboratory, Midwest Technical Service Center, Lincoln, Nebraska.

[2] Data are on file in the Department of Agronomy, University of Illinois.

[3] Data are on file in Section of Ground-Water Geology and Geophysical Exploration, Natural Resource Building, Urbana, Illinois.

cepts of soil genesis, and in estimating the properties and behavior of a soil.

The samples used for determining the data were collected from carefully selected sites, mainly from the representative profile which is described in the section on "Descriptions of the Soils."

The sampling and laboratory tests were by standard procedures (*14*).

General Nature of the County[8]

In this section, the cultural and natural features of Saline County are described, and climatic data for the county are given.

Cultural Features

Saline County was established on February 25, 1847. The region which became Saline County was inhabited by the Piankashaw and Shawnee Tribes when the first settlers arrived in 1814.

The population of the county reached its peak of 38,353 in 1920. It remained stable until 1940, then declined to 25,721 by 1970. The urban population declined until 1960 but showed a slight gain in the 1970's. According to the 1970 U.S. Census, Harrisburg had a population of 9,535; Eldorado, 3,876; Carrier Mille, 2,013; and Galatia, 792.

There are four community unit school systems in the county. Each of these units has one high school attendance center, and all except Galatia have more than one elementary attendance center. Southeastern Illinois College is 6 miles east of Harrisburg.

Mineral resources have been important to the economy of Saline County. Salt mining, important in the early history of the county, declined in importance as large amounts of coal were mined.

The county is served by five State highways and several hard-surfaced county roads. Plans for a limited access freeway are currently under study. Three railroads and one airport serve the county.

[8] ROBERT BASINGER, district conservationist, Soil Conservation Service, assisted in the preparation of this section.

The coal mining industry remains one of the major employers in the county. Services, mining, and wholesale and retail trade provide 70 percent of the employment in the county. Manufacturing, construction, transportation, and communication are secondary employers.

Cash grain accounts for about two-thirds of the farm income, and livestock production, one-third. The soils in the east-central and northeastern parts of the county are used intensively for growing corn and soybeans. Livestock is raised mainly in the western and southern parts of the county. The 1970 Conservation Needs Inventory (*17*) shows 133,640 acres of cropland, or 55 percent of the land. The main crops are corn, soybeans, and wheat. Corn was harvested on 55 percent of the cropland acres devoted to cash grain, soybeans on 35 percent, and wheat on 10 percent. In the past few years, however, corn and soybean acreage has been about equal. Much of the grain is marketed at local elevators and shipped by barge on the Ohio River, but some is shipped by rail or truck.

Pasture occupies 31,000 acres, or 13 percent of the land. The U.S. Census of Agriculture in 1969 (*16*) reported 8,453 cattle. There were also 2,444 brood sows and 41,717 fattened hogs marketed in 1969. Most livestock in the county is sold at local markets.

There is extensive acreage of forest land in Saline County. The Conservation Needs Inventory lists 34,900 acres of farm woodland, or 14 percent of the land. The Shawnee National Forest manages an additional 10,920 acres, making a total of 19 percent of the land area in woodland.

Flooding in the Saline River bottom land has been a serious problem for many years. The Saline Valley Conservancy District and the U.S. Corps of Engineers are presently improving the channel of 67 miles of the Saline River for improved drainage and flood control. Also, 20 local drainage districts have constructed 157 miles of ditches to provide outlets for surface runoff and tile drains.

Recreational opportunities—camping, fishing, hunting, hiking, and horseback riding—are abundant. There are three park districts in the county, one conservation area, and several recreation areas developed in

Shawnee National Forest. Also, several private fishing lakes are operating on a fee basis.

A recent change of land use has been the development of residential areas in the outskirts of Harrisburg, Eldorado, and Carrier Milles. Also, strip development of residential areas has taken place along the highway between Eldorado and Raleigh and along the highway between Harrisburg and Carrier Milles.

Natural Features

The topography is varied in Saline County. The highest elevation is atop Hortin Hill, which is 1,000 feet above sea level; the lowest elevation is 323 feet at the junction of the Saline River channel and the east county line near Equality, Ill. Somewhat less than half of the county consists of nearly level bottom lands and terraces of low relief. About one-fourth consists of nearly level to rolling uplands, and the remaining part of the upland is hilly. Most of the area was wooded, and there were a few islands of prairies on the terraces and uplands, mainly in the central and northern parts of the county.

Most of the streams in the county flow into South Fork Saline River and Middle Fork Saline River, but in the northeast corner drainage is to North Fork Saline River.

Most of the soils on the bottom lands and terraces are in the Saline River basin. These are mainly low-lying soils. Most areas are susceptible to frequent to rare flooding either from backwaters of the Ohio River or from headwaters of local streams. The large terrace areas in the east-central and northeastern parts of the county are generally at elevations between 360 and 370 feet. The highest record flood at Harrisburg, in January 1937, was 375 feet. Most of the terrace area has been designated as flood-prone area.[9]

Climate[10]

Saline County has the continental climate typical of southern Illinois. There is a wide annual temperature range. Minimums are below zero (0° F) during 6 out of 10 winters, and maximums are 100° or higher during 8 out of 10 summers. Weather fronts associated with low-pressure areas bring frequent changes in temperature, humidity, cloudiness, and wind direction during much of the year. Such changes are considerably less frequent during summer months. Climatic data for Saline County are presented in tables 11 and 12.

Annual precipitation averages about 42 inches and varies from 25 to 72 inches. About one year in seven will have less than 32 inches, and more than 52 inches occurs about equally as often. Precipitation is rather uniformly distributed throughout the year. An average of slightly less than 3 inches occurs during the three driest months, and more than 4 inches falls during the three wettest months. More than half the annual average falls during the April through September growing season.

Normal July and August rainfall is insufficient to meet the demand of a vigorously growing field crop. Subsoil moisture must be stored during the previous fall through spring for best crop production during most seasons. Major droughts are infrequent. Rather prolonged dry periods during a part of the growing season are not unusual. Such periods generally result in a reduction from potential crop yields.

Summer precipitation occurs mostly as showers or thunderstorms of brief duration. A single thunderstorm commonly produces more than an inch of rain and occasionally is accompanied by hail and damaging winds. More than 7 inches of rain has fallen in a 24-hour period, and more than 17 inches in one month.

Growing field crops are most likely to be damaged if hail falls during the months of June, July, and August. Thunderstorm days average about 50 annually, and less than half of these occur during the critical growing period. Hail-producing thunderstorms in the same locality average less than three annually and about one in 2 years during the three summer months. Not all hailstorms have stones of sufficient quantity or size to produce extensive crop damage (*5*).

Only light snows fall during most winters. The annual average snowfall is about 12 inches, and only rarely does a winter have as much as 20 inches. On several occasions there has been as much as 20 inches of snow in one month.

January is normally the coldest month. February commonly has days as cold as those in January, but cold periods are generally of shorter duration. The lowest temperature of record is −23° F on February 2, 1951, and the January low of −20° F was in 1912.

Summers are warm, and warm periods are occasionally prolonged. Cool air invasions are less frequent in summer in all of Illinois. Many of these fail to penetrate as far south as Saline County. July is normally the warmest month, and daily maximum temperatures are likely to average as high as 90° F in both July and August. The highest recorded temperature is 113° F on July 13, 1936.

Cloudiness is greatest during the winter. The average percentage of possible sunshine received increases from near 40 percent in December and January to more than 70 percent from June through September.

The number of days between the average day of the last freezing temperature (32° F or below) in spring and the average date of the first freeze in fall has been termed the growing season. This is about 185 days in Saline County. The growing season designation is somewhat misleading because different crops have different temperatures at which growth is affected. Table 11 indicates the probabilities of occurrence of several different threshold temperatures. Temperatures vary considerably between ridges and valleys during radiation freezes, the type most common in Illinois.

[9] Southeastern Illinois Planning and Development Commission—data supplied by the Geological Survey, U.S. Department of the Interior; U.S. Army Corps of Engineers; and the Watershed Planning Staff, Soil Conservation Service, U.S. Department of Agriculture.

[10] DON WUERCH, climatologist for Illinois, Environmental Science Services Administration, U.S. Department of Commerce, furnished the data for this section.

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TABLE 11.—*Probabilities of last freezing temperatures in spring and first in fall*

[All data are based on temperature recorded in a standard National Weather Service Shelter approximately 5 feet above the ground and in a representative location. At times the temperature is lower near the ground or in local areas subject to extreme air drainage]

Probability	Dates for given probability and temperature				
	32° F or lower	28° F or lower	24° F or lower	20° F or lower	16° F or lower
Spring:					
50 percent chance after	April 16	March 30	March 16	March 2	February 26
25 percent chance after	April 25	April 8	March 25	March 11	March 7
10 percent chance after	May 3	April 16	April 2	March 19	March 15
Fall:					
50 percent chance before	October 19	November 6	November 11	November 23	December 6
25 percent chance before	October 10	October 28	November 2	November 14	November 27
10 percent chance before	October 3	October 21	October 26	November 7	November 20

TABLE 12.—*Temperature and precipitation data*

[Based on records from Harrisburg, Illinois. Period of record, 1931–60]

Month	Temperature					Precipitation			
	Average daily maximum [1]	Average daily minimum [1]	Record highest	Record lowest	Mean degree-days [2]	Average total	Maximum monthly amount	Minimum monthly amount	Average snowfall
	°F	°F	°F	°F		*Inches*	*Inches*	*Inches*	*Inches*
January	46	27	78	−11	887	3.9	17.7	0.1	3.0
February	49	29	78	−23	728	3.0	7.1	0.1	3.7
March	58	36	88	−8	583	4.3	13.1	0.7	2.4
April	70	46	89	22	234	4.1	9.0	1.4	0
May	79	55	99	31	71	4.3	14.3	1.1	0
June	88	64	106	40	0	3.7	8.6	0.4	0
July	92	67	113	47	0	3.3	8.2	0.2	0
August	91	66	110	46	0	3.5	10.4	0.2	0
September	85	57	105	29	51	2.9	7.5	0.5	0
October	74	46	98	19	202	2.9	8.1	0.2	0
November	58	36	84	−2	543	3.3	8.4	0.7	0.9
December	48	29	76	−7	831	3.0	6.8	0.5	2.3
Year	70	46	113	−23	4,130	42.3	----------	----------	12.3

[1] Average daily temperature for any month is the average of the average daily maximum and the average daily minimum.
[2] Base 65° F.

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Glossary

Alluvial fan. A fan-shaped deposit of sand, gravel, and fine material dropped by a stream where its gradient lessens abruptly.

Alluvium. Soil material, such as sand, silt, or clay, that has been deposited on land by streams.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern.

Available water 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 capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Board foot. The amount of wood in a board 1 foot wide, 1 foot long, and 1 inch thick; 144 cubic inches; 1/12 of a cubic foot.

Buried soil. A developed soil, once exposed but now overlain by more recently formed soil.

Calcareous soil. A soil containing enough calcium carbonate (often with magnesium carbonate) to effervesce (fizz) visibly when treated with cold, dilute hydrochloric acid.

Channery soil. A soil that contains thin, flat fragments of sandstone, limestone, or schist, as much as 6 inches in length along the longer axis. A single piece is called a fragment.

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 clay on the surface of a soil aggregate. Synonyms: clay coat, clay skin.

Claypan. A compact, slowly permeable soil horizon that contains more clay than the horizon above and below it. A claypan is commonly hard when dry and plastic or stiff when wet.

Coarse fragments. Mineral or rock particles more than 2 millimeters in diameter.

Complex, soils. A mapping unit consisting of different kinds of soils that occur in such small individual areas or in such an intricate pattern that they cannot be shown separately on a publishable soil map.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrations of compounds, or of soil grains cemented together. The composition of some concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are examples of material commonly found in concretions.

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 and brittle; little affected by moistening.

Contour farming. Plowing, cultivating, planting and harvesting in rows that are at right angles to the natural direction of the slope or that are parallel to terrace grade.

Cover crop. A close-growing crop grown primarily to improve and to protect the soil between periods of regular crop production; or a crop grown between trees and vines in orchards and vineyards.

Creep, soil. The downward movement of masses of soil and soil material, primarily through the action of gravity. The movement is generally slow and irregular. It occurs most commonly when the lower part of the soil is nearly saturated with water, and it may be facilitated by alternate freezing and thawing.

Crusty soil. Soil that tends to form a thin, massive or platy surface layer under the beating action of raindrops. The opposite of "crusty" is "self-mulching."

Cultivation. A mechanical stirring of the soil in place, such as operations to prepare a seedbed or control weeds.

Disperse. To break up compound soil particles.

Drainage class (natural). Refers to the conditions of frequency and duration of periods of saturation or partial saturation that existed during the development of the soil, 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 different classes of natural soil drainage are recognized.

Excessively drained soils are commonly very porous and rapidly permeable and have a low available water capacity.

Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform color in the A and upper B horizons and mottling in the lower B and the C horizons.

Somewhat poorly drained soils are wet for significant periods but not all the time, and some soils commonly have mottling at a depth below 6 to 16 inches.

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils.

Very poorly drained soils are wet nearly all the time. They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile.

Diversion, or diversion terrace. A ridge of earth, generally a terrace, that is built to divert runoff from the natural course and, thus, to protect areas downslope from the effects of such runoff.

Drainage, surface. Runoff, or surface flow, of water from an area.

Drift, (geology). Material of any sort deposited by geologic processes in one place after having been removed from another; includes drift materials deposited by glaciers and by streams and lakes associated with them.

Effluent. The outflow of water from a subterranean storage space. The term is also used in reference to gases and other liquids.

Eluviation. The movement of material from one place to another within the soil, in either true solution or colloidal suspension. Soil horizons that have lost material through eluviation are said to be eluvial; those that have received material are illuvial.

Erodible. Susceptible to erosion.

Erosion. The wearing away of the land surface by wind (sandblast), running water, and other geological agents.

Erosive. In reference to wind or water, having enough velocity to cause erosion. Not to be confused with "erodible."

Fertility, soil. The quality of a soil that enables it to provide compounds, in adequate amounts and in proper balance, for the growth of specified plants, when the growth factors such as light, moisture, temperature, and the physical condition of the soil are favorable.

Flood plain. Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless protected artificially.

Fragipan. A loamy, brittle, subsurface horizon that is very low in organic-matter content and clay but is rich in silt or very fine sand. The layer is seemingly cemented. When dry, it is hard or very hard and has a high bulk density in comparison with the horizon or horizons above it. When moist, the fragipan tends to rupture suddenly if pressure is applied, rather than to deform slowly. The layer is generally mottled, is slowly or very slowly permeable to water, and has few or many bleached fracture planes that form polygons. Fragipans are a few inches to several feet thick; they generally occur below the B horizon, 15 to 40 inches below the surface.

Friable. See *Consistence.*

Genesis, soil. The manner in which a soil originates. Refers especially to the processes initiated by climate and organisms that are responsible for the development of the solum, or true soil, from the unconsolidated parent material, as conditioned by relief and age of landform.

Glacial drift (geology). Rock material transported by glacial ice and then deposited; also includes the assorted and unassorted materials deposited by streams flowing from glaciers.

Granule. A single mass, or cluster of many individual soil particles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, and covered by grass for protection against erosion; used to conduct surface water away from cropland.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rains. The distinction between gully and rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by normal tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage. V-shaped gullies result if the material is more difficult to erode with depth; whereas U-shaped gullies result if the lower material is more easily eroded than that above it.

Habitat. The natural abode of a plant or animal; it refers to the kind of environment in which a plant or animal normally lives as opposed to its range, or geographical distribution.

Heaving (of plants). The partial lifting of plants out of the ground, frequently with breaking of roots, that results from material freezing and thawing during winter.

Herb. A plant that dies annually or after flowering; grasses and forbs, as distinguished from shrubs and trees.

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons:

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues.

A horizon.—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus. The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or some combination of these; (2) by prismatic or blocky structure; (3) by redder or stronger colors than the A horizon; or (4) by some combination of these. Combined A and B horizons are usually called the solum, or true soil. If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum. In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock usually underlies a C horizon but may be immediately beneath an A or B horizon.

Hue. One of the three variables of color. The dominant spectral (rainbow) color; it is related to the dominant wavelength of the light.

Illuviation. The accumulation of material in a soil horizon through the deposition of suspended material and organic matter removed from horizons above. Since part of the fine clay in the B horizon (or subsoil) of many soils has moved into that horizon from the overlying A horizon, the B horizon is called an illuvial horizon.

Immature soil. A soil lacking clearly defined horizons because the soil-forming forces have acted on the parent material only a relatively short time since it was deposited or exposed.

Intermittent stream. A stream or part of a stream that flows only in direct response to precipitation. It receives little or no water from springs and no long-continued supply from melting snow or other sources.

Lacustrine deposits (geology). Material deposited in lake water and exposed when the water level is lowered or the land is elevated.

Land. The total natural and cultural environment within which production takes place. Land is a broader term than soil. In addition to soil, it applies to mineral deposits and water supply; location in relation to centers of commerce and population; the size of the individual tracts of holdings; and the existing plant cover, works of improvement, and the like.

Land leveling. Reshaping of the ground surface for more uniform application or irrigation water.

Landscape. All the characteristics that distinguish a certain kind of area on the earth's surface and give it a distinguishing pattern, in contrast to other kinds of areas. Any one kind of soil is said to have a characteristic natural landscape, and under different uses it has one or more characteristic cultural landscapes.

Leaching. The removal of soluble materials from soils or other material by percolating water.

Legume. A member of the legume or pulse family (*Leguminosae*). It is one of the most important and widely distributed plant families. It includes many valuable forage species, such as peas, beans, peanuts, clover, alfalfa, sweet clover, lespedeza, vetch, and kudzu. Practically all legumes are nitrogen-fixing plants, and many of the herbaceous species are used as cover and green-manure crops. Even some of the legumes that have no forage value (crotalaria and some lupines) are used to improve the soil. Other legumes are locust, honeylocust, redbud, mimosa, wisteria, and many tropical plants.

Lime. Chemically, lime is calcium oxide (CaO), but its meaning has been extended to include all limestone-derived materials applied to neutralize acid soils. Agricultural lime can be obtained as ground limestone, hydrated lime, or burned lime, with or without magnesium minerals. Basic slag, oystershells, and marl also contain calcium.

Lime concretion. An aggregate cemented by the precipitation of calcium carbonate ($CaCO_3$).

Loess. Fine-grained material, dominantly of silt-sized particles, that has been deposited by wind.

Made land. Areas filled artificially with earth, trash, or both.

Mature soil. Any soil with well-developed soil horizons that has characteristics produced by the natural processes of soil formation and that is in near equilibrium with its present environment.

Mica. Primary alumino-silicate minerals in which two silica layers alternate with one alumina layer. The layers separate readily into thin sheets or flakes.

Mine dumps. Areas of waste from mines, quarries, and smelters.

Mottling, soil. Irregularly marked with spots of different col-

ors that vary in number and size. Mottling in soils usually indicates poor aeration and lack of 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 these: *fine,* less than 5 millimeters (about 0.2 inch) in diameter along the greatest dimension; *medium,* ranging from 5 millimeters to 15 millimeters (about 0.2 to 0.6 inch) in diameter along the greatest dimension; and *coarse,* more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension.

Mulch. A natural or artificially applied layer of plant residue or other material on the surface of the soil. Mulches are generally used to help conserve moisture, control temperature, prevent surface compaction or crusting, reduce runoff and erosion, improve soil structure, or control weeds. Common mulching materials are wood chips, plant residue, sawdust, and compost.

Neutral soil. In practice, a soil having a pH value between 6.6 and 7.3. Strictly speaking, a soil that has a pH value of 7.0.

Open drain. A ditch constructed to remove surplus water from wet land; may also include cross-slope ditches on sloping land.

Parent material. Disintegrated and partly weathered bedrock from which soil has formed.

Ped. An individual natural soil aggregate, such as a crumb, a prism, or a block, in contrast to a clod.

Pedisediment. Material eroded from an older soil surface and redeposited.

Percolation. The downward movement of water through the soil.

Permeability. The quality that enables the soil to transmit water or air. Terms used to describe permeability are as follows: *very slow, slow, moderately slow, moderate, moderately rapid, rapid* and *very rapid.*

Phase, soil. A subdivision of a soil, series, or other unit in the soil classification system made because of differences in the soil that affect its management but do not affect its classification in the natural landscape. A soil series, for example, may be divided into phases because of differences in slope, stoniness, thickness, or some other characteristic that affects its management but not its behavior in the natural landscape.

Plastic. See *Consistence.*

Plow layer. The soil ordinarily moved in tillage; equivalent to surface soil.

Plowpan. A compacted layer formed in the soil immediately below the plowed layer.

Productivity (of soil). The present capacity of a soil for producing a specified plant or sequence of plants under a specified system of management. It is measured in terms of output, or harvest, in relation to input of production for the specific kind of soil under a specified system of management.

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material.

Puddled soil. A soil that is dense, massive, and without regular structure because it has been artificially compacted when wet. Commonly, a puddled soil is a clayey soil that has been tilled when wet.

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is precisely neutral in reaction because it is neither acid nor alkaline. An acid, or "sour," soil is one that gives an acid reaction; an alkaline soil is one that is alkaline in reaction. In words, the degrees of acidity or alkalinity are expressed thus:

	pH		*pH*
Extremely acid	Below 4.5	Neutral	6.6 to 7.3
Very strongly acid	4.5 to 5.0	Mildly alkaline	7.4 to 7.8
Strongly acid	5.1 to 5.5	Moderately alkaline	7.9 to 8.4
Medium acid	5.6 to 6.0	Strongly alkaline	8.5 to 9.0
Slightly acid	6.1 to 6.5	Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Residual material. Unconsolidated, partly weathered mineral material that accumulates over disintegrating solid rock. Residual material is not soil but is frequently the material in which a soil has formed.

Rolling. Having moderately steep, complex slopes; intermediate between undulating and hilly.

Root zone. The part of the soil that is penetrated, or can be penetrated, by plant roots.

Rotation grazing. Grazing two or more pastures, or parts of a range, in regular order, with definite recovery periods between grazing periods. Contrasts with continuous grazing.

Row crop. A crop planted in rows, generally 2 to 4 feet apart, to allow cultivation between rows during the growing season.

Runoff (hydraulics). The part of the precipitation upon a drainage area that is discharged from the area in stream channels. The water that flows off the land surface without sinking in is called surface runoff; that which enters the ground before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. Individual rock or mineral fragments in a soil that range in diameter from 0.05 to 2.0 millimeters. Most sand grains consist of quartz, but they may be of any mineral composition. The textural class name of any soil that contains 85 percent or more sand and not more than 10 percent clay.

Seepage. Slow escape of water from a soil along an extensive line of surface.

Series, soil. A group of soils developed from a particular type of parent material and having genetic horizons that, except for texture of the surface layer, are similar in differentiating characteristics and in arrangement in the profile.

Shale. Sedimentary rock formed by the hardening of clay deposits.

Shrub. A woody perennial plant differing from a perennial herb by its persistent and woody stems, and from a tree by its low stature and its characteristic of branching from the base.

Silt. Individual mineral particles in a soil that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). Soil of the silt textural class is 80 percent or more silt and less than 12 percent clay.

Slick spots. Small areas in a field that are slick when wet because they contain excess exchangeable sodium, or alkali.

Soil. A natural, three-dimensional body on the earth's surface that supports plants and that 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 variant. A soil having properties sufficiently different from those other known soils to suggest establishing a new soil series, but a soil of such limited known area that creation of a new series is not believed to be justified.

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active. The solum in mature soil includes the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Splash erosion. The removal of soil particles from their position by the beating effect of raindrops.

Stone line. A concentration of coarse rock fragments in soils that generally represents an old weathering surface. In a cross section, the line may be one stone or more thick. The line generally overlies material that weathered in place, and it is ordinarily overlain by sediment of variable thickness.

Stones. Rock fragments greater than 10 inches in diameter if rounded, and greater than 15 inches along the longer axis if flat.

Stratified. Composed of, or arranged in, strata, or layers, such as stratified alluvium. The term is confined to geological material. Layers in soils that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

Stripcropping. Growing crops in a systematic arrangement of strips, or bands, to serve as vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles. The prin-

cipal 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 together without any regular cleavage, as in many claypans and hardpans).

Stubble. The basal part of plants that remains after the top has been harvested, also the part of grasses that remains after current grazing is completed.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. Technically, the part of the soil below the solum.

Surface layer. A term used in nontechnical soil descriptions for one or more layers above the subsoil. Includes A horizon and part of B horizon; has no depth limit.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

Swamp. Any area, such as a marsh or bog, where the soil is saturated with water much of the year; during most of the year, however, the surface of the soil is not deeply submerged.

Talus. Fragments of rock and other soil material accumulated by the forces of gravity at the bases of cliffs or steep slopes.

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 it may soak into the soil or flow slowly to a prepared outlet without harm. Terraces in fields are generally built so they can be farmed. Terraces intended mainly for drainage have a deep channel that is maintained in permanent sod.

Terrace (geological). An old alluvial plain, ordinarily flat or undulating, bordering a river, lake, or the sea. Stream terraces are frequently called second bottoms, as contrasted to flood plains, and are seldom subject to overflow. Marine terraces were deposited by the sea and are generally wide.

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."

Tile drain. Concrete or pottery pipe placed at suitable spacings and depths in the soil or subsoil to provide water outlets from the soil.

Tilth, soil. The condition of the soil in relation to the growth of plants, especially soil structure. Good tilth refers to the friable state and is associated with high noncapillary porosity and stable, granular structure. A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Upland (geology). Land consisting of material unworked by water in recent geologic time and lying, in general, at a higher elevation than the alluvial plain or stream terrace. Land above the lowlands along rivers.

Value (color). One of three variables of color. Value increases as the relative intensity of reflected light increases.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

Weathering. All physical and chemical changes produced in rocks at or near the earth's surface by atmospheric agents. These changes result in more or less complete disintegration and decomposition of the rock.

GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and the description of the soil series to which the mapping unit belongs. The descriptions of the capability units are in the section "Capability grouping," which begins on page 39.

Map symbol	Mapping unit	Page	Capability unit	Woodland group	Wildlife group	Recreation group
3B	Hoyleton silt loam, 1 to 4 percent slopes	24	IIe-1	3o1	4	4
8E	Hickory loam, 12 to 18 percent slopes	20	IVe-1	1r2	2	3
8E3	Hickory loam, 12 to 18 percent slopes, severely eroded	21	VIe-2	1r2	2	3
8F	Hickory loam, 18 to 45 percent slopes	21	VIe-1	1r2	3	3
13A	Bluford silt loam, 0 to 2 percent slopes	11	IIw-1	3o1	4	4
13B	Bluford silt loam, 2 to 4 percent slopes	12	IIe-1	3o1	4	4
14B	Ava silt loam, 2 to 4 percent slopes	8	IIe-2	2o1	1	1
14C2	Ava silt loam, 4 to 7 percent slopes, eroded	8	IIIe-1	2o1	1	1
14D2	Ava silt loam, 7 to 12 percent slopes, eroded	8	IIIe-1	2o1	1	2
14D3	Ava silt loam, 5 to 12 percent slopes, severely eroded	8	IVe-2	2o1	1	2
71	Darwin silty clay	16	IIIw-2	3w6	6	8
72	Sharon silt loam	32	I-1	1o4	7	6
108	Bonnie silt loam	12	IIIw-2	2w5	6	7
W108	Bonnie silt loam, wet	12	Vw-1	3w6	6	7
109	Racoon silt loam	30	IIIw-1	3w6	6	5
120	Huey silt loam	24	IVw-1	4t3	6	5
122B	Colp silt loam, 1 to 4 percent slopes	15	IIIe-2	3o1	1	1
142	Patton silty clay loam	29	IIw-2	2w5	6	4
164A	Stoy silt loam, 0 to 2 percent slopes	32	IIw-1	3o1	4	4
164B	Stoy silt loam, 2 to 4 percent slopes	33	IIe-1	3o1	4	4
165	Weir silt loam	34	IIIw-1	4w2	6	5
173	McGary silt loam	27	IIIw-1	3o1	4	4
214B	Hosmer silt loam, 2 to 4 percent slopes	22	IIe-2	2o1	1	1
214C2	Hosmer silt loam, 4 to 7 percent slopes, eroded	22	IIIe-1	2o1	1	1
214D2	Hosmer silt loam, 7 to 12 percent slopes, eroded	22	IIIe-1	2o1	1	2
214D3	Hosmer silt loam, 7 to 12 percent slopes, severely eroded	23	IVe-2	2o1	1	2
301B	Grantsburg silt loam, 2 to 4 percent slopes	18	IIe-2	3d2	1	1
301C2	Grantsburg silt loam, 4 to 7 percent slopes, eroded	18	IIIe-1	3d2	1	1
301D2	Grantsburg silt loam, 7 to 12 percent slopes, eroded	19	IIIe-1	3d2	1	2
301D3	Grantsburg silt loam, 7 to 12 percent slopes, severely eroded	19	IVe-2	3d2	1	2
337	Creal silt loam	16	IIw-1	3o1	4	4
338	Hurst silt loam	25	IIIw-1	3o1	4	4
339E	Wellston silt loam, 12 to 18 percent slopes	35	IVe-1	2r2	2	3
339F	Wellston silt loam, 18 to 45 percent slopes	35	VIe-1	2r2	3	3
340D2	Zanesville silt loam, 7 to 12 percent slopes, eroded	37	IIIe-1	3d2	1	2
340D3	Zanesville silt loam, 7 to 12 percent slopes, severely eroded	37	IVe-2	3d2	1	2
340E2	Zanesville silt loam, 12 to 18 percent slopes, eroded	37	IVe-2	3d2	2	3
340E3	Zanesville silt loam, 12 to 18 percent slopes, severely eroded	37	VIe-2	3d2	2	3
382	Belknap silt loam	10	IIw-3	2o4	5	6
420	Piopolis silty clay loam	29	IIIw-2	2w5	6	7
422	Cape silty clay loam	14	IIIw-2	2w5	6	8
426	Karnak silty clay	26	IIIw-2	3w6	6	8
427	Burnside silt loam	14	IIs-1	1o4	7	6
467C2	Markland silt loam, 3 to 7 percent slopes, eroded	27	IIIe-2	2o1	1	1
467D3	Markland soils, 7 to 15 percent slopes, severely eroded	27	VIe-3	2o1	1	2
482A	Uniontown silt loam, 0 to 2 percent slopes	33	I-2	2o1	1	1
482B	Uniontown silt loam, 2 to 6 percent slopes	33	IIe-3	2o1	1	1
484	Harco silt loam	20	I-3	2o1	4	4
524	Zipp silty clay loam	38	IIIw-2	3w6	6	8
524+	Zipp silt loam, overwash	38	IIw-2	3w6	6	8

GUIDE TO MAPPING UNITS--Continued

Map symbol	Mapping unit	Page	Capability unit	Woodland group	Wildlife group	Recreation group
723	Reesville silt loam	31	IIw-1	2o1	4	4
786D3	Frondorf silt loam, 7 to 12 percent slopes, severely eroded	17	IVe-2	3r2	1	2
786E	Frondorf silt loam, 12 to 18 percent slopes	17	IVe-1	3r2	2	3
786F	Frondorf silt loam, 18 to 45 percent slopes	17	VIIe-1	3r2	3	3
787	Banlic silt loam	9	IIw-1	3o1	5	6
803C	Orthents, 5 to 15 percent slopes	28	VIs-1	-----	2	-----
803F	Orthents, 15 to 60 percent slopes	28	VIIs-2	-----	3	-----
804F	Orthents, acid, 15 to 60 percent slopes	28	VIIIs-1	-----	3	-----
986F	Wellston-Berks complex, 15 to 30 percent slopes	35	VIIe-1	3r2	3	3
986G	Berks-Wellston complex, 30 to 60 percent slopes	10	VIIe-1	3r2	3	3

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